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THE PALGRAVE HANDBOOK OF THE HISTORY OF SURGERY

Edited by
Thomas Schlich



The Palgrave Handbook of the History of Surgery

Thomas Schlich
Editor

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ISBN 978-1-349-95259-5 ISBN 978-1-349-95260-1 (eBook)
<https://doi.org/10.1057/978-1-349-95260-1>

Library of Congress Control Number: 2017944555

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Printed on acid-free paper

This Palgrave Macmillan imprint is published by Springer Nature

The registered company is Macmillan Publishers Ltd.

The registered company address is: The Campus, 4 Crinan Street, London, N1 9XW, United Kingdom

ACKNOWLEDGEMENTS

This book has been made possible through the expertise and commitment of its authors. I am grateful for their responsiveness and creativity. Most of them have also read and commented on various other chapters, which has been of invaluable help. Special thanks go to Chris Lawrence and Sally Frampton who have been particularly active and helpful in providing extremely useful comments on numerous chapters. Thanks also to Cameron Macdonell for copy-editing some of the chapters. Finally, I would also like to thank Palgrave Macmillan for having approached me with the idea for this handbook and making the project a reality.

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Introduction: What Is Special About the History of Surgery?

Thomas Schlich

In his autobiography, surgeon Richard Selzer characterized the surgical knife as being ‘like a slender fish’ that ‘waits, at the ready, then, go[es].’ He continued by describing its actions on the patient’s body: ‘It darts, followed by a fine wake of red. The flesh parts, falling away to yellow globules of fat. Even now, after so many times, I still marvel at its power—cold, gleaming, silent ... for a most unnatural purpose, the laying open of the body of a human being.’¹ Unnatural as it may be, surgery is an extremely common contemporary practice, cutting into the living body to fix a problem is done thousands of times every day, all over the world. Harvard surgeon Atul Gawande estimated in 2012 that the repertoire of conventional surgery encompassed over 2500 different procedures, and that the average American can expect to undergo seven operations during his or her lifetime.² According to Eurostat, the most common procedure in the European Union, cataract surgery, was performed 3.6 million times in 26 member states in 2013. Tonsillectomy, as another common form of surgery, reached a prevalence of 170 per 100,000 inhabitants in some of the EU states in that year.³ For most of history this was unthinkable. Before 1800 operative surgery was for the most part limited to the body surface and to emergencies. Today the planned and controlled intervention into the living body has become a realistic therapeutic option for many medical conditions. Surgery is a universal, safe, and to a certain extent even popular way of solving a whole variety of medical

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(and some non-medical) problems. The question is how historians can explain and understand this dramatic change. Surgeons themselves have shown a long-standing and vivid interest in their history and have produced numerous valuable accounts of the technical history of their art.⁴ Their work is helpful for orientation and as a rich source of information on the technical aspects of surgery. However, considering its central place in the history of medicine, surgery has not yet received the attention it deserves from professional historians.⁵ The history of surgery is a relatively young thematic field with many open questions. Surgery has come up as part of other topics, such as the history of cancer treatment, or the history of germ theory,⁶ but less so on its own. The last comprehensive attempt at examining the conceptual, cultural and social basis of modern surgery is Christopher Lawrence's collected volume of 1992, especially his introductory chapter.⁷

This handbook is meant to address the gap in historical attention to surgery. It covers fundamental developments in the technical, social and cultural history of surgery, but it also offers wider perspectives on the subject. The individual entries function as starting points for anyone who wants to obtain up-to-date information about the respective topic or area, be it for purposes of research or just for general information. Thus, each of the chapters reflects state-of-the-art historical research on its specific topic. The contributions deal with the approaches other researchers have taken, discuss their strengths and weaknesses, and situate them in the context of past and ongoing historiographical discussions. They point to the significance of their specific topics for the history of surgery and, if applicable, for the history of medicine and other areas of history too. Even though the handbook's emphasis is modern surgery, it also takes a longer perspective by including pre-modern medicine in some of its chapters. Tracing modern surgery's roots back to an older tradition in this way both contextualizes the practice within Western medicine and helps to define its special character.

The strategy of choosing specific topics among the potentially unlimited number of subjects for the handbook has been fourfold. Some areas are basic for any historical account on surgery. Subjects such as wound disease, anaesthesia, abdominal surgery, and instruments have been part of surgical historiography for a long time. They are covered by acknowledged experts who bring up new perspectives in examining these themes. In addition, there are topics that are relatively new in the history of medicine (such as women, patients, animals, clinical trials, images, art) and which take on a specific dynamic if examined in the context of the history of surgery. A third category consists of subjects that help open up new thematic perspectives in the historiography of the field and link it to emerging areas in history, such as the history of popular culture and the history of emotions. The discussion of such topics also shows that, on the one hand, the history of surgery can benefit from other areas of historical scholarship; on the other hand, the history of surgery can provide new insights and stimulation for these domains. Finally, there are

entries about circumscribed techniques or areas of application of surgery, for example neurosurgery or transplants. These have the character of case studies that serve to explore some more general issues: minimally invasive surgery is used as a historical examination of technical innovation, neurosurgery as a node for the various ways historians can investigate disciplines or specialized fields of activity. The handbook's purview thus goes beyond taking stock of what has been done in the field to include new directions and approaches in the history of surgery.

The geographic focus of the chapters on Europe and North America reflects both the history and the historiography of surgery. As to its history, modern surgery originated in Western medicine. As I will discuss later in this introduction, it is specific to the Western world, and only subsequently spread to other areas of the globe. Similarly, its predecessor, traditional surgery, uniquely developed in the Western world. This Western traditional surgery was the starting point for the rise of modern surgery. As to historiography, the global spread of modern surgery in the past 200 years has been a relatively neglected topic so far. Much of the existing historical work has been focussed on a few national contexts, mostly Britain, North America, France and the German-speaking countries. This is in part due to the fact that much of the dynamism of late modern surgery originates in these regions. While many of the individual chapters counterbalance the cases from the Anglo-American sources with examples from outside the UK and North America, there is still a tendency to favour the English-speaking world in many (but not all) of the chapters. This is partly because this handbook is written in English, but it also reflects the current overrepresentation of English-language historiography in the field.

In this introduction, I discuss what is special about surgery as a historical topic and a theme for a handbook. For this purpose, I give a definition of surgery from a historical point of view and lay out to what extent it is specific to the West and to the modern period. As an introduction, this chapter does not provide a detailed survey of the research literature. This can be found in the handbook chapters themselves. Instead I draw the threads of the different chapters together and point out in which ways they address the specificity of surgery.

DEFINITION AND SPECIFICITY OF SURGERY

Surgery is not only very common in the modern world but also specific to a particular historical and geographical context. The idea of opening up the living body with instruments to restore its health is rather unique. Most cultures don't have it. Erwin Ackerknecht has pointed out that the reason for the absence of surgery in other cultural and historical settings is not a lack of anatomical knowledge or technical capability but a different understanding of health and disease.⁸ In many cultural contexts, it is not obvious to intervene

into the body's structure to solve a health problem. A comparative study by Shigehisa Kuriyama has shown that even the idea that the body's structure matters for health and disease can be traced to a Western origin in Greek antiquity. Chinese medicine, by contrast, has emphasized dynamic balances and energies rather than structural anatomy.⁹ Additionally, in some cultures, the body's integrity was so valued that even a simple tooth extraction met with opposition. Intervention into the body's structure was often not used in situations that look obviously surgical to us today—bone fractures or open wounds, for example, were treated with herbal potions or with some form of magic. However, interventions into the living body were performed in non-surgical contexts, for example as ritual or judiciary mutilations, as they can be found in various historical and cultural contexts. Moreover, many cultures did not clearly distinguish between medical and non-medical manipulative interference, as we do today, and often, such interventions were performed by practitioners who are not equivalent to our Western definition of a doctor. Thus, speaking of 'surgery' or 'surgeon' outside the Western medical tradition can easily lead to misinterpretations. The existence of a specialized group of doctors in charge of what we understand as the field of surgery is a specific historical phenomenon. In other cultures and at other times, the division of labour worked in different ways. Practices that we today define as being surgical were often divided up among various groups of practitioners. Broken bones, for instance, were, until quite recently, treated by specialized bonesetters in many contexts.

Surgery is thus a very specific and very special practice. Its history is in many ways different from the general history of medicine. As one of its defining features, it consists of manual practices performed with instruments on a living body. While medicine in general typically deals with bodily problems too, surgery is particularly close to bodily concerns. It makes a difference whether one gives a pill or cuts into the patient's flesh. The living body is quite literally the surgeon's working material. Moreover, in modern surgery, under anaesthesia, the patient as a person is in significant ways absent during the operation. What is present is the patient's body—again a situation that is untypical for medicine, but quite typical for surgery. Intervention into the intact body, as it is routinely performed in modern surgery for many different purposes, makes surgery a distinct and special activity. This fact has lent surgery a very special character, leading some surgical authors such as Selzer to a certain form of hyperbole when they call the 'the ritual of surgery', 'at once murderous, painful, healing, and full of love'.¹⁰ In such accounts, the surgical incision, the moment the integrity of the body is violated, has often been identified as a key event, as in the introductory quote from Selzer's book.¹¹

Once the patient's body is opened, it becomes vulnerable to an unparalleled extent. Stripped of its capacity for self-regulation and preservation, many of its functions have to be controlled or substituted artificially. A whole range of control technologies must be mobilized in order to stave off the dangers that arise from that first intervention into the integrity of the body: haemostasis,

pain control, maintenance of respiration and circulation, as well as defence against the body's invasion by microorganisms all become necessary.¹² Many specificities of the history of surgery have to do with this exposure of the patient's body to various dangers and the management of the associated risk. It is a risk that has affected the operating surgeon too. Because of the perceived immediacy of the effects and dangers of surgical intervention, it jeopardized the surgeon's reputation each time he or she operated on a patient. The question is how such a remarkable, risky and, for most of history and for cultures outside the West, unthinkable approach to treating disease could become so wide-spread, so seemingly normal and, in a word, so incredibly successful.

KNOWLEDGE

One dimension of this question is the knowledge on which surgical practice is based. At a general level, the history of knowledge about the body and disease is, of course, central to the history of all medicine. But surgical knowledge is specific in important ways. It takes the structures of the body as its basis. There is a long and varied history of surgery's relationship with anatomy as the domain that produces knowledge about the body's physical structure. A structural, anatomical approach has been a distinguishing characteristic for surgery for a long time. As Michael McVaugh has pointed out, in the Middle Ages, when learned surgeons tried to carve out a niche in the medical marketplace for their manual kind of treatment, they conceptualized illness in terms of localized, anatomy-based pathology (while physicians tended to adopt an individualized, physiological pathology).¹³ Surgical interest in body structures included particular concepts and ways of speaking about the body and its disorders. According to Owsei Temkin and the historians who have followed his lead, this structural or 'localist' approach became dominant in modern medicine more generally. It is based on the assumption that the body is a composite of organs and tissues with particular functions and that disorders affect these at the structural or functional level. Surgery can rectify these disorders by removing the diseased structures or restoring their function. With the emergence of pathological anatomy in the eighteenth and early nineteenth centuries this 'surgical point of view', as Temkin called it, became one of the defining characteristics of modern medicine. It also made modern surgery possible and desirable because, according to this approach, localizing a disease allowed performing the appropriate treatment.¹⁴ As Christopher Lawrence has pointed out, the emergence of modern surgery in the nineteenth century can be understood to a large degree through the redefinition of previously internal diseases as surgical problems. Thus, Lawrence explained, the localist approach is not a timeless or value-free way of describing the body and disease. As natural as it looks to us today, it is still a partial perception, influenced by particular interests and practices which shaped this knowledge in a particular way. In any case, the rise of the surgical point of view turned the

interior of the body into the rightful domain of the surgeon and made the living body a surgical object *in potentia*.¹⁵

Historians of medicine have followed the further developments of the surgical rationale and have described how, subsequent to surgery's focus on structure, a new generation of doctors and scientists turned towards body function. This was a move that was crucial for the further expansion of surgery, for example in the direction of organ transplants and neurosurgery. It was combined with surgeons' increased orientation towards experimental laboratory science, which in the 1880s had become a resource not only for supporting the surgical rationale but also for finding new surgical healing strategies.¹⁶ These trends form part of the history of how surgery related to different varieties of science, a theme that comes up in many of the chapters of this handbook.

The various versions of the surgical healing strategy have certain points in common. They consist of a manual–technical intervention performed locally on a specific body structure by a highly qualified expert. Their use favours repair of an already existing damage over other strategies such as prevention—an attitude that puts them in opposition to traditional medical strategies of maintaining or reconstituting a balance within the body or between the body and its environment through complex, often systemic measures which frequently concern the patient's way of living. Surgery, by contrast, can be characterized as following the strategy of a technological fix. What is important is that this rationale is, once more, neither natural nor self-explanatory. It has a history. Its emergence and further development can be situated in time and space, and in different social and cultural contexts. Part of that history has been the rise of modern surgery, changing not only medicine but also ideas about the body in modern societies more generally. Thus, surgery provided technical solutions to problems that were originally not understood as being medical, let alone surgical, for example deviant behaviour and traffic accidents.¹⁷ The mutual influence of surgery and widespread body concepts is one way in which the history of surgery is also part of the history of the body, a flourishing thematic field since the 1980s, which has not been fully exploited with regard to surgery, even though the theme runs through most of its history.¹⁸

TECHNOLOGY

Knowledge is only part of the story. The rationale for surgery developed in tandem with the technical capabilities of its application. How did doctors learn to intervene successfully into the human body? What did surgeons do with their hands, their bodies and their tools to make their interventions work out? After all, surgery concerns not only the patient's body. The surgeon's body (and in modern surgery, the bodies of the whole surgical team) is involved in surgical work in significant ways too.¹⁹ Surgery requires bodily knowledge that is situated in the practitioner's body in the form of skill and know-how.²⁰ This means that physical skill and the specific conditions

of knowledge acquisition and transmission are of primary importance to the history of surgery. This goes with the fact that, historically, surgery has strong roots in craft traditions, whereas internal medicine tended to base itself in academic learning. Surgeons themselves sometimes characterize their work as ‘handicraft at the highest level’.²¹ Know-how and skill have their place in the history of medicine more generally. They also have been particularly pertinent for a number of decades in history of science as well as in science and technology studies. In both fields scientists’ skills have been put in close relationship to the knowledge they produce. In the history of surgery, material practices—what practitioners do with their hands and instruments, and how such practices can be recorded, passed on, or evaluated—play a prominent role indeed.

Surgery can, in fact, be described and analyzed as a technology. Under the comprehensive definition proposed by scholars in science and technology studies, the term ‘technology’ has three layers of meaning.²² First, there is the physical level. In surgery, this involves the instruments, the operating room and so on. Second, technology can be seen as an activity, as a means to accomplish a specific goal. This refers to what the surgeons do in the operative procedure. Finally, technology is what people know: having instruments and starting to use them on bodies was not enough for successful surgery; surgeons also had to know how to apply the tools and the techniques within their sphere of activity. A surgical technology cannot be spread without the relevant knowledge, know-how and practical skills. Looking at surgery as a technology shifts the focus from theory to practice. It is more about how it has been possible for modern surgery to emerge and to expand, and not why it was seen as desirable in the first place. This aspect includes the question of the effectiveness of surgical measures (including technologies around surgery such as anaesthesia, antiseptics and asepsis), which confronts historians with the problem of how to evaluate the achievements of practitioners in the past. Part of the answer lies in looking at how people at the time assessed the effects of surgical treatment, how they defined success and failure in their historical context.

It is obvious that surgery as a technology has gone through major change. It is equally obvious that the analysis of such technological change is crucial for understanding how modern surgery in its present form developed.²³ To deal with this question, in the past few decades many historians have used the concept of innovation as a framework. Originally, the idea of innovation was introduced to overcome historians’ exclusive focus on discovery and invention and to avoid naïve and teleologically charged views of ‘progress’ and ‘advance’. Looking at technological change as innovation has helped to investigate the wider conditions of successful new practices and knowledge in the context of the prevailing social, political and economic conditions.²⁴ More recently, scholars have viewed the innovation framework more critically. Sally Frampton has argued that the model only works well if technologies remain identical over time, but this is often not true in surgery, where

practices shift continually.²⁵ One can claim that the usefulness of the distinction between innovation, invention and diffusion is questionable in a situation where ‘both the context and the technology of a surgical innovation are liable to change.’²⁶ The whole notion of a linear development of surgical innovation runs the risk of making the acceptance of new techniques look inevitable, over-simplifying its often complex and convoluted character. It is rare, for example, that the idea of a new procedure leads directly to its use. Normally the ‘relationship between theory and practice in the construction of a “new” operation’ is ‘complex and circular’.²⁷ In many cases, there is no clear direction of innovation pointing from scientific theory to surgical practice. In the introduction of antisepsis and asepsis, for example, scientific research in the laboratory and surgical practices stood in complicated mutual relationships.²⁸ Moreover, many new techniques in surgery were first used in practice and only later justified by scientific research, for example, osteosynthesis (the operative treatment of broken bones with metal implants, such as plates and screws). Instead of a linear development, one can use a metaphor from science and technology studies and think of the rise of modern surgery as the emergence of a network of various and heterogeneous technologies of control. Thus, the introduction of a technology like osteosynthesis can be analyzed as ‘the building of a complex network of specific practices, actors and objects linked to different localities’.²⁹

SOCIAL HISTORY

The focus of historical research on surgery has not always been on its technical and material aspects. Since the rise of the social history of medicine from the 1970s onwards, historians have turned towards a wide range of social groups involved in surgery—practitioners and their patients, the patients’ families, nurses, manufacturers and dealers of instruments, regulators and legislators and so on—as well as to the various institutions—hospitals, schools, colleges, universities, professional organizations—that played a role in its history.

Some of the research has focused on patients’ roles in surgery. The people whose bodies undergo surgery were, of course, central to the development of the field. And the rise of modern surgery was only possible to the extent that patients were interested in it and trusted practitioners enough to undergo it. Along these lines, more recent work has tended to emphasize the active role that patients took in decision-making, showing, for example, that in many situations, the patients rather than the doctors pushed for surgery. Moreover, it has been established that the surgeon-patient dyad is too narrow. Patients’ families and friends, but also the wider public, have played into these decisions in important ways.³⁰ Seen from a history of technology point of view, in surgery, the provider–user relationship tends to be more complex than in most of the history of medicine. The primary user of surgical technology is the surgeon, but the surgeon applies the technology to another participant

in the setting, a patient, who thus becomes in a way the end-user of surgical technology and, in certain instances, an active participant in the employment of new tools and techniques.³¹ In this handbook, patients figure as central agents in several chapters, for example the ones on popular culture, on emotions, on women, on cancer and on bariatric and cosmetic surgery.

The theme of patients and, related to that, of public opinion lends itself to taking a cultural-history perspective and explore the dimension of meaning in surgery. The examination of cultural interfaces between surgery and other spheres of life is a common topic in history, as evident in this handbook not only in the chapters on emotions, art, popular culture but also in the neurosurgery chapter, for example. Many historians of surgery have aimed at a cultural contextualization and examined how cultural conditions have shaped surgery and vice versa, often in relationship to a particular cultural topos with connection to other areas of life, for example the idea of conquest, which can be found in colonialism as well as in surgery, as Christopher Lawrence and Michael Brown have described it in a recent paper.³²

Most of the social history of surgery, however, has focussed on occupational history and, in most cases, has used the framework of professionalization theory to this purpose. This perspective makes the professional and economic interests of the various groups involved in medicine visible. Its use was very much a critical reaction to a traditional medical historiography that seemed to centre too much on the triumphal progress of medical science brought about by supposedly heroic and selfless doctors and scientists.³³ The emphasis on the profession is not specific to surgery. Much of the history of medicine deals with the history of the occupational groups providing medical services. The standard narrative starts with pre-modern and Early Modern medical pluralism, which, in the course of the eighteenth and nineteenth centuries, was replaced by the dominance of one united medical profession. In the setup of medical pluralism, there was not one medical profession but a whole range of occupational groups, often with fuzzy boundaries.³⁴ Social historians such as Roy Porter have looked at Early Modern healthcare as a consumer-driven marketplace, in which providers were competing for economic advantage.³⁵ In much of this work, distinctions between the different groups of health practitioners have not been taken for granted but examined as to their social and economic dynamics.³⁶ Within this framework, practitioners who performed surgical acts can be found in many different contexts and cannot be easily subsumed under one general term. Capturing this heterogeneity requires a perspective that goes beyond medicine in a narrow sense and includes a whole range of occupations and businesses, encompassing activities such as barbering and musical instrument making, which were both sometimes combined with surgery. In this way, the history of surgery can provide a broad perspective helpful for re-interpreting the history of health care provision more generally. However, despite this heterogeneity, it is possible to describe a long-standing tradition of surgery in the West, a tradition that could later be adopted by modern surgeons as their own.

The subsequent sections of this introduction present the different chapters and provide a brief characterization of their contribution to the overall topic of the history and historiography of surgery with particular emphasis on what is special about the history of surgery. For practical reasons, the chapters are grouped into three parts. Part I: ‘Periods and Topics’ contains chapters on basic themes in the history of surgery. Part II: ‘Links’ is about approaches and subjects from outside the history of surgery that are applied to this field. Part III: ‘Areas and Technologies’ includes examples from the history of particular topics and how they can be examined through novel approaches.

PERIODS AND TOPICS

Among the scholars of various backgrounds who have approached the history of surgery from different angles, surgeons probably represent the group with the longest tradition. Since antiquity, surgical authors have documented, described and evaluated their predecessors’ techniques and theories. In his chapter ‘[Surgery and Its Histories: Purposes and Contexts](#)’, Christopher Lawrence analyzes how surgeons in the past have written their own history. For the longest time, this was not done for conducting historical research in our sense of documenting and explaining how things were in the past and how further developments led up to what we have in the present. It was done for the purpose of providing information about technical points in a direct way. However, at the same time, evoking surgeons from the past and their work was often a way of claiming particular identities for surgical practitioners. Practitioners could thus use history to form an identity distinct from that of their colleagues who did not cut into their patients’ bodies; they could also use history conversely, to emphasize the commonalities they had with different groups of practitioners, thus claiming surgeons’ membership in the medical profession. Thus, starting with the Hippocratic texts, surgery has been repeatedly identified as a special mode of treatment that medicine has to offer. However, the idea that surgery as an identifiable and comprehensive field of knowledge and practice can only be traced back in the West to the twelfth and thirteenth centuries. At that time there were also groups of healthcare providers who specialized in surgical work and made their living by performing some form of surgery. They varied widely in terms of education and social and economic status. In the milieu of towns, over time a distinct hierarchy of surgical practitioners developed, ranging from university-trained learned surgeons to part-time practitioners and itinerant specialists for particular interventions.

In the late Middle Ages and Early Modern period surgery as field of activity was dominated by a craft tradition, which unfolded a strong, expansive dynamic in the medical marketplace. The field of surgery parted ways with medicine, participated in the specialization of trades and differentiated itself as a craft organized in the form of guilds. Such surgical guilds, with their specific form of training through apprenticeship, appeared in many towns and cities in various parts of Europe during the fourteenth and fifteenth centuries.

These craft surgeons, often joined by the more numerous barbers, became the specialists for external diseases and emergencies. They played a central role in the provision of general healthcare services at a larger scale in most parts of Europe until the second half of the nineteenth century. Within this general trend there was a great deal of fluidity and diversity, and the separation of medicine and surgery remained partial and incomplete. Often professional status was linked with particular practices. Thus, surgeons' status suffered from their association with bodily work and in particular with cutting and the shedding of blood. Their variable identity and their often-contested status was reflected, claimed or challenged in histories of surgery, with their various claims about the genealogy and social place of surgery.

The chapter on surgical historiography can be read side-by-side with Faith Wallis' chapter on traditional surgery, '[Pre-Modern Surgery: Wounds, Words, and the Paradox of "Tradition"](#)'. This chapter puts the focus on the production and transmission of surgical knowledge through texts from the Hippocratic corpus to the end of the eighteenth century, discussing the methodological issues associated with this approach. One of the methodological challenges consists of the changing definitions of surgery in varying historical contexts. Thus, surgery can, for example, be defined as either an activity or a professional field. For a long time, as we have seen, surgery was indeed a practice performed by various kinds of health practitioners. When medieval surgeons started becoming visible as an occupational group in craft and in academic contexts, the written tradition provided the opportunity for the crystallization of surgery as a subfield within medicine.

In the chapter '[Medicalizing the Surgical Trade, 1650–1820: Workers, Knowledge, Markets and Politics](#)', Christelle Rabier looks at the changing occupational positioning of surgeons in the context of Early Modern medical pluralism up until the early nineteenth century. Recent historiography on this topic has taken its cues from the history of occupations and examined the labour market and practitioners' careers as well as changing patterns of consumption of medical services and goods in the population. In doing this, historians transcend the limits of the field of medicine, taking into account the multiplicity and variability of practitioners who offered surgical services. Along with this new orientation and in accordance with the material turn in history, practices and objects have been taken more seriously for their role in defining not only the field but also the identity of practitioners. These new approaches, as Rabier points out, offer less teleological and present-centred accounts of surgeons' professional status than do the studies conducted within the framework of professionalization theory.

Peter Kernahan's chapter, '[Surgery Becomes a Specialty: Professional Boundaries and Surgery](#)', deals with how surgery, once it was part of the medical profession, went on to become a special field of activity within this profession, and how, subsequently, this field underwent further sub-specialization. Using Andrew Abbot's concept of jurisdiction as an explanatory tool to understand these processes, he looks specifically at surgical associations and other organizations that claimed authority over the regulation of surgical

practice. Thus, once more, the identity of surgery was not determined by the nature of things; it was an object of negotiation. Major operations, for example, which characterize the domain today, became constitutive for the field of surgery only in the course of the nineteenth century. The examination of different national contexts, in this case the UK, France, Germany and the USA, emphasizes the contingent nature of such defining criteria.

One other boundary, between surgeons and veterinarians, was to determine which kind of patients practitioners treated. However, even this seemingly clear delimitation was subject to negotiations, as described by Abigail Woods in her chapter ‘[Between Human and Veterinary Medicine: The History of Animals and Surgery](#)’. Thus, some practitioners treated both humans and animals; others were specialized in certain animal species, usually horses; moreover, some lay practitioners performed only very specific interventions, for example spaying. In general, animals figure in surgery in at least three different roles: first, they can be patients; second, they can be used as animal models in experimental science, where they stand in for humans; third, they can be the source of organs for xeno-transplants. The last two roles are predicated on the fact that animals are physically close enough to humans to replace them for experiments or organ retrieval but, at the same time, different enough in their ethical status to be used against their own interests in such ways—an arrangement that the philosopher Philippe Descola has called ‘naturalistic ontology’.³⁷ With regard to surgery, these examples also raise the question of categorical limits: to what extent can we call animal experiments surgery, or, for that matter, castration or organ retrieval? Besides being of interest for the history of surgery, the examination of the contradictory roles of animals in this domain provides fascinating insights into the history of the human–animal relationship more generally, representing its changes and contradictions in a condensed manner.

Boundaries created by inclusion and exclusion of practitioners are also central for the study of women in surgery. In the chapter ‘[Women in Surgery: Patients and Practitioners](#)’, Claire Brock discusses the history of women as practitioners and as patients. Until quite recently, operative surgery has been considered a practice that women were incapable of performing. Women were, however, very much deemed suitable objects of surgical intervention. Consequently, in many historical accounts the female patient figures as the narrative counterpart of the male surgeon—the passive victim of male aggression. As Brock argues in this chapter, it is worth overcoming this dichotomy and reconstituting women’s agency in both roles, surgeon and patient, without however, losing sight of the real limits set for women in their role as practitioners and as patients.

The importance of gender in the history of surgery also becomes obvious if one looks at the role of nurses in the development of modern surgery, as Rosemary Wall and Christine E. Hallett do in the chapter ‘[Nursing and Surgery: Professionalisation, Education and Innovation](#)’. The emergence of modern surgery was not just a result of surgeons’ activities. It was dependent on a whole range of other actors who are less visible in most histories of surgery. Nurses took on various crucial tasks in connection with surgery

and were thus of particular significance. Unlike surgery, nursing has for a long time typically been a female occupation. It is, therefore, interesting to see in which ways women as nurses were integrated into the male-dominated domain of surgery. They were, for example, kept away from the cutting part of surgery—the intervention into the integrity of the body. Instead they were relegated to supposedly feminine tasks associated with household chores, such as cleaning and tidying. In the surgical division of labour, nurses were attributed functions of assistance and of caring, passing instruments to the surgeon and looking after the needs of the patient. However, with the growing importance of technology in surgical practice, the range and number of the nurses' duties increased too. They took on new jobs, tending not only to the increasingly sophisticated armamentarium of surgical instruments but also to anaesthesia, antisepsis and asepsis, as well as to the act of monitoring the patient's vital functions, thus contributing centrally to the further development of surgery in general.

The expansion of surgery can be examined particularly well by looking at abdominal surgery, arguably the most important example of surgery's broadening domain of activity within the body. The ability to perform surgery in the abdomen was crucial for the new function of modern surgery of treating internal disease. Many of the bread-and-butter operations in general surgery, such as cholecystectomy and appendectomy, are interventions into the abdominal cavity. In the chapter '[Opening the Abdomen: The Expansion of Surgery](#)', Sally Frampton discusses the various conditions—technical, conceptual, professional—that made abdominal surgery possible and desirable as a routine intervention and looks at how, in turn, this new practice shaped the identity and self-image of surgery as being progressive and modern.

It is well known that anaesthesia was one of the technologies that contributed most to the growth and special character of modern surgery. As Stephanie Snow discusses in her chapter, '[Surgery and Anaesthesia: Revolutions in Practice](#)', surgery was already on a trajectory of expansion when anaesthesia was introduced in the 1840s. Interestingly, suitable substances had already become available decades before, but at the time using them for anaesthesia was not within the scope of imagination because pain and consciousness were seen as inseparable from life. The space for painlessness without dying only opened up with new ideas about the physiology of consciousness and death in the nineteenth century. In addition, at that time, surgery had become more sophisticated. This often meant that operations took more time than before, so the need for suppressing operative pain had increased. The use of anaesthetics, in turn, changed the character of surgery in significant ways. As mentioned earlier, with anaesthesia, the patient as a person was in many ways absent during the operation. Surgeons no longer needed to interact with their patients while operating. More than ever, the patient's body could be treated as the working material of the surgeon's art. On the one hand, this made operating easier. On the other hand, the patients' unconsciousness increased their susceptibility to failure of their vital functions and thus required more

attention to monitoring the organism's condition during the operation. All of this made surgery even more different from other forms of medical therapy.

In the mid-nineteenth century, shortly after the introduction of anaesthesia, surgeons' attention was drawn to another source of danger for the patient's opened-up body. They noticed an increase of post-operative mortality caused by wound disease: some time after the surgery itself, wounds would start suppurating, patients would get very sick and feverish and many of them would die. The phenomenon seemed to be somehow related not only to the conditions of the wound but also to the operative environment and the operator's cleanliness. As a reaction, many surgeons, in particular in the UK, developed special technologies of cleanliness aimed at preventing such wound complications. Some of them turned to the emerging germ theory of disease and made the presence of microscopic life forms responsible for the problem. The most important surgeon to do that was Joseph Lister, who developed antiseptics as a special technique for eliminating germs in the wound by applying carbolic acid. This strategy remained controversial for a long time. It was eventually supplemented by asepsis, a method of keeping wounds and the surgical environment germ-free in the first place. In the chapter '[The History of Surgical Wound Infection: Revolution or Evolution?](#)', Michael Worboys describes the emergence of these key technologies of modern surgery and discusses their various genealogies as well as their reception and spread in surgery. Like other cases, this example raises the question of how technical change occurs in surgery, why some technologies get accepted while others are rejected and how they changed surgery as a result. In addition, the topic is a good example for the difficulties of determining the success of treatments in the past. Did antiseptics really work? Historians have, in fact, been able to identify a significant decrease of surgical mortality following the introduction of the technology. But was antiseptics the cause of that improvement? Mortality might have decreased because other factors changed at the same time. Maybe surgical patients were better nourished and healthier than before. Maybe concurrent, but independent, improvements in cleanliness in hospital wards and operating venues are to be credited for change. Maybe mortality dropped because the use of antiseptics led to more conscientiousness and cleanliness in operations, so that what we see is in a way an unintended side effect of antiseptics. These issues are not limited to the problem of wound disease. They come up whenever historians try to determine the effects of medical measures in the past, but they are particularly obvious in surgery.

The most basic elements of all surgical techniques are instruments. As surgeon-historian John Kirkup has noted, surgery requires tools for cutting, grasping, holding and connecting living tissues.³⁸ Without such technological means, practitioners would not be able to make cuts in a precise and controlled way, see and manipulate body structures efficiently, keep the patient's organism from bleeding to death and restore its contiguity by closing it up after the surgery. The history of instruments illustrates the central importance of the material dimension in the history of surgery, a dimension that Claire L. Jones discusses in her chapter, '[Surgical Instruments: History and](#)

Historiography’ and which is of interest for all of medicine, especially for surgery. Jones’ chapter discusses different approaches to material history and how they can be made useful for understanding the evolution of surgery. This approach raises the question of what role objects themselves can have in such a history—not just in terms of the invention of new instruments but also in their everyday use, their multiple connections to different practices, to other objects and to various historical actors, and how these multifaceted links can be represented in historical accounts, for example as elements of heterogeneous networks.

LINKS

One dimension of the material history of surgery is the history of the development of the built environment for surgery. In the chapter **‘Surgery and Architecture: Spaces for Operating’**, Annmarie Adams discusses how surgery, more than other medical practices, has had a specific relationship to the spaces in which it has been performed. The spaces for surgery can be conceptualized as nodal points in the network of control technologies of modern surgery. They have been set up to enable control in various ways: they provide good lighting (and often imaging technology to enhance visual control), clean air and a calm, closed-off space, free of dirt and germs, equipped not only with instruments but also with operating tables and other means of enabling manual accessibility. The development of such spaces can be seen as reflecting the technological advances of modern surgery; but they can also be seen as producing such advances. Accordingly, surgeons come into the picture not only as the users of these spaces but also as their designers. However, practical functionality is only part of the story. Architecture always has a symbolic dimension too, which is closely connected to developments outside of surgery, for example the rise of modernism as a style in architecture. The symbolic side in material history is of considerable significance, since it also shaped, in its own way, the conditions for the rise of modern surgery.

Harriet Palfreyman and Christelle Rabier discuss, in their chapter, **‘Visualizing Surgery: Surgeons’ Use of Images, 1600–Present’** another aspect of surgery’s material history: the production and use of images by surgeons. Surgery as a practice has a strong visual and tactile dimension, which is difficult to convey in words. Therefore, practitioners have often attempted to use pictures in order to describe their practices and pass them on to their colleagues. At the same time, as this chapter emphasizes, images helped to construct a special surgical identity associated with the use of sharp instruments and the knowledge of anatomy. In this way, images participated in the process of characterizing surgery as a specific branch of medicine, as a physical craft in charge of manipulating the patient’s body.

In terms of visual media, surgery has also been a subject of the visual arts for a long time. Works of art have showcased the bodily dimension of the field, focussing in different ways on surgeons’ interventions into their patients’ bodily integrity, often depicting the patient as a passive object of

intervention in contrast to the active surgeon. In such representations, the surgeon's body, in particular his (it's mostly men who have been represented) hands, frequently take centre stage. In the chapter [‘Art and Surgery: The Expert Hands of Artists and Surgeons’](#) Mary Hunter describes these features and draws the parallel between art and surgery, characterizing both as visual and haptic practices, equally centred on the hands as their primary tool. Visual art thus represents the special character of surgery as well as the special role of the surgeon—often idealized in a variety of ways. Surgeons are portrayed not only as competent and in control but also as empathetic and caring. However, as the chapter clarifies through its focus on three different cases, art reflects and creates surgeons' identities differently in different historical contexts.

Emotions are one of the main subjects of surgical representations in art. In his chapter [‘Surgery and Emotion: The Era Before Anaesthesia’](#) Michael Brown draws the connection between the history of surgery and the history of emotions. He focusses on the pre-anaesthetic period and situates the emotions elicited by surgery within the ‘emotional regime’ of the time period, contextualizing the expression of feelings and the discourse about them within the standards and expectations of the time and its specific culture of sentiment. The way emotions were talked about also needs to be linked to other aspects of the contemporary context, such as, in this case, professional politics within surgery. This explanatory strategy is also applicable to other time periods up to the present. What is specific to surgery are the emotions associated with the violation of the body's integrity, be it by cutting into someone's body or by being operated on as a patient. Thus, surgery's transgressive character as well as the high stakes involved in its performance are often seen as requiring a special emotional set-up on the surgeons' part. Operators have to distance themselves emotionally from what they do. This chapter shows that this notion is by no means straightforward. Whether, and in which ways, emotional distance was seen as a positive attitude depended very much on the context. At a more general level, discussing emotions in history raises the fundamental question to what extent feelings are universal and time-independent or contingent and shaped by the environment of their time. This issue is particularly striking in the context of surgery because of the field's proximity to bodily concerns.

Emotional reactions to surgery have also shaped the popular culture around the domain, as discussed by Susan E. Lederer in the chapter [‘Surgery and Popular Culture: Situating the Surgeon and the Surgical Experience in Popular Media’](#). What has made surgery interesting to the wider public is its transgressive quality—the cutting into the body—and its potential healing effect, which gives it an almost miraculous aura. This is also why some domains in surgery have been of particular interest to the lay public—usually operations that went beyond the limits of what is normally done in medicine. Transplantation, for example, as a practice that involves removing a body part or organ from one organism and letting it grow in another one, has been perceived as a direct assault on commonly accepted notions of personal identity.

Popular culture has expressed this kind of conflict through fantasies about chimaeras and composite beings made out of different species by crazy-scientist-type surgeons. Surgery on the heart and the brain elicited similar fears, since both organs were seen as the centre of life and the seat of personal identity. However, for the most part, popular culture has portrayed surgeons as heroes of modernity and has linked the field to ideas of progress. In the US context, popular media also cast the patients in the role of consumers who are looking for the best product and the best service for their money.

A very different context was present in the colonial settings outside the European and North American centres of modern medicine. Examining these settings provides historians with the opportunity to investigate the conditions of the world-wide spread of Western surgery and describe how, in the process, it was reinterpreted and modified. Such research is of particular interest in a world of ongoing and accelerated globalization, with medicine and surgery as important arenas. In the chapter ‘[Surgery, Imperial Rule and Colonial Societies \(1800–1930\): Technical, Institutional and Social Histories](#)’, Kieran Fitzpatrick turns to India in the nineteenth and early twentieth centuries as one setting of colonial medicine. He shows how this context shaped both the performance and the perception of modern surgery and discusses ways in which historians can capture and analyze this phenomenon. This chapter can only be a first foray into the potentially extremely rich research field of the global spread of modern surgery beyond the Western world, an area which has been so far sorely neglected by medical historians.

Another special context of surgery is war. In historical discussions, particularly in lay circles, but also among surgeons and sometimes among historians too, warfare is often associated with innovation in surgery. It is common to claim that surgery among all medical fields owes much of its development to war. In the chapter ‘[Surgery and War: The Discussions About the Usefulness of War for Medical Progress](#),’ Leo van Bergen takes a critical look at this claim with regard to World War I, tracing it back to its origins and analyzing the controversial discussions around it. The most convincing objection against the benefit of war for surgery concerns the specificity of innovations made in times of war. Many of them don’t carry over easily into peacetime surgery. Moreover, the conditions in wars are usually unfavourable for research and innovation: lack of time, lack of resources and flagrant violation of ethical principles all make wars bad breeding grounds for new techniques that would be of value in times of peace.

AREAS AND TECHNOLOGIES

Among the various technologies of modern medicine, transplant surgery is arguably one of the most spectacular. As Sibylle Obrecht discusses in her chapter ‘[Transplantation Surgery: Organ Replacement Between Reductionism and Systemic Approaches](#),’ transplantation, like no other surgical practice, embodies the promise of modern surgery to offer a technological fix for complex

medical problems. But at the same time, the treatment method has raised particularly urgent concerns about modern surgery. One reason is that transplant surgeons intervene into more than one body; as mentioned earlier, they need to obtain tissues or organs from another body, which in the case of living donors is completely intact. In addition, for critics, transplant surgery often stands for a mechanized view of the human body as a kind of machine repairable through the use of spare parts. The rationale of this technology is based on the concept that the body can be fragmented into exchangeable elements. However the biological limits of exchangeability have forced surgeons and scientists to re-conceptualize the organism as a holistic system that possesses and defends its own individuality. To deal with these contradictory aspects, surgeons have needed to enter into close collaboration with other specialists, such as immunologists, with the result that the surgical act itself has become just one element in the transplant procedure. In this chapter Obrecht argues that a differentiated investigation of these complex matters helps to better understand the history of such spectacular interventions as transplantation beyond simplistic stories of conquest and mechanization of the body.

Neuro- and brain surgery has been another taboo-breaking area. Like the abdomen, the interior of the skull was a long-standing forbidden zone for surgeons. Delia Gavrus analyzes how, in the North American context, those practitioners who ventured into this zone subjected themselves to special professional norms. For one, these norms required highly developed skills and technical precision as well as knowledge based in experimental science. But they also demanded superior ethical standards. American neurosurgeons created a specific group ethos of restraint and responsibility for their practice. This ethos was strictly enforced in order not to jeopardize the trust that the public had set in the new discipline of neurosurgery. This rigour became even more necessary, as public imagination about brain surgery tended towards extremes of both enthusiasm and anxiety. By including the multiple dimensions of the establishment of such a specialized group of doctors, Gavrus' chapter, '[Opening the Skull: Neurosurgery as a Case Study of Surgical Specialisation](#)', exemplifies how specialties, sub-disciplines or areas of practice can be examined at the various levels of practices, knowledge, institutional organization and cultural meaning.

As stated earlier, the rise of modern surgery depended crucially on its acceptance by patients. The history of patients in surgery is the main focus of David Cantor's chapter '[Cancer: Radical Surgery and the Patient](#)'. Because of its physical character, its often stark consequences and the risks involved, surgery is a particularly suitable field for exploring the changes in the role of patients in medical decision-making. This is even more true in the case of radical surgery for cancer. There, historians can study the extremes of, on the one hand, the complete marginalization and exclusion of patients from therapeutic choices and, on the other hand, more recent attempts to have the patient take on the whole burden of therapeutic and diagnostic responsibility. This example also shows the importance of the wider context for examining the history of patients and the need to go beyond a dyadic and idealized doctor–patient relationship to properly understand the patient's role in medicine. As the

chapter shows, cancer surgery is a useful case study for analyzing the changing position of surgery within the scope of treatment options in modern medicine, which in this case have become broader and more complex over time.

The acceptance of surgery as a viable treatment option has been closely linked to surgeons' capabilities to demonstrate the usefulness and safety of their art. The patient's readiness to undergo surgery had much to do with the trust they placed into the practitioners, their skill and knowledge, and the effectivity and reliability of their methods. Not only for cancer surgery but also for surgery more generally, the stakes are often high, the results visible and responsibility for failure seems to be easily attributed. This has been especially pertinent for interventions that are not reactions to an obvious emergency. Modern surgery's healing strategy of opening the patient's seemingly intact body to fix a structural problem inside came with a strong need for justification. One would undergo such an intervention only if the chances of relief outweighed the risks. Therefore, surgeons developed methods of documenting therapeutic effects relatively early. The classic medium was the case history, which in a way replaced direct testimony and made the reader an indirect witness of the surgery. The effects of surgery, good or bad, seemed to be so obvious in part because the immediate structural change through an operation tended to overshadow its less evident long-term effects. This is why surgeons have tended to be satisfied with case histories or simple counts of success and failure, even at the time when new technologies of evaluation has become common in other fields of medicine. Thus, surgical practitioners have been hesitant to use the randomized clinical trial (RCT), with its sophisticated methodology of control groups, randomization, blinding and standardization of procedures. RCTs were thought not to be applicable to surgery because surgical procedures were hard to standardize, their results depended on the skill of the individual surgeon and their application varied according to the characteristics of the individual patient's anatomy and disease. It was even influenced by chance events during the surgery. Furthermore, blinding was impossible or imperfect, and placebo surgery was ethically dubitable. For all these reasons, clinical trials in surgery have a very special history, as discussed by David Jones in the chapter, '[Surgery and Clinical Trials: The History and Controversies of Surgical Evidence](#)'. Situated at the crossroads of the history of surgery and of clinical trials, the history of evidence in surgery helps understand how, through its evaluation methods, modern surgery became so widespread and quasi-natural during the past 200 years. At the same time, investigating the various techniques of documentation and evaluation of treatment results in the surgical context sheds new light on the history of these techniques as such. One can see, for example, that the RCT, despite its claims to universality, is a method that was very much shaped by the specific conditions of drug therapy and that it is by no means obvious to use it for other modes of treatment.

Bariatric and cosmetic surgery are two other fields of recent and rapid innovation. In the chapter '[Bariatric and Cosmetic Surgery: Shifting Rationales in Contemporary Surgical Practices](#)', Jean-Philippe Gendron discusses these two practices together. Both of them stand out because they consist of interventions into healthy structures of the body for reasons that are not necessarily

characterized as medical in the first place. One way these interventions have been justified has been to reframe the original problem as being medical and in this way make it acceptable to treat it surgically. Both surgical fields also have in common that they meet a demand that in principle originates with the patient. Because of this background, the usual issues pertaining to the risks of surgical intervention into the patient's bodily integrity are even more marked. This is also why such areas of surgery are particularly controversial, and aspects such as the societal and cultural standards of body appearance form essential elements of their historical investigation. Conversely, bariatric and, in particular, cosmetic surgeries are good examples of how surgical practices shape society. They show that the possibility to fulfil societal standards of beauty and normality (which, in practice, often includes racial 'normality') through cosmetic interventions stabilizes and enhances cultural standards in what can be described as a feedback mechanism. It is, however, worth noting that the person who is the object of surgery usually takes an active role in decision making, an observation that contradicts one-sided narratives of top-down victimization and control.

Whenever new techniques and technologies have been introduced, the evaluation of treatment results has been particularly important. One of the most recent large-scale innovations in surgery has been the adoption of minimally invasive surgery. The method uses a thin tube with a camera at its end, passed through a small incision, to perform surgical procedures within the patient's body. It was introduced during the last decades of the twentieth century and has since become the standard approach for many surgeries. It is thus an ideal case for studying the various dimensions of technological change in surgery and the ways historians can study them, as Nicholas Whitfield shows in his chapter, '[A Revolution Through the Keyhole: Technology, Innovation, and the Rise of Minimally Invasive Surgery](#)'. Because minimally invasive surgery came with completely new requirements on the surgeons' skill, it also offers the opportunity to investigate the transfer of new skills and capabilities in surgery, including the dimensions of tacit knowledge and the role of verbal, visual and practical instruction—a central issue for surgery in general. It lends itself furthermore to discussing questions of evidence and control of innovation, as well as the patients' roles in surgical change. With all these aspects, minimally invasive surgery is an excellent example of the necessity of an inclusive and broad approach to understanding technical change in surgery.

CONCLUSION

With their vast variety of perspectives and approaches, the chapters in this handbook represent significant trends in the recent historiography of surgery. They reflect influences from neighbouring domains, such as science and technology studies, and more general trends in various fields of history. In the social history of medicine, for example, hitherto neglected agents – patients, women and nurses, and new settings, among them non-Western countries, are being investigated more frequently. Traditional themes – the history of surgical knowledge and surgical rationales, techniques and technologies, surgery in war, surgical

historiography, history of the profession and disciplinary history – are examined with new approaches. What one could call a cultural-history approach to surgery looks at the history of emotions and the representation of surgery in popular culture and art. There is also a strong new current of the history of material practice, an approach, which is particularly appropriate for the domain of surgery, where the material dimension is of obvious importance. Research on many topics in the history of surgery now often includes material and practical considerations and is in some cases very much centred on this approach, for example in the history of instruments, of architecture and of images in surgery. Many of the chapters also show that different approaches are increasingly linked, for example social history with material history. Here surgery as such can provide the content as well as the context of the historical phenomena being studied. It is probably in these cross-overs where the most promising areas for future research lie. Links with other domains of history in general (body history, history of visualization, occupational history, etc.) and of the history of medicine more specifically (patient history, history of medical technology, medical industry) also emphasize the particular opportunities that the topic of surgery offers for gaining insight into a whole range of more general issues. In any case, surgery shows itself to be a very special topic of historical enquiry, in many ways specific and different from medicine in general. Studying it opens up novel perspectives, drawing attention to new historical themes as well as to new ways of looking at well-known phenomena. This handbook aims to provide a point of departure for enquiry and further research into surgery and the many historical themes associated with this ubiquitous but curiously under-researched domain of modern life.

NOTES

1. Richard Selzer, *Mortal Lessons: Notes on the Art of Surgery* (New York: Simon and Schuster, 1974), 92.
2. Atul Gawande, ‘Two Hundred Years of Surgery’, *New England Journal of Medicine*, 366 (2012): 1716–1723, see 1721–1722.
3. Link: http://ec.europa.eu/eurostat/statistics-explained/index.php/Surgical_operations_and_procedures_statistics, accessed 23 Aug. 2017.
4. The gold standard of this genre is the still useful monograph by Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery. From Empiric Craft to Scientific Discipline* (Folkstone: Kent Dawson, 1978). But there are also more recent examples, such as Harold Ellis, *A History of Surgery* (London: Greenwich Medical Media, 2001).
5. Thus, for example, the recently published *Oxford Handbook of the History of Medicine*, ed. Mark Jackson (Oxford: Oxford University Press, 2011), includes no chapter on surgery. However, the older *Companion Encyclopedia* has two chapters on the topic: Ghislaine Lawrence, ‘Surgery (Traditional)’, in William F. Bynum and Roy Porter (eds), *Companion Encyclopedia of the History of Medicine*, vol. 2 (London: Routledge, 1993), 961–983; and Ulrich Tröhler, ‘Surgery (Modern)’, in *ibid.*, 984–1028. The textbook by Deborah Brunton has an introductory chapter on the topic too: Thomas Schlich, ‘The Emergence of Modern Surgery’, in Deborah Brunton (ed.): *Medicine Transformed:*

- Health, Disease and Society in Europe, 1800–1939* (Manchester: Manchester University Press, 2004), 61–91. Other books with a survey character often include a few pages on surgery, see, e.g., William F. Bynum, A. Hardy, S. Jacyna, C. Lawrence and E. M. Tansey (eds), *The Western Medical Tradition: 1800–2000* (New York: Cambridge University Press, 2006), 561–562.
6. Barron H. Lerner, *The Breast Cancer Wars: Fear, Hope and the Pursuit of a Cure in Twentieth-Century America* (Oxford: Oxford University Press, 2001).
 - Michael Worboys, *Spreading Germs. Disease Theories and Medical Practice in Britain, 1865–1900* (Cambridge: Cambridge University Press, 2000).
 7. Christopher Lawrence, ‘Democratic, Divine and Heroic: The History and Historiography of Surgery’, in idem. (ed.), *Medical History and Surgical Practice: Studies in the History of Surgery* (London: Routledge, 1992), 15–16.
 8. Erwin H. Ackerknecht, ‘Surgery and its Paradoxes’, in: H.H. Walsler and H.M. Koelbing (eds), *Medicine and Ethnology: Selected Essays*, (Bern: Huber, 1971), 95–113. For the following passages, see also Lawrence, ‘Democratic’, 15–16.
 9. Shigehisa Kuriyama, *The Expressiveness of the Body and the Divergence of Greek and Chinese Medicine* (New York: Zone Books, 2002).
 10. Selzer, *Mortal Lessons*, 15.
 11. Selzer, *Mortal Lessons*, 92.
 12. This passage is inspired by Joseph Rouse, *Knowledge and Power* (Ithaca: Cornell University Press, 1987), 231–234. Rouse made that point for natural phenomena in the laboratory and for obstetrics. For its application to surgery, see Thomas Schlich, ‘Surgery, Science and Modernity: Operating Rooms and Laboratories as Spaces of Control’, *History of Science* 45 (2007): 231–256.
 13. Michael McVaugh, ‘Cataracts and Hernias: Aspects of Surgical Practice in the Fourteenth Century’, *Medical History* 45 (2001): 319–340, see 320; see also Lawrence, ‘Democratic’, 3–4; on different kinds of anatomy and surgery’s relations to them, see, e.g., Carin Berkowitz, *Charles Bell and the Anatomy of Reform* (Chicago: University of Chicago Press, 2015); and Lindsay Granshaw, ‘Knowledge of Bodies or Bodies of Knowledge? Surgeons, Anatomists and Rectal Surgery, 1830–1985’, in Lawrence (ed.), *Medical History and Surgical Practice*, 232–262.
 14. Owsei Temkin, ‘The Role of Surgery in the Rise of Modern Medical Thought’, *Bulletin of the History of Medicine* 25 (1951): 248–259; Russell C. Maulitz, *Morbid Appearances: The Anatomy of Pathology in the Early Nineteenth Century* (Cambridge: Cambridge University Press, 1987), 12, 227–229.
 15. Lawrence, ‘Democratic’, 15, 20–23.
 16. Ulrich Tröhler, *Der Nobelpreisträger Theodor Kocher (1841–1917): Auf dem Weg zur physiologischen Chirurgie, 1841–1917* (Basel: Birkhäuser, 1984); Peter English, *Shock, Physiological Surgery, and George Washington Crile. Medical Innovation the Progressive Era* (Westport: Greenwood Press, 1980); Gert H. Brieger, ‘From Conservative to Radical Surgery in Late Nineteenth-Century America’, in Christopher Lawrence (ed.), *Medical Theory, Surgical Practice* (London: Routledge, 1992), 216–231.
 17. Thomas Schlich, ‘The Technological Fix and the Modern Body: Surgery as a Paradigmatic Case’, in Linda Kalof and William Bynum (eds.) *The Cultural History of the Human Body*, vol. 6, ‘1920–Present: The Age of Change’, ed. by Ivan Crozier (London: Berg Publishers, 2010), 71–92.

18. One of the founding texts of the genre of body history, Barbara Duden, *The Woman Beneath the Skin: A Doctor's Patients in Eighteenth-Century Germany* (Cambridge: Harvard University Press, 1991, orig. 1987), discussed treatment modalities in the context of body concepts and the medical division of labour; there are some topics in the history of surgery, for example, cosmetic or aesthetic surgery, that have been very popular in body history, see, e.g., Sander L. Gilman, *Making the Body Beautiful: A Cultural History of Aesthetic Surgery* (Princeton: Princeton University Press, 1999).
19. This has been highlighted early on by ethnographic work on contemporary surgery, e.g. Stefan Hirschauer, 'The Manufacture of Bodies in Surgery', *Social Studies of Science* 21 (1991): 279–319.
20. However, skill and its evaluation are also dependent on historical context, see Thomas Schlich, "'The Days of Brilliancy are Past": Skill, Styles and the Changing Rules of Surgical Performance, ca. 1820–1920', *Medical History* 59 (2015): 379–403.
21. Anon, 'Ich greife in die Schöpfung Gottes ein', *Frankfurter Allgemeine Zeitung* (Jan. 1, 2016). http://www.faz.net/aktuell/gesellschaft/menschen/chirurgen-tragen-eine-enorme-verantwortung-wie-fuehlt-sich-das-an-13975822.html?printPagedArticle=true#pageIndex_2, accessed 13 Jan. 2016.
22. Wiebe E. Bijker, Thomas P. Hughes and Trevor Pinch, 'General Introduction', in idem (eds), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology* (Boston: MIT Press, 1987), 1–15, see 4. For the use of this concept on surgery, see Thomas Schlich, *Surgery, Science and Industry: A Revolution in Fracture Care, 1950s–1990s*, (Houndsmills: Palgrave Macmillan, 2002).
23. On this topic see Thomas Schlich and Christopher Crenner (eds), *Technological Change in Modern Surgery: Historical Perspectives on Innovation* (Rochester: The University of Rochester Press, 2017).
24. John V. Pickstone, 'Introduction', in idem (ed.), *Medical Innovations in Historical Perspective* (Houndsmills: Macmillan, 1992), 1–16, see 1; Ilana Löwy, 'Medicine and Change', in idem (ed.), *Medicine and Change: Historical and Sociological Studies of Medical Innovation*, (Paris: INSERM, 1993), 1–4. For a survey, see Jennifer Stanton, 'Introduction', in idem (ed.), *Innovations in Health and Medicine. Diffusion and Resistance in the Twentieth Century* (London: Routledge 2002), 1–15, see 1.
25. Sally Frampton, "'The Most Startling Innovation": Ovarian Surgery in Britain, c. 1740–1939' (PhD thesis: University College London, 2013), 224–225.
26. Schlich, *Surgery, Science and Industry*, 241.
27. Frampton, 'Ovarian Surgery', 70.
28. Worboys, *Spreading Germs*, 73–107, 150–192.
29. Schlich, *Surgery, Science and Industry*, 241. On the use of the network concept for the history of surgery more generally, see also Thomas Schlich, 'Ein Netzwerk von Kontrolltechnologien: Eine neue Perspektive auf die Entstehung der modernen Chirurgie', *NTM Journal of the History of Science, Technology and Medicine* 16 (2008): 333–361.
30. See, e.g., Sally Wilde, 'Truth, Trust and Confidence in Surgery, 1890–1910: Patient Autonomy, Communication and Consent', *Bulletin for the History of Medicine* 83 (2009): 302–330.

31. In recent years, historians of technology have urged a more user-centred approach to understanding innovation; see, e.g., David Edgerton, *The Shock of the Old: Technology and Global History since 1900* (London: Profile Books, 2006). For surgery see Beth Linker, 'Spines of Steel: A Case of Surgical Enthusiasm in America', *Bulletin for the History of Medicine* 90 (2016): 222–249.
32. Christopher Lawrence and Michael Brown, 'Quintessentially Modern Heroes: Surgeons, Explorers and Empire, c. 1840–1914', *Journal of Social History* 50 (2016): 148–178.
33. For this critical tradition, see, e.g., Sabine Sander, *Handwerkschirurgen: Sozialgeschichte einer verdrängten Berufsgruppe* (Göttingen: Vandenhoeck & Ruprecht, 1989); Toby Gelfand, *Professionalizing Modern Medicine: Paris Surgeons and Medical Science and Institutions in the 18th Century* (Westport: Greenwood Press, 1980).
34. See, e.g., for the city of Cologne in Germany, Robert Jütte, *Ärzte, Heiler und Patienten. Medizinischer Alltag in der frühen Neuzeit* (Munich: Artemis und Winkler, 1991), 30–32, 97–100.
35. Roy Porter, *Health for Sale: Quackery in England, 1660–1850* (Manchester: Manchester University Press, 1989).
36. Margaret Pelling, 'Occupational Diversity: Barber-Surgeons and the Trades of Norwich, 1550–1640', *Bulletin of the History of Medicine* 56 (1982): 484–511; Thomas Broman, *The Transformation of German Academic Medicine, 1750–1822* (Cambridge: Cambridge University Press, 1996), 3.
37. Philippe Descola, *Par-delà nature et culture* (Paris: Gallimard, 2005), 168–180.
38. John Kirkup, *The Evolution of Surgical Instruments: An Illustrated History from Ancient Times to the Twentieth Century* (Novato: Historyofscience.com, 2006), see, e.g., 3–5.

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PART I

Periods and Topics

Surgery and Its Histories: Purposes and Contexts

Christopher Lawrence

This chapter looks at histories of surgery since antiquity. I examine how these histories, besides being records, are interjections into debates about the place and role of surgery. The word ‘histories’ can be misleading because until the early nineteenth century writers on surgery studied or invoked authorities as far back as Hippocrates for practical and professional reasons as well as historiographical ones. So here I discuss both self-proclaimed histories as well as the practical historical references in surgical texts because both served to situate surgeons and surgery in relationship to the past and present. This is primarily a chapter about polemical histories. I can only indicate sketchily the origins of the many learned discourses that have graced the subject since the Renaissance. I pay particular attention to the mutual constitution of the surgical idea of disease and surgery as an occupation and how contests over the boundaries of these were related to changing socio-economic conditions. I do not deal in detail with modern studies but show that many current historical questions are rooted in issues well-recognized by former surgeons. A large part of the chapter is devoted to much earlier periods since most of the themes I address originated there.

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DISORDERS, DISEASES, AND OCCUPATIONS IN THE ANCIENT WORLD

In the ancient Greek medical world, a number of disorders were considered best treated manually and some practitioners' daily work was devoted to such treatments. The *Hippocratic Corpus* contains texts dealing with the hands-on management of injuries and other conditions and on the requirements (personal qualities, training, skills, equipment, etc.) deemed necessary to carry out such operations. At this time the distinction between surgical and other disorders was descriptive. Surgical conditions were by definition the objects of manual work and there was no stipulation of hierarchy in the understanding of disease or the practice of healing. This perception changed markedly in the Middle Ages.

Later in Antiquity the encyclopaedic work of Celsus (c. 25 BCE–c. 50 CE) contains what is described as the first history of medicine and illuminates further the ancient view of surgery. Celsus' 'history' can be constructed from the prefaces (Prooemia) to the books of his main text, a massive compilation of medical observations, theories, and treatments. Celsus' work was recovered during the Renaissance and, although little employed as a guide to surgical technique, it was recurrently cited as a historical authority and used to legitimize various views on the knowledge needed by surgeons and the place of surgery in the healing order. If Celsus had a political agenda it was signalled by his nostalgia for a Golden Age when 'neither indolence nor luxury had vitiated' health, for 'it is these two which have afflicted the bodies of men, first in Greece, and later amongst us; and hence the invention of this complex Art of Medicine.' This is why surgery alone, and even then only for injuries, was needed in the simpler Homeric age. Celsus dated surgery to 'Podalirius and Machaon, who followed Agamemnon as leader to the Trojan War', noting that Homer tells us that they gave no aid 'in the various sorts of diseases, but only that they relieved wounds by the knife and by medicaments.' He concluded: 'Hence it appears that by them those parts only of the Art were attempted, and that they were the oldest.'¹

Celsus recorded that Hippocrates separated medicine from philosophy and in the period immediately following, from Diocles of Carystus to Erasistratus, 'the Art of Medicine was divided into three parts: one being that which cures through diet, another through medicaments, and the third by hand.'² For convenience, I use the term the 'Art of Medicine' to cover all three methods of healing and I group curing through diet and drugs together as internal medicine or physio. Celsus did not explicitly value one part of the Art of Medicine over another but he accorded surgery high status by being the oldest branch of healing and gave it eminence by dint of the value Hippocrates placed on it. 'This branch, although very ancient', Celsus wrote, 'was more practised by Hippocrates, the father of all medical art, than by his forerunners.' Celsus connected surgery to a written, learned tradition. After Hippocrates, he recorded, 'it began to have its own professors; in Egypt it grew especially by the influence of Philoxenus ... Gorgias also and Sostratus and

Heron and the two Apollonii and Ammonius, the Alexandrians, and many other celebrated men ... In Rome also there have been professors of no mean standing, especially ... Mege, the most learned of them all, as can be understood from his writings.' Celsus' history has a definite sense of progress; surgery in his time was better than in former ages. The authors that he mentioned, 'have made certain changes for the better, and added considerably to this branch of learning.' Celsus also portrayed the operator's requirements in similar fashion to the *Hippocratic Corpus*.³

The tripartite division of the Art of Medicine was the 'central organizing device of Celsus' entire extant work.'⁴ Celsus used this device to describe how practitioners had made distinctions between various sorts of disease (internal and external), the possible ways of learning about disease (rational and empirical), and indicated that some healers considered that there should be a hierarchy of medical occupations based on these distinctions. Roughly speaking, Celsus grouped together wounds and some external local disorders, such as abscesses, under conditions treated by surgery. Systemic disturbances such as fevers were gathered under treatment by diet and drugs. Celsus considered surgery the most straightforward of treatments. In surgery, he said, we can usually easily judge whether a treatment has worked or not. He wrote: 'The effects of this treatment [surgery] are more obvious than any other kind; inasmuch as in [internal] diseases ... it may be doubted whether recovery has been due to medicine or a sound body or good luck.'⁵

Celsus also observed that some healers considered it important to understand the hidden causes of diseases. Famous Greek authorities, he said, who 'cured diseases by diet', endeavoured 'to go more deeply into things, [and] claimed for themselves also a knowledge of nature, without which it seemed that the Art of Medicine would be stunted and weak.' Celsus was inclined to this view, the rationalist perspective, that to manage disorders required knowledge of things not presented to the senses. The opposite of this was the empiricist position. History was used by Celsus to explain and contrast the origins and state of these opinions and promote his estimation that 'the Art of Medicine ought to be rational, but to draw instruction from evident causes.'⁶

Celsus also observed that the rationalists, by claiming that dealing with diseases required knowledge of hidden causes, introduced a qualitative element into the distinctions between practitioners. He noted, among 'the divisions of the Art of Medicine, the one which heals [internal] diseases, as it is the most *difficult*, is also the most famous.' If that is so, he asked, 'what is the proper province of this [the surgical] part of my work[?]' Celsus recognized that although surgeons dealt with obvious external conditions whose causes were not hidden they also encountered 'difficult' internal conditions which presented as surgical disorders. For instance, internal diseases might develop external 'ulcerations', usually the province of the surgeon. Celsus resolved this by observing, I 'deem one and the same man' should be able to

undertake both dietetic and surgical treatment. Thus Celsus expected the surgeon to have as extensive a knowledge of hidden causes as healers by diet or drugs. Managing and understanding internal diseases might be ‘difficult’ but ‘when divisions are made [in the healing arts], I praise him who has undertaken the most [different sorts of cases].’⁷ This incipient division between internal diseases understood through the senses and reasoning and external ones known by the senses alone was later infrastructural to the organization of healing into physic and surgery.

Galen of Pergamum (c. 130 CE–c. 210 CE), probably the most influential medical author ever, presented a similar picture of surgery. For Galen, surgery was an occupational branch of the Art of Medicine, mastery of which started with knowledge of philosophy and climbed through anatomy, physiology, and pathology to clinical medicine. Galen practised surgery at Pergamum, 157–161 CE, where he treated gladiators. A great deal of surgical material is embedded in his works. As for history, however, ‘Galen displays relatively little interest in ... [it] and indeed, seems to have displayed some contempt for historians.’⁸ There is no surviving history of surgery by Galen but he did meticulously record his surgical precursors. His books were a way of situating his own contributions through exegesis of the texts of his forerunners (largely amounting to attacks on everyone excepting Hippocrates). Thus subsequent practitioners learned a great deal of surgical history from him.

The historical stories of Celsus and Galen tell us about an idealized intellectual unity of medicine in a world in which there was no possibility of social union among healers. In the Roman Empire the status of individual practitioners of medicine varied enormously. Healers included slaves and high-status doctors like Galen who moved in the highest circles. Celsus was an encyclopaedist who also wrote treatises, now lost, on topics such as agriculture. Nonetheless he considered himself, as any well-educated man might, equipped to write about medical matters. It is a mistake to talk of an ancient medical ‘profession.’ Rather, one should consider the occupation of healing in the ancient world. The term *professio medici* occurs but there were no examinations, no regulatory bodies or any of the other characteristics of a modern medical profession. Different sorts of healers were differently valued according to their background, status, learning, and skills. Individuals, institutions, and governments employed different sorts of healer according to context. In the late Roman Empire, the state (including, of course, the army) made extensive use of healers but there seems to have been no vertical differentiation by type, such as physician over surgeon. Although inscriptions show that most artisans, including healers, had formed *collegia*—a type of guild—from the earliest Roman times they had no political clout and authorities were generally hostile to any kind of autonomous private corporation.⁹ Briefly we might say in an aristocratic, landowning society where wealth was based on rural slavery, or its equivalent, conditions did not exist for creating organized civic professions and mercantile federations. Neither did such a culture

foster technological innovation. With no ambitions for, perhaps because they had little idea of, corporate identity surgeons were unlikely to flourish.

SURGERY IN A CIVIC SOCIETY

The economy and society of the Middle Ages were the antithesis of the civilization of classical antiquity. A new economic infrastructure enabled the rise of resilient, relatively autonomous towns dependent on crafts, industry, and trade.¹⁰ The successful late medieval surgeon lived in a civic society, highly regulated intellectually and occupationally. From the eleventh century onwards historical references in surgical texts point not only to sources of knowledge, they also functioned as gestures indicating that surgeons were members of a brotherhood encompassing present and past practitioners. These texts were celebrating, as ancient authors did, the whole Art of Medicine, but they were, I suggest, also something new. They were calling for a single *profession* of surgery.

Historians have shed much light on medieval scholasticism, especially the commentary, and surgeons' use of it for transmitting knowledge and, strategically, incorporating surgery into the hierarchy of learning. But commentary—which included extensive name-dropping and authority-citing—also worked as rhetoric for integrating a profession. The narrative that prefaces the *Chirurgia Magna* (finished 1363) of Guy de Chauliac (c. 1300–1368) is recognized as the first named history of surgery. But in the Middle Ages all teaching of medicine and surgery in the schools and the universities was based on historical authorities. Cornelius O'Boyle observes: 'An essential aspect of university instruction, then, was to teach students how to read texts ... as to make it seem as though the ancients were speaking directly to them.'¹¹ Intellectually the flower might be medieval but the roots lay in antiquity. The Greek author Paul of Aegina (625–c. 690) is generally regarded as the major transmitter of ancient medical knowledge, via the Arabs, to the European Middle Ages. But Paul transmitted not just surgical knowledge but also a way of learning through history. He named ancient surgeons and evaluated them. So, in his surgical chapter we find such statements such as, 'Leonidas directs the incision to be made along the middle of the forehead.'¹²

Guy's history described the surgery of the ancients and the Arabs and relates, how, in Michael McVaugh's words, surgery 'had moved out of the darkness of empiricism into the illumination of scholarly learning.'¹³ According to McVaugh, 'much current history of medicine still follows his interpretations.'¹⁴ Indeed, from Guy's time to the present, surgeons and historians have concurred in seeing a new surgical era begin with north Italian practitioners associated with Bologna, Padua, and Milan: Roger of Frugard (c. 1140–c. 1195), Bruno Longburgo (fl. c. 1250), Hugh (Ugo) of Lucca (c. 1160–c. 1257), and William of Saliceto (c. 1210–c. 1280). Between, roughly, 1170 and 1270, McVaugh says, 'these writers produced a series of

increasingly comprehensive, increasingly learned, increasingly sophisticated surgical encyclopaedias.¹⁵

Throughout the Middle Ages surgical works balanced two socio-intellectual forces. Some surgeons assiduously followed physicians and attempted to raise their subject's status by claiming it as a learned discipline. Others stressed its independence as a knowledge-based manual art. William of Saliceto was teaching in the middle of this period. He composed two compendia, including the *Chirurgia* of 1275. For William surgery was 'a particular science which is included in and depends upon more general medical knowledge.'¹⁶ To understand this he directed his readers to Galen, Avicenna, and Albucasis. Theodoric (1205–1296/8) who was a surgeon, a bishop, and practised as a physician wrote a *Chirurgia* (c. 1267). Son of Hugh of Lucca, Theodoric's *Chirurgia* 'was intended in part to explain his father's methods to a friend and patron.' His 'abandonment of secrecy', McVaugh observes, 'is a ... sign that some surgeons ... wanted to change their subject from a traditional craft to something approaching a learned discipline.'¹⁷ Trade secrets were associated with crafts. The citation of authorities by Theodoric not only guaranteed the worth of his teachings, it also taught surgeons that history showed all were professional colleagues. Theodoric quoted various Arab authors not simply on technical matters but in order to encourage cooperative practice. He cited Haly Abbas who urged practitioners to 'frequent the places where skilled surgeons operate.' Theodoric also recommended emulation of recent predecessors such as 'the excellent Hugh of Lucca.'¹⁸

In Paris, university medicine was reaching its most refined form. Henri de Mondeville (c. 1260–1316), a French cleric trained in medicine, vigorously championed academic surgery. McVaugh describes how Henri tried to win over two groups. He 'had to convince the academic physicians of Paris that it would do their discipline no harm to introduce *operatio manualis* into medical training, and he had to convince empiric surgeons that their practice could only be truly successful if they first obtained a theoretical grounding in anatomy, physiology, and pathology.'¹⁹ Like the works of his contemporaries Henri's *Chirurgie* (written 1306–1320) drew on ancients and moderns: Avicenna for anatomy, Theodoric for wounds, and Lanfranc for ulcers and other diseases. Henri was creating a community out of past and present practitioners who could be both guides and critics for he noted that it 'is extremely risky for a little-known surgeon to treat any case other than as his colleagues generally do.'²⁰

Like these earlier texts, Guy's 'History' also bound practising surgeons with dead and living brethren. Hippocrates, he claimed, had 'led medicine to perfect enlightenment' following 500 years of darkness after Aesculapius. Guy praised Galen for cultivating the seed that Hippocrates had sown and for being a 'master in demonstrative science.' Surgery was an integral part of the whole Art of Medicine and Guy pointed to the great difficulties of dividing disease into internal and external types. He praised various Arab writers dignifying them with epithets that implicitly encouraged the reader to emulate

their achievements: Haly Abbas was ‘a great master’, Avicenna, an ‘illustrious prince.’ He also commended many of his near contemporaries: William of Saliceto, for instance, was ‘a man of worth.’ Guy, like Henri, enjoined cooperation and encouraged the witnessing of operations.²¹

As surgeons created an intellectual and historical brotherhood from the inside, they increasingly demarcated boundaries with enemies outside. We can date this defensive network fairly accurately. In William of Saliceto’s work there are neither critical nor sarcastic assaults on learned doctors or attacks on manual and empirical practitioners; doctrinal and professional hierarchy, however, was about to arrive.²² Concerns over uneducated competitors appear in the writings of William’s contemporary, Theodoric, who quoted Almansor (Rhazes) as contending ‘that the practitioners of this art [surgery]’ were ‘for the most part uncouth and unfeeling ignoramuses.’²³ By the late thirteenth century the tensions between learned surgeons and physicians and between surgeons and empirics were increasing. Lanfranc (c. 1250–1306), a pupil of William who moved to Paris, described a case distinguished by the ‘haughtiness’ of the attending physicians who were ‘too theoretical’ and who looked down on the surgeon. On the other hand, beneath the surgeon, and equally contemptible, he located the lay practitioners (*‘idiotae’*, ‘empirics’).²⁴ Guy lamented the passing of a supposed golden age before Avicenna, when ‘all were both physicians and surgeons, but since then, either through refinement or because of too great occupation with cures, surgery was separated and left in the hands of mechanics’ and medical sects.²⁵

The surgery of the Middle Ages, like its cathedrals, was built to last, and it did so in two important, although contradictory, senses. First the ancient idea of the intellectual unity of the Art of Medicine was consolidated and remained a theme in surgical histories ever after. Second, the view that surgery should be a bounded occupation or profession, distinct from physic, was institutionalized. From the thirteenth century onwards, guilds, ‘mysteries’, and corporations of surgeons, lesser surgeons, and barbers were established throughout Europe. Rules and ordinances governed who could practice what and where. From their earliest days, these institutions themselves became the focus of parochial histories. Seals, bowls, paintings, charters, and so on became talismanic of their independence and venerableness. The potential conflict between the intellectual unity of the Art of Medicine and the professional independence of the surgeons infiltrated surgical histories thereafter.

SURGERY IN THE ABSOLUTIST WORLD

To understand how Renaissance surgeons situated themselves through their histories we need to consider two general trends. First, the attempt by scholars to recover ancient texts and, second, the interest that men of letters showed in the technical expertise of craftsmen. On the first matter Vivian Nutton has observed the ‘Renaissance saw the restoration of classical surgery.’ Knowledge of Hippocratic surgical texts became widespread between

about 1526 to 1560. The Italian physician Vidus Vidius (1509–1569) tried to ‘bring to the notice of his contemporaries the instruments used by his classical predecessors.’ Various Galenic texts of relevance to surgery became available and provided ‘a model for the integration of medicine.’ Humanists of this time recurrently stressed the unity of medicine, practical and theoretical, past and present. At Lyons, Jean Canappe (1495–1552), a physician and lecturer in surgery, strove to improve the education of surgeons through classical learning. He defended ‘traditional craft loyalty ... being strengthened by classical precept.’ He produced French translations of Galen’s surgical works in comparatively cheap editions. Canappe recognized surgeons were treating internal diseases and took the position that if they were doing so, it was best they were educated in the classics. How else, he declared, could they rise above ‘circulateurs, basteleurs, theriacapoles, vulgairement, triacleurs, ou imposteurs et abuseurs’?²⁶

Renaissance humanists worked for the practical advancement of surgery. But their scholarly interests also laid the foundations of long-term bibliographic and antiquarian interest in the subject. This approach is often dated to the studies of the Swiss physician Conrad Gessner (1516–1565) who published an extensive collection of surgical works in 1555 accompanied by a tract on the historical importance of surgery.²⁷ Following Gessner a distinguished line of authors have ornamented serious surgical scholarship. Eighteenth and nineteenth-century writers such as Kurt Sprengel, Charles Daremberg, and Ernst Julius Gurlt cannot detain us here, but deserve notice because they exemplify how much research has been done by German and French scholars. There are many reasons for this but most pertinent are the closer intellectual and institutional ties between learned physicians and surgeons on the continent of Europe compared to the UK and North America where surgeons developed rather different histories of their discipline. Scholarly authors merit note too, because of the fruit that their work bore in the twentieth century.

The sparkling humanism of the sixteenth century failed to consummate the medieval surgeons’ dream of parity in the universities. Even at Padua, home of Vesalius, surgery really succeeded only as anatomy. The German universities, except Tübingen, were not important for surgery. In London and at Oxford university humanists like Thomas Linacre (c.1460–1524), John Caius (1510–1573), and William Bullein (c.1515–1576) promoted the idea of surgical learning. They despised empirics and admired the great surgeons of the past. But these men were stuck in a medieval mould—they were *physicians* writing about the unity of the medical art. For all his insistence on the importance of surgical knowledge, Bullein (actually not an MD) still contrasted the ‘learned Physicion’ with the ‘cunning Chirurgion.’²⁸ As Nutton suggests, the humanists’ ‘zeal’ could be interpreted by surgeons as ‘unfair intrusion by physicians.’²⁹

From the middle of the sixteenth century surgeons began to factor into their identity the second element that transformed their discipline: the

appreciation of craft skills. This element was integral to the confidence that can be seen in the rising power of corporate institutions and surgeons publishing in the vernacular. As to the corporate institutions, English and Scottish surgeons cemented their identity around new bases. The painter Hans Holbein the Younger's depiction of the union of the barbers and surgeons in 1540 in the embrace of Henry VIII was then, as now, a celebration of surgical grandeur. English surgeons, such as, Thomas Vicary (c. 1490–1561), Thomas Gale (1507–1586), William Clowes (1544–1604), and John Read (fl. c. 1588) extolled the unity of the art, ancient knowledge, and the virtues of humanism but also talked of their 'profession.' A text which appeared under Vicary's name designated Galen 'the Lanterne of all Chirurrgions' and peppered its dedications with references to the dignity of surgery and the opinions of Lanfranc and Avicenna. But the book was written for instruction of 'all such young Brethren of his fellowship practising Chirurgerie' and the operative section turned its back on antiquity, 'On wounds in the Legges' instructed the surgeon in any eventuality 'use not the medicines of the Ancients.'³⁰

Early modern surgeons boasted of their journeying and described their works in terms of value to the nation. The Scottish surgeon Peter Lowe (c.1550–1610) wrote in English, told of his travels, and translated *Presages of the Divine Hippocrates* (probably from the French). His sentiment that 'all men are naturally obliged to serve to the common wealth by some honest profession' he expressed in institutional form in 1599 when he helped found the Faculty of Physicians and Surgeons of Glasgow. His 'of the Originall Beginning, Antiquitie and Excellence of Chirurgery' was filled with antique and biblical testimony to surgery's magnificence. It conceded nothing to physic: 'If we consider the sentence of the divine Philosopher Plato, that thinges good are difficile, there is no thing, harder then Chirurgery.'³¹ We might remember that Celsus said it was 'difficulty' that set physic apart.

Similar themes are identifiable in France in the life of Ambroise Paré (c. 1510–1590). Paré was in some ways a conventional surgeon wedded to humanism; significantly a friend of Canappe. But his contemporaries singled him out as a champion of surgical independence based on his claims to innovation, advocacy of anatomy, use of the vernacular, and his asserting the primacy of experience, for example when he wrote: 'Thou shalt far more easily and happily attain to the knowledge of these things by long use and much exercise, than by much reading of Books or daily hearing of Teachers.' The voice of individualism was prominent in his work and soon became loud in surgical texts. Famously he supposedly discovered that soothing applications and not boiling oil were the best treatments for gunshot wounds. The short text in which he describes this recounts how 'I found a chirurgion ... I found means ... before I could possible draw the receipt from him ... then I was joyfull ... I had understood.'³² English authors of the seventeenth century began to draw on Paré to extol experience. Thomas Johnson, Paré's

translator (albeit a physician) noted Paré's 'experience, or practise (the chief help to attain the highest perfection in this Art) it was wonderful great.'³³

By the seventeenth century the value of craft experience was enrolled in the cause of social and scientific advancement more generally, notably, in the works of Francis Bacon. In this context surgical authors gradually began to abandon ancient authorities as sources of technical knowledge but clung to them as a fount of inspiration and professional solidarity. John Woodall (1570–1643) in 1628 noted, 'without painting of phrases, or collecting of great Authors, my methode you may know by the plainness of the stile, and my method is no other then the old beaten path-way of all Surgions.'³⁴ The title page of the 1639 edition of his *The Surgeons Mate* was adorned with portraits of the ancients but also moderns, notably Paracelsus, widely recognized as an iconoclast. The text was based on 'my own deare experience' and contained observations collected 'for future public good.' Although he did note that young surgeons should give the physician 'due honour and precedence' this was not a declaration of territorial retreat, for he observed 'all those that are of opinion to hinder a Surgeon from using outward and inward medicines, have quite misconstrued *Hippocrates* and *Galen*.'³⁵

Sir D'Arcy Power (1855–1941), a distinguished and learned British surgeon, acutely observed that Richard Wiseman (1620–1676) 'deserves notice as the first of the really great surgeons who lifted the surgical profession from its state of subordination to the physicians.'³⁶ Wiseman was styled 'the Ambrose [sic] Paré of the English.'³⁷ He was probably so called because of his comparable military background and method of treating wounds, but he also used similar language to describe surgery's historical lineage and its social place. 'I am,' he said, 'a Practiser not an Academick', my own 'judgement and experience' is better than 'eminent chirurgical authors' and 'other mens [sic] authority.' He claimed 'Disdain' for the 'meer Academick', 'subtill Disputants', and 'Theory.' He had a modern (in the seventeenth-century sense and still current) view of surgical progress—it was by 'Observations to the bulk of what hath been heretofore heaped up.' But he emphasized, employing a metaphor still used in science, 'how much is wanting to make the Building compleat.' It was, he wrote, nonetheless the ancients who had recognized the elevated place that surgery should have in the social order for the 'Grecians testifie their reverence of the eminent men of the Profession, by referring them into the number of the gods.' Gratifyingly, today, nations 'have rewarded us with Honor, Wealth and Collegiate Foundations.'³⁸ Historical, institutional, and professional identity were coterminous and Wiseman urged students to read both the ancients and his English predecessors, William Clowes and John Woodall.

SURGERY IN THE ENLIGHTENMENT

British surgeons of the Enlightenment built their claims for recognition on the foundations laid by surgeons such as Wiseman, stressing how their independence and status depended upon empirical knowledge, the study of anatomy, new operative techniques, and innovation in instrument design. History was still a prominent resource but it was less often resorted to as a repository of working knowledge and increasingly became a subject of serious antiquarian interest. Practitioners perceived themselves to be living in a new surgical age in which improvement was the keyword. 'Perhaps', wrote Samuel Sharp (1700–1778) in 1750, 'there never was a Period of Time in which any art was more cultivated than Surgery has been for these last thirty years.' The disadvantages under which the ancients had amputated, he said, had 'been removed by a succession of Improvements.'³⁹ Benjamin Gooch (1707–1776) in 1767 observed that there had been 'great improvements' in surgery mainly because 'Anatomy is more universally known.' Strikingly, moderns were better operators than the ancients. We have 'abler Surgeons than in former ages', Gooch wrote.⁴⁰ Where Renaissance humanists had ransacked ancient texts in search of new and better surgical tools, Percivall Pott (1714–1788) now thought ancient surgery 'coarse' and 'encumbered with a multitude of awkward and unmanageable instruments.'⁴¹

Current and past historians largely agree that the most glorious decades in the annals of French surgery were those following the Revolution of 1789. In spite of the discontinuity sometimes attributed to this period, French surgeons of the time saw their roots in the work of their immediate predecessors. Of these Pierre-Joseph Desault (1738–1795) was especially praised. He was revered by Xavier Bichat (1771–1802) and named by Napoleon the 'restorer' of French surgery, an opinion obtained from Dominique Jean Larrey (1766–1842), pupil of Desault and chief surgeon of the Emperor's Imperial Guard.⁴² French surgeons continued to invoke the necessity of unity in the healing art which legally occurred with the abolition of the institutions of the ancien régime and the creation of three medical schools in 1795. The sentiments of the Paris surgeon Alexis Boyer (1757–1833) are representative: 'Surgery has been cultivated from the earliest antiquity, with more or less success; but it has made the greatest progress of late years ... The modes of operating are fixed and described with a precision which leaves little room for improvement.' Boyer said that the foundations for these 'improvements' were laid by 'the labours of the Royal Academy of Surgery [founded 1731] and ... have rapidly rendered obsolete the complete Systems of Surgery published in the course of the last century.'⁴³

SURGEONS AND THE AGE OF INDUSTRIAL CAPITAL

The medieval declarations of the unity of the Art of Medicine were not lost in the intervening centuries but they were stridently reaffirmed in the early nineteenth century. General pathology was designated by surgeons as the science

underpinning this union. Different nations, however, historicized different figures as the parent of this science. I use the examples of Paris, London, and Edinburgh. In Paris, Bichat was crowned as the seminal figure. In 1846 the French doctor Pierre-Victor Renouard (1798–?) praised eighteenth-century French surgery and the ‘inseparable union of those twin sisters’, medicine and surgery, sanctioned in 1795 by the ‘restoration of its Medical Schools.’ He paid homage ‘above all’ to Bichat, ‘a genius’ who shed light ‘on the whole of pathology.’ Bichat’s ‘idea of separating the human body into elementary tissues ... has now for fifty years served as the basis of the researches of all pathologists.’⁴⁴

The perspective of French surgeons in the revolutionary years was characterized by their sense of continuity. Paradoxically, in London, surgeons cultivated the idea of a break with history. The key figure here was John Hunter (1728–1793) who was shaped into the ‘father of scientific surgery.’ This move was similar to the earlier canonization of Isaac Newton by practitioners of the physical sciences. During the Enlightenment, surgeons had begun to designate their discipline a ‘science’ in a recognizably modern sense of the word. They considered surgery should be based on general physiological and pathological principles or laws generated from observation and experiment. By the turn of the century the term ‘science of surgery’ was common. The particular scientific basis of surgery with which Hunter was credited with creating is unimportant here. As Stephen Jacyna has shown, variously his disciples stressed experimental physiology, natural history, and general pathology. Hunter had prepared his successors for creating him as a catastrophist, as he himself spurned history as a legitimating resource. Hunter’s break with the past was stressed by men such as Matthew Baillie (1761–1823) and Everard Home (1756–1832) who gave the first Hunterian orations at the now Royal College of Surgeons. In his oration of 1815 William Blizard (1743–1835) compared Hunter to Newton, and John Abernethy (1764–1831) in 1819 thought there had been no-one ‘comparable’ in the ‘whole history of medical science.’ It is important to note the work this history was doing. Surgeons used their claim to be practising a science-based art to demonstrate that they were the equal of physicians and thus, like them, gentlemen. Before Hunter, these orators claimed, their predecessors had practised a craft, a ‘mystery’ lower in the occupational chain than physic. Everard Home, in the first oration of 1814, observed that, until the present day, surgery was ‘kept down’ by the Royal College of Physicians through the attempted control of the licensing of all practitioners.⁴⁵

Although modern historians have identified the ways in which the language of science was used ideologically by early nineteenth-century surgeons to elevate their professional standing, surgeons of the time had already made the equivalent observation. John Vincent, a St Bartholomew’s Hospital surgeon, noted in 1848, ‘it would seem that it is upon the acknowledged superiority of a scientific character that professional men lay claim to the advantages of the high ground they occupy.’ In the case of the surgeon ‘who is by no

means backward in putting in claims of this kind ... the grounds of his pretensions may be questionable.⁴⁶

One of Hunter's hagiographers deserves special note. In 1829, the St Bartholomew's Hospital surgeon William Lawrence (1783–1867), one of the UK's most distinguished practitioners, gave an introductory lecture on surgery in which he depicted Hunter as one of the major creators of general pathology. Important here is how Lawrence used history and reprised the arguments of Celsus to draw Hunter into a broader historical framework in order to underline the unity of physic and surgery. Lawrence considered the 'distinction' between surgery and physic 'a mere matter of arbitrary usage.' He made clear that he meant this cognitively and professionally. 'Nothing like the modern distinction was made by the ancients', he argued, noting that 'Hippocrates, Galen, Celsus ... treat indifferently of the nature and management of fevers, injuries, external and internal disorders, and operations.' After using historical examples to ridicule the distinction between physic and surgery Lawrence then grounded its arbitrariness naturalistically, in the workings of the body. There is, he declared, only one general pathology just as there is only one anatomy or physiology: 'To assert that surgery and physic are essentially distinct, is to say that there are two kinds of pathology.'⁴⁷

The production of Hunter as a founder of scientific surgery was initially a London phenomenon brought about by domestic forces of social hierarchy and a conservative, Christian reaction to everything that the French seemed to be good at: Revolution, war, atheism, and surgery. In Hunter's native Scotland, ironically, his uptake was a little slower. National teaching traditions and, perhaps, ancient bonds with France played a part here. A Scottish work of 1803 reminded its readers that 'surgery and Science are inseparable' and incorporated an admonition to surgeons to attend to their '*duties towards Society*.' Its historical range was broad and distributed praise widely between Germans, French, and Scots. Lorenz Heister (1683–1758), John Bell (1763–1820), and James Latta (1754–1894) were named and the course of operations described by Pierre Dionis (1643–1718) was stated to be 'the best system of operative Surgery that had ever been made known.'⁴⁸ Ten years later in 1813 in Edinburgh, John Thomson (1765–1846) in his *Lectures on Inflammation* included a historical tour of surgery and applauded the institutional progress of French surgery. Thomson, like his London colleagues, appealed for surgery to be based on general pathology, but not that of Hunter, nor Bichat, rather of Thomson's physician hero William Cullen (1710–1790).⁴⁹

William Lawrence articulated the idea of the unity of pathology in 1829 and within 50 years a modern profession would make surgery the treatment of choice for internal diseases. In retrospect, in the decades around 1800 the social and scientific foundations of modern surgery were created. But, although individual surgeons might rise to considerable heights, the place of surgeons as a whole in these years was still the relatively immobile one, and

their perspective the static one, of a patronage-based society. The absolutist world may have been in dissolution but the dynamics of industrial capitalism that generated modern surgery were still being created. We should not impose on surgeons of the early nineteenth century the view that they were inaugurating a spectacular change in medicine. Surgery was being transformed by work on the ward, in the post mortem room, the museum, and in the operating theatre but it would be an historiographical error to read into surgeons' celebration of these things the later invasion of the body's cavities. Quite the reverse; the world of modern surgery was perceived to have arrived there and then, surgeons of the time held their art or science had reached 'perfection.' In 1798 Bichat declared, 'LA [sic] chirurgie s'avance vers la perfection précédée du génie & suivie de l'expérience.'⁵⁰ Boyer, in the thick of 'Paris Medicine', affirmed that surgery 'seems now to have attained all the perfection of which it is susceptible.'⁵¹ In 1826 an Edinburgh surgeon announced: 'Within the last thirty years, by the almost exclusive labours of the surgeons of this country, our knowledge of the diseases and accidents of the arterial system has arrived at a degree of perfection unknown in any other branch of science.'⁵²

The conceptual foundation of surgery's massive transformation in the nineteenth century was the idea that internal diseases were pathologically the same as external ones and therefore accessible to the knife.⁵³ The study of morbid anatomy and a new general pathology along with a large, captive hospital population are all counted as the constituents from which this view was fashioned and institutionalized. Paris was increasingly designated as the major site where this development occurred. To a great extent this was an historical story created by the French themselves and by the droves of US students who went to Paris where they not only imbibed new ways of learning and doing medicine but also found in French practitioners models of egalitarianism dear to their own post-revolutionary hearts.⁵⁴ Modern historiography has largely accepted the French version of the 'Paris Medicine' story but the issue is still contentious.⁵⁵

MODERNITY

Essential to the history of the surgical entry into the body was surgery's achieving a place among the science-based professions of industrial capitalism.⁵⁶ Surgery, its historians told their readers, was new and modern. Surgery's stories were related through the romantic language of wonder, heroism, boldness, pioneering, courage, genius, nationalism, and power. Youthful boldness was replaced, or at least twinned with, venerable age as authority. Paré, seen as an exception even in his own time, became, in the 1840s, for the French surgeon Joseph-François Malgaigne (1806–1865), the man to whom 'chance had revealed his first discovery; but what was not chance was that rapidity and that depth of judgement, that boldness of resolution which took him immediately—him, a young man without name or authority and,

furthermore, without letters and without philosophical studies—to recognise, to point out, to challenge a doctrine universally held and sustained by the most famous surgeons of the time.⁵⁷

Writers of popular texts heaped praise on the technological wonders of their age and the great men who had made them.⁵⁸ Surgical authors were no exception and their triumphalist histories described the new technologies that were transforming their discipline as though they had changed practice overnight. This was notably so with anaesthesia and Listerian antiseptics.⁵⁹ Of course, these technologies were dynamite when seen in long perspective, but in context these innovations were gradually introduced and with much controversy. We know some surgeons used anaesthesia from the start, but in 1853 James Syme (1799–1870) surveying ‘improvements’ over the previous 30 years still gave pride of place to simplicity of technique and the ‘confident expectation of primary healing’; the skinflap technique in amputations had been ‘more important’ for surgery than chloroform.⁶⁰ In 1862 The Dublin surgeon Maurice Collis (1824–1869) was still saying of lithotomy: ‘If the chloroform is to be used ...’⁶¹ The antiseptic surgery of Joseph Lister (1827–1912) was the source of much controversy for 20 years after its introduction in 1867. For instance, in 1881 it was said that one surgeon’s results showed he ‘never needed to adopt it [Listerism].’⁶² But four years earlier, the middle of the Listerian controversy, one of the most vocal advocates of antiseptics, George MacLeod (1828–1892), Regius Professor of Surgery at Glasgow declared, ‘of all the improvements or discoveries made [in surgery] ... none can compare to anaesthetics and antiseptics, which have done more to diminish suffering and save human life than the united inventions of two thousand years.’⁶³ This explosive entry into the surgical arena is the way these innovations are popularly portrayed today.

In this dynamic new world surgeons repeated the old refrain of the unity of medicine but now declared surgery to be the healing art *primus inter pares*. The French surgeon Jules Eugène Rochard (1819–1896) noted the unity had been proclaimed by Hippocrates and added triumphantly, today, ‘La chirurgie n’est que la médecine avec une arme de plus.’⁶⁴ Two years later George MacLeod echoed this exact sentiment, noting surgery ‘is medicine with an extra arm.’⁶⁵ This proclaimed new power to relieve suffering touched an older religious theme and Victorian surgeons dealt with it in two ways. First, some histories took on an aggressively anti-clerical character. Thus in 1886 the physician-historian George Jackson Fisher (1825–1893) observed: ‘During all the ages that the healing art was held and practised by the priest-physicians its degradation was extreme and disgraceful to the last degree.’⁶⁶ Or, second, surgeons presented themselves as secular inheritors of the Christian tradition of healing. ‘[I]t is the province of the surgeon’, wrote William Williams Keen (1837–1932), ‘in imitation of Him who went about doing good, to restore to health and happiness.’ The end of the nineteenth century, Keen said, had ‘vouchsafed such magical nay such almost divine power to the modern surgeon.’⁶⁷

History, other than as a celebratory flourish or a serious antiquarian pursuit began to disappear from surgery's everyday life. So modern did surgery seem and so different from its past that surgeons fashioned their image by using the language of exploring and adventuring. They claimed that they performed 'pioneering' and 'heroic' explorations, 'opening up' new territories for the benefit of individuals and society.⁶⁸ In Birmingham, UK, Lawson Tait (1845–1899) wrote that 'For my own part, so fearless am I now of abdominal surgery ... that in every case of disease in the abdomen ... [I say that] an exploration of the cavity should be made.'⁶⁹

Nationalism, like surgery, was modern and figured conspicuously in the surgical discourse of the era. This was particularly true in the USA where practitioners spoke of surgery's boldness and originality with the same pride—swagger even—that characterized so much late nineteenth-century US rhetoric. This view was captured in Thomas Eakins' (1844–1916) painting of Samuel Gross (1805–1884) of Jefferson College, Philadelphia (see figure 1, in chapter 'Art and Surgery: The Expert Hands of Artists and Surgeons'). Jefferson was at the forefront of the American adoption of French surgical ideas and ideals—the opportunity it offered humble men to become great surgeons and be elevated into national heroes. The art historian Elizabeth Johns suggests that Eakins believed that modern democratic ideals fostered civic virtues in professional men like Gross. Borrowing Baudelaire's phrase, Johns says that Eakins was depicting the 'heroism of modern life.'⁷⁰

US surgeons applauded their colleagues and related their achievements to unique qualities in American history. Frederic Shepard (1850–1934), one of the USA's most distinguished surgical professors, saw the self-reliance of US surgeons confronting the frontier of the body as having produced the finest, technically most accomplished profession of surgery in the world. He traced their achievements to the 'manly independence' of the 'early settlers.' Beyond surgery, he said, 'no science demands more of self-reliance, principle, independence and determination in the man.' It was, he noted, 'these old-time Puritan qualities, which, descending to them in succeeding generations, have passed into the surgeons of America.'⁷¹

Modern surgeons gloried in their operative triumphs. They proclaimed not only the astonishing nature of particular operations but the manner in which surgery had become global.⁷² But, more than this, surgery was declared to be a medicine for all people and all diseases. This is a modern and, in a sense, an ahistorical, idea. In strikingly universalist language, William Williams Keen, styled the USA's first brain surgeon, observed in 1897,

surgery is one and the same the world over. Whether in the frozen north or under the equator, in civilised America or barbaric Africa, be the patient white Caucasian, swarthy Negro, red Indian or yellow Malay, the same accidents and diseases assail him, the same remedies save him; a new remedy discovered in Japan is equally efficacious in Philadelphia; a new operation devised in America is equally applicable in Egypt.⁷³

This chapter has presented a continuous history of surgeons' accounts of their relation to the past. However, there is also a discontinuous version of this story. As Faith Wallis shows in her chapter 'Pre-modern Surgery: Wounds, Words, and the Paradox of "Tradition"', nineteenth-century surgeons, and following them many historians, saw the origins of modern surgery in the late Enlightenment. This is accurate insofar as we can recognize many new cognitive and professional elements of the time that are constitutive of surgery today. But in a different account, the surgery of modernity was created from about 1850 onwards. This story is explicit or implicit in most accounts of surgical history whether given by professional historians or surgeons from that day to this. The key word here is modernity. This surgery is the universal, technology-dependent therapy of a science-based profession. In every important respect it is different from its predecessor: technically, therapeutically, professionally, and in its social relations. In a curious way my account can be seen to be agreeing with the analytical rhetoric of those late nineteenth-century surgeons who proclaimed they were living in a new, exciting, and different age. With the creation of the surgery of modernity, relations with history were changed profoundly. Historical surgery, from being part of surgeons' perception of their place in the world, became the forerunner and precondition of modern surgery but not constitutive of it. Today, history is still undertaken by surgeons as chronology, record, and a celebration of the craft. But it is not part of the modern surgeons' identity nor has any role in everyday practice.

In 1857 the surgeon J. Sampson Gamgee gave an historical lecture containing an irony pointing to the momentous change that surgery was beginning to undergo. Gamgee spoke learnedly of surgical history and lamented the fact that 'the neglect of the study of historical surgery is growing more apparent.' On the surface this looks like an unremarkable complaint. But it needs to be contrasted with how Gamgee portrayed his own era as 'the surgical epoch.'⁷⁴ For the Victorians the idea of an epoch would have conjured up images of a dominant nation, culture, and system of beliefs. It would have evoked associations of a vast geological stratum, resting on lower layers but different from them. Surgeons credited their modern heroes with actively breaking with the past. Lister's work, said one, was 'Epoch-Making.'⁷⁵ Where surgeons around 1800 saw their subject attaining perfection as part of ongoing historical progress their successors in the late nineteenth century studied history but, in some sense, saw themselves at the end of it or beyond it. Gamgee's complaint about 'the neglect of the study of historical surgery' unwittingly pointed to its history no longer having a presence in everyday surgical life. The 'experience of modernity', as Marshall Berman calls it, made history in Nietzsche's words 'the storage closet where all the costumes are kept.'⁷⁶

What does a survey of surgeons' histories say for the history of surgery today? In spite of the death of history, surgeons continue to labour at the historical coalface. The distinguished tradition of scholarly study by surgeons

has continued in, for instance, bibliographical, institutional, biographical, and technical history. Triumphalist history by surgeons and their popularizers abounds. The fabulous world of heroic, technologically powerful, pain-free, germ-free surgery which operators inhabited at the end of the nineteenth-century was not theirs alone. There is no need to detail here the myriad popular books and films which today dwell on the horrific painful surgery of the past and the miraculous surgery of the present. The bases of these histories were created in the late nineteenth century and their assumptions underwrite populist surgical history today. Current documentary films reveal ‘the brutal, bloody and dangerous history of surgery’ and the move from ‘the early days of surgery’ when it was ‘dark and barbaric’ to the ‘life-saving discipline it is today.’⁷⁷ The significance of these histories is that they are a measure of and participants in surgery’s break with its past and its entry into modernity.

Past histories of surgery show us that many of the issues that vex current historians originate in questions that surgeons debated at the time: how innovative was mediaeval surgery, to what extent was modern surgical pathology a creation of ‘Paris medicine’, what does it mean to call surgery scientific, and was antisepsis more ideologically than practically useful? Surgeons in the past were creating and addressing these questions in ways dependent on their contemporary agendas or interests. Professional historians today tend to raise other issues about surgery, as the chapters in this handbook attest. Questions about the surgical concept of disease, the social relations of surgery, professionalization, and so forth may seem a mile away from older approaches. Yet there are deep historical origins to these modern questions. In the early twentieth century the scholarly, focused, tradition of surgical history writing was married to a new, largely German, broader academic study of history. This union, by way of the institutionalization of history of medicine at Johns Hopkins University in Baltimore in the 1930s, produced much of today’s seminal work in modern social and cultural history of surgery.⁷⁸

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Acknowledgements Thanks, as ever, to Jan Robinson for a penultimate read. For comments, thanks to Sally Frampton and Thomas Schlich, and to Mike Brown for working together on some of the ideas in the latter section.

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Pre-modern Surgery: Wounds, Words, and the Paradox of ‘Tradition’

Faith Wallis

TOWARDS A HISTORY OF PRE-MODERN SURGERY

One of the central questions of the long-term history of surgery concerns periodization, and in particular the distinction between pre-modern and modern surgery. When does surgery become modern, and what makes it modern? UK and US histories conventionally locate the threshold in the eighteenth century, the age of William Cheselden and John Hunter. Indeed, these men are hailed as the ‘fathers’ of surgery *tout court*; what came before them was not surgery at all, but ‘the age of agony’.¹ Continental histories take a rather different perspective, emphasizing, sometimes for polemical reasons, the deep roots of surgery in the past—roots that legitimated its claim to intellectual distinction and public utility equal to that of physic. The highly polemical history of French surgery by the surgeon and economic philosopher François Quesnay, published in the midst of the legal and public relations *contestations* pitting Paris surgeons against the Faculty of Medicine, is notoriously dishonest as a history, but it helped to seal the victory of the surgeons in the minds of the public. Other Continental histories, more sober and credible, took the same position.²

UK and Continental histories, despite these differences, concurred that surgery had either its genesis or its definitive reformation in the Enlightenment. The result is that neither UK–US nor Continental historians, with some exceptions,³ have been inspired to write histories of pre-modern surgery as

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such. There is thus no coherent historiography of western surgery prior to the eighteenth century; indeed, it is rare to find ancient, medieval, and Early Modern surgery considered together.⁴ More commonly, each period is treated in isolation in specialist studies devoted to particular individuals, institutions, or topics, and grounded in different disciplinary traditions. Ancient surgery tends to be covered by classical philologists interested in texts, papyri, and inscriptions, or by archaeologists cataloguing items of surgical gear. Medieval surgery is dispersed among historians of vernacular literatures, social historians of health care, and the exceptional intellectual or cultural historian. Early Modern surgery attracts biographers, social and institutional historians of medicine, and historians of print culture. In consequence, many themes common to all pre-modern surgery, such as the significance of anatomy, the role of instruments, or the impact of war, lack deep and critical scholarly analysis.

Is a history of pre-modern surgery as a whole even feasible? Can we locate factors that persist across space and time amidst the profound changes to surgery's social, political, and cultural environment; and if we can, are these sufficiently robust to sustain a narrative? This chapter sketches one possible approach to that question, and does so in a rather old-fashioned way: it follows a chronological path from the Hippocratic corpus to the second half of the eighteenth century, and focuses on how surgical knowledge was recorded, transmitted, and transformed through writing. The chronological termini are reasonably easy to defend. In Antiquity, while there was in some circles a notional division of medicine called 'surgery', there were effectively no 'surgeons'. Surgical procedures were some of the things *iatroi* or *medici* did, and could write about. In western Europe in the High Middle Ages, surgeons become visible as a distinct occupational group. Some who espoused surgery were book-learned and connected to academic settings; others were craft-trained, *a fortiori* for specialist interventions like eye operations and lithotomy, or as barber-surgeons practicing phlebotomy and wound treatment. If we focus on the history of occupations, we can say that surgery became 'modern' when craft-surgery disappeared in the eighteenth century, and the term 'surgeon' came to denote a formally educated practitioner essentially similar to a physician in status.

This shift corresponds to an ideological transformation. When medicine and surgery come to be viewed as complementary and interpenetrating parts of a single, empirically and experimentally constituted 'medical science', we can be said to have passed into the modern era. While it is true that ancient surgery was never separated from medicine, and even medieval and renaissance surgery was less alienated from medicine than is usually thought, this 'medical science' is a new construct, because medicine itself was transformed by a surgical viewpoint that framed disease in local, anatomical, and ontological terms.⁵

Electing to concentrate on knowledge production and transmission through texts leads to a specific account that has certain problematic aspects. Most surgery of this period was done by people trained through apprenticeship, and those who wrote about (and read about) surgery were not necessarily practitioners. Hence an 'ideal history of surgery', it is argued, would be a

history of the surgical profession, surgical pathology, and surgical technique, not of surgical texts.⁶ However, looking at the history of surgery through texts has some advantages. The effort to articulate surgery in writing had an important effect on shaping surgical knowledge by creating stable schemata within which particular actions could be analysed and compared, and techniques refined by breaking them down into steps. Writing certainly does not allow others to reproduce the action simply by reading about it, but it does encourage reflections on cause and effect, on exceptions and analogies; above all, it provides a sense of the topic as a conceptual whole—as a defined class or category.⁷ The actual procedures recorded from the age of Hippocrates to the Early Modern period often changed very little; they continued to be recorded because books made it possible to think about surgery, and for this thinking process to be sustained by many people, across time and distance. These processes were accelerated by transformations in the vehicles of texts, for example from manuscript to print, from universal classical languages to contemporary local vernaculars, from comprehensive treatises to concise and topical *comptes rendus*.

On the other hand, a history of pre-modern surgery that uses the textual record as its scaffolding will not be a literary history of surgery. It will not aim at presenting a comprehensive catalogue of surgical texts, but will seek out representative exemplars of significant trends in communication. This is also the approach of the present chapter.

The chronological path can be summarized thus. In classical antiquity, certain therapeutic interventions were called collectively ‘the work of the hand’ (Greek: *cheirurgia*); some of these also involved instruments wielded by the hand—knife, probe, cautery iron, bandage—or medications applied by the hand, such as salves and caustics. With or without an instrument, the hand could normally only address problems at or near the surface of the body, or in an accessible orifice such as the mouth. Hence ancient surgery was driven by the practitioner’s concern with the continuity of the body’s integument of skin and flesh and its armature of bones. This is reflected in the medieval Latin term for trauma, *solutio continuitatis*, ‘rupture of continuity’.⁸ This tradition of *wound surgery* covers the treatment of wounds, ulcers, abscesses, fistulae, skin conditions, tumours, and other traumatic or infectious conditions on or near the exterior of the body, as well as the reduction of fractures and dislocations, and amputation. By the Hellenistic period, however, a number of elective *operative* procedures for ophthalmological, genito-urinary and obstetric problems had been developed. These were high-risk, because they involved deliberately creating a wound in the body, but they were also high-value techniques, in that they could save or vastly improve lives. Wound surgery was part of the repertoire of the all-round practitioner; operative surgery was in most cases not. And yet the forms of surgical writing of the Roman imperial period and Late Antiquity dictated that they be treated together as one field of surgery.

Written records of surgical thinking and practice from the Middle Ages assumed that surgery was an integral dimension of a total medical art, but

evolved towards greater interest in its distinctive character. This was reinforced by Arab-Islamic medical literature, which began to be translated into Latin (the language of learning in western Europe) in the late eleventh century, along with some ancient Greek medical writings not heretofore available. The driving force of this cultural appropriation was the academic turn of the twelfth and thirteenth centuries—a revolution in higher education that emphasized collective instruction in formally constituted schools, based on reading and discussing standardized curricula of canonical works by recognized authorities. These teaching and knowledge-production practices are collectively called ‘Scholasticism’. Medicine found a place in the new universities of western Europe, and its teaching and text production practices adopted Scholastic forms. The twelfth century saw the appearance of the first dedicated treatises bearing the title *Surgery*. By the middle of the fourteenth century, several generations of Latinate surgical writers had produced a vigorous Scholastic literature that treated surgery as a distinct domain of the medical art. Once so constituted, learned surgery could, in some instances, be the subject of university instruction. At the same time, but completely independently of the Scholastic turn, people called ‘surgeons’ had appeared as craft-trained health-care practitioners, including specialists in the high-risk, high-value operations like lithotomy, cataract couching, and operations for hernia. The outpouring of vernacular translations of Scholastic surgery texts, and later of original treatises, speaks to the ambitions of the working surgeon, but also points to tension between physicians concerned to protect the academic character of their learned profession, and the craftsmen who were becoming the default surgeons of European society. The Latinate academic surgeons were caught in the middle.

The period from about 1450 to 1750 saw accelerated changes in communication. The advent of the printing press coincided with the humanist project of recovering classical learning, including surgical learning; but it also allowed voices from outside the academy to win public recognition. In addition, it promoted the importance of anatomy and dissection through the publication of works illustrated with detailed, visually compelling, authoritative and replicable images. This favoured the cause of surgery’s claim to anatomy as its ‘theory’. Surgery’s confidence was encouraged by an intelligentsia increasingly ready to trust experience and experiment. The result was a new framework for rapprochement between medicine and surgery, exemplified on the one hand by medically trained surgical writers, and on the other by surgeon-anatomists. And finally, the ideology of the Enlightenment, with its emphasis on the amelioration of human welfare and its bias towards the practical, found in surgery its exemplary science.

ANTIQUITY: ‘SURGERY’ WITHOUT ‘SURGEONS’

Surgical activity is abundantly documented in Egyptian sources, notably the Edwin Smith Papyrus, but the tradition of western surgical writing effectively begins in ancient Greece.⁹ The treatises linked to Hippocrates include works

that were classified even by the ancients as surgical in character: *Fractures, Joints* with its appendix *Instruments of Reduction* or *Mochlicon* ('Leverage'), *Wounds in the Head*, *Ulcers*, *Haemorrhoids*, and *Fistulas*, as well as *Excision of the Foetus*. To these can be added the essays entitled *The Physician* and *In the Surgery*, which contains precepts on conducting cautery and bandaging.¹⁰

No Hippocratic work discusses surgery as a whole, or defines and delimits it. These are procedural essays that deal with handling discrete problems or categories of problems. Who the intended reader was, is not clear. *Fractures* and *Joints*, for example, consists of adroitly structured treatises, but they insist that the work of the hand cannot be learned from books. Elizabeth Craik concludes that they must have served as an adjunct to direct instruction by providing 'a general idea' of the procedure.¹¹ This schematic function underpins almost all pre-modern surgical writing; the global picture, the comparative perspective, is the work of writing. The procedures described are not particularly invasive, and are confined to wound surgery. Indeed, wound surgery marks the boundary between the Hippocratic *iatros* and the people whom *The Oath* calls *ergatai andres*—'men who work'—at the surgical removal of bladder stones. As the Hippocratic *Oath* implies, the *ergatai andres* were specialist experts in this complex operation—a procedure which required particular equipment, trained assistants, and constant, focused practice that would not be available to the generalist doctor. Hence the Hippocratic *iatros* of the treatises wielded 'the knife' (*sideros*—literally, 'an iron [tool]') that exposes cranial fractures, or cut away mangled flesh around a wound, but eschewed 'the knife' that opens the body. The well-known passage in *Aphorisms* 7.87—'What drugs will not cure, the knife will; what the knife will not cure, the cautery will; what the cautery will not cure must be considered incurable'—implies a problem like gangrene or sepsis, treated first with caustics, then ablation, and if all else fails, cautery. This inflection of 'the knife' orients us to the modest horizon of Hippocratic surgery. *Haemorrhoids* 2, for example, reassures the reader that making a cut into the anus, or cauterizing it, is not as dangerous as it seems. Normally, cutting into an untraumatized body was confined to phlebotomy (a perennial intervention for both therapeutic and prophylactic ends), lancing an abscess (e.g. *Diseases* 2.47 and 3.16, *Internal Affections* 9), and the removal of external growths. All the treatment in *Ulcers* are non-operative, save for the excision of varices. The type of dressing or medication was dictated by the need to manage the production of pus by promoting the healthful kind and avoiding suppuration; Hippocratic procedure, in short, is framed in a context of physiological and pathological theory, though for the most part this is implicit.

The reduction of fractures and dislocations was a domain where Hippocrates' influence would remain virtually unchallenged to the end of antiquity. The treatises devoted to these problems, *Fractures* and *Joints*, are remarkable for their economical and pedagogical structure. Both begin with detailed discussions of paradigm cases: fracture of the forearm and dislocated shoulder, respectively. *Fractures* then deals with dislocations of foot and ankle, fractures

of the leg, compound fractures, and dislocations of elbow; *Joints* also covers fractured collarbone, dislocation of the elbow, wrist, fractures and dislocations of the jaw, broken nose, spinal deformities, broken ribs, dislocated hips, gangrene, and amputation.¹² Tellingly, compound fractures are best left alone (*Fractures* 35, *Joints* 63–67). Amputation is only carried out at the joints of the foot and hand (*Joints* 68); the Hippocratic author is willing, particularly in cases of compound fractures, to wait for necrosis to take its course and the body spontaneously to shed the diseased part. These treatises are also remarkable for their descriptions of equipment—planks, balls to insert beneath the armpits, pestles, logs, chair-backs, ladders—and for the role they assign to trained assistants. Combinations of apparatus and manual exertion are prescribed for cases of spinal deformity, though some of these procedures are (by Hippocrates’ own admission) unlikely to be successful (*Joints* 47–48). *Mochlicon* adds windlasses, levers, wedges and presses for extension and reduction. The most elaborate apparatus is the so-called ‘Hippocratic bench’ for extending dislocations of the hip using a windlass and lever; this is described in *Joints* 72–73, but the author comments that most dislocated joints can be reinserted ‘with much weaker extensions and more ordinary apparatus’.¹³ The description was reproduced in late Antiquity by Oribasius and Paul of Aegina, and depicted in illustrations, but subsequent attempts to reconstruct the device have not been persuasive; it is not impossible that it survived as a literary artefact—an aspiration rather than a prescription.¹⁴ Other equipment is catalogued in the essay *The Physician*: cautery irons, scalpels, cupping instruments, tooth- and uvula-forceps, compresses, and above all, bandages. The correct form of bandaging is also the subject of minute analysis in *In the Surgery*. Adroit application, and a neat and comfortable result were the ideal; like a physician’s garb, his bandages should be elegant but not fussy—a useful reminder that dressings were the outward and visible sign for the public of the practitioner’s skill and concern. This also draws our attention to the dimensions of ethics and etiquette in the surgical writings.¹⁵

Finally, it should be noted that the Hippocratic corpus does not contain the substantive *cheirurgos*, ‘surgeon’. The earliest references to people called ‘surgeons’ comes from the first and second centuries of our era: Celsus (see later), Plutarch (*Moralia* 486c) and Galen (*Method of Healing* 6.5) who mentions ‘so-called surgeons’ (*kaloumenoi cheirurgoi*), a turn of phrase which suggests that this is an unfamiliar designation.¹⁶ Celsus normally refers to the practitioner as *medicus*, and this was the title of medics in the Roman army. There is a persistent tendency in historiography to identify ancient military medicine with surgery, ignoring the more common non-traumatic ailments that *medici* dealt with.¹⁷ It is often claimed that Hippocrates recommended getting some experience in the army, but the relevant passage in *Physician* 14 notes both how difficult it was to acquire, and its limited usefulness—essentially providing practice in extracting missiles.¹⁸

The first substantial treatment of surgery after Hippocrates and the most extensive in classical Antiquity comes from the pen of a Roman gentleman

and encyclopaedist, Celsus.¹⁹ Celsus was not a physician, let alone a surgeon, and neither was his intended readership—a salutary reminder that surgical writing need not be by and for surgeons. His sprawling compendium of universal knowledge covered topics of interest to the Roman elite male: agriculture, military science, rhetoric, philosophy, and jurisprudence, but the only part that survives is the eight books on medicine. Celsus divided his subject into dietetics, pharmacy, and surgery; thus the two books on surgery (7 and 8) stand out prominently. He further divides surgery into (1) cases where the practitioner himself must make a wound (e.g. lancing an abscess or removing a nasal polyp), or where a pre-existing wound can be better treated by the hand than by medicines (e.g. removing an embedded missile) (book 7), and (2) cases involving broken or dislocated bones (book 8). In book 5, however, under the rubric ‘medications’, Celsus deals with topical treatments for wounds, ulcers, and similar conditions. Thus, what defines surgery is manual action, not the problem addressed, or the status of the practitioner.

Celsus names as his sources treatises (now lost) devoted to operative surgery by Alexandrian *professores* like Philoxenus, Gorgias, Sostratus, and Heron, and his work reflects important developments in the Hellenistic period.²⁰ Many of the operations in book 7, in contrast to the traumatology of book 8, are without Hippocratic precedent: surgical repair of hernia (7.18–7.21), anal fistula (7.4), and intestinal prolapse (7.14, 7.16); couching for cataract (7.7); paracentesis for dropsy (7.15); and amputation through the bones and living flesh rather than at the joints.

Celsus’ showcasing of ‘the work of the hand’ essentially created surgery as a coherent category of medical thinking, populated by a wide-ranging repertoire of operations as well as treatments for trauma. The implication is that a ‘surgeon’ should be master of both. Moreover, on one significant occasion, Celsus refers to the practitioner as *chirurgicus*, namely when describing the psychological and physical requirements of wielding the knife (7, Proem. 4). This catalogue of qualities—a steady hand, keen vision, nerves unfazed by the patient’s cries—would take on a life of its own. With variations and elaborations, it would be repeated in the early Middle Ages in such unpretentious works as the *Liber chirurgiae Ypocratis* and the closing chapters of the pseudo-Galenic *Introductio sive medicus*,²¹ and in the great *summae* of the Scholastic period, beginning with Bruno of Longobucco and extending through Lanfranc of Milan to Henri de Mondeville, none of whom read Celsus’s original text.²²

Celsus, in short, raised expectations concerning surgery. By contrast, Galen’s direct impact on surgery is ambiguous. He only occasionally describes an operation, for example how he removed an abscessed rib from the slave of Maryllus, thereby exposing the heart, or how he excised part of the omentum of a gladiator with an abdominal wound. Compared with his abundant discussion of venesection, however, these accounts are few and perfunctory.²³ But his system of physiology and pathology would exert an enormous influence on surgery in the centuries to come. In late Antiquity, and

later in the Arab-Islamic world, the impetus to organize medical knowledge into comprehensive encyclopaedias would be driven by the need to process Galen's thinking into a system of medicine by rationalizing his own works, and supplementing them with pharmacological and surgical material. In the Greco-Roman sphere, this task was taken up by Oribasius of Pergamum (c. 325–400 CE), Alexander of Tralles (sixth century CE), Aëtius of Amida (first half of sixth century CE) and Paul of Aegina (seventh century CE).²⁴ The encyclopaedic impulse was reinforced by the Arabic writers of the ninth to thirteenth centuries.

MEDIEVAL SURGERY: SURGEONS AND 'SURGERIES'

The western European encounter with Arabic medical writing in the later eleventh century was through such encyclopaedias, where surgery was subsumed in the larger framework.²⁵ The first to be translated into Latin was the *Whole Art of Medicine* of 'Ali ibn al' Abbas al Majūsi (Haly Abbas, d. 982–994); under the pen of Constantine the African (d. c. 1087–1100), this became the *Pantegni*, of which part 2, book 9 (partially translated by Constantine, later completed by John the Saracen and Rusticus of Pisa) was devoted to surgery. In the later twelfth century, Gerard of Cremona (1114–1187), working in Toledo, translated the monumental *Canon* of Abū Alī al-Husain ibn 'Abdallāh ibn Sīna (Avicenna, 980–1037); *Canon* 4, fens 3–5 covers surgery. A major watershed, however, was Gerard's translation of the surgical section—and only the surgical section—of the thirty-book compendium of the whole medical art, *Kitāb al-Tasrif* of Abū al-Qāsim Khalaf ibn al-'Abbās az-Zahrāwī (Albucasis, 936–1013), largely based on Paul of Aegina. Whether accidentally or deliberately, Gerard's selective translation provided the West with its first dedicated surgical authority.²⁶ The fact that Albucasis entered the West as a surgeon implied a specialist identity he may not have possessed; many of the operations recorded by the Arabic compendia were avowedly never performed or even recommended by them.²⁷ Indeed, encyclopaedias have the effect of preserving discrete items of surgical information that are obsolete or otherwise unusable; like 'junk DNA', they are replicated across generations because they travel within a text that aims to be comprehensive.²⁸

The decision to package Albucasis as surgery may have been a response to Western demand. Well before Gerard translated his book, a new genre of Latin texts exclusively dedicated to surgery had emerged. 'Surgery' was, for the first time, the title of a book. Simultaneously, a distinct occupational corps of people called 'surgeons', something unheard of in Antiquity, becomes visible. It was from their ranks—or at least, with the benefit of their craft-transmitted knowledge—that the authors of these new surgeries arose.

The key figures here were Italian.²⁹ The intellectual tradition of Salerno that centred around the corpus of Constantine's translations produced two specialized treatises, the concise *Chirurgica salernitana* (which shows little

Constantinian influence, but possibly was used to supplement the still-incomplete *Pantegni practica* 9), and the more ambitious *Bamberg Surgery* (first half of the twelfth century) which drew on the complete version of *Pantegni practica* 9, and added materials on phlebotomy, surgical pharmacy, anatomy, and physiology.³⁰ Its impact was not great, for it was eclipsed by the productions of northern Italian surgical authors, but it is an important witness to empirical surgical traditions antedating the advent of the new Arabic literature, including, for example, recipes for a general anaesthetic infused in a sponge and inhaled by the patient, and for the treatment of goitre with ashes from a marine sponge. There was clearly a vigorous tradition of craft surgery prior to the translations, though recoverable only with difficulty.³¹

As a practitioner of a specialized craft who aspired to literate status, Roger Frugeri of Parma (second half of the twelfth century) was emblematic of the social, economic, and cultural energy of Italian commercial cities. His *Surgery* is not a compilation or synopsis of prior texts, but a guide to surgical action from the practitioner's perspective. Though he uses the occasional Arabic term and adopts the head-to-toe order of *Pantegni practica* 9, his *Chirurgia* shows little dependence on ancient, Arabic or Salernitan literature. Indeed, Roger needed editorial assistance and help with Latin, so he partnered with a professor of dialectic, Guido d'Arezzo. The result is a text remarkable for its logic and clarity; subsequent translations into Anglo-Norman, German, Provençal, and Italian created a truly European idiom of surgery. Moreover, it began immediately to be used for teaching. Marginal glosses sprang up, and Roger's student Roland of Parma produced a revised and expanded edition, the *Rolandina*. The mysterious 'Four Masters' composed a commentary on the *Rolandina* focusing on the humoral pathology underlying the various conditions.³² Finally, Roland moved from Parma to Bologna, seat of an important *studium* that would become the premier Italian centre of medical education. This is certainly related to Roland's decision to supplement Roger with material drawn from Avicenna and Galen. At the same time, Roland grants authority to his own experience: for example, he claims to have successfully treated a damaged lung, and criticizes those who say this is impossible.³³

In a society where Latin text-based learning enjoyed elevated status, writing about surgery justified its importance and dignity. Beginning around 1240 and ending in the middle of the fourteenth century, a chain of Latin-literate surgeons in Italy and France would make this case with insistence, producing what Michael McVaugh calls the tradition of 'rational surgery'. They aimed, in short, to make surgery scientific, in Scholastic terms, through orderly presentation for teaching, logical argumentation, and grounding in authoritative textual doctrine. Moreover, these men read one another's works, and responded to them.³⁴

The initial link in the chain was Teodorico Borgognoni, son of the Bologna town surgeon Ugo of Lucca, but by the time he composed his surgical texts, a Dominican friar and bishop of Cervia. That Teodorico continued to

work as a surgeon while in major orders illustrates how flexible and generally disregarded were the ecclesiastical strictures on medical and surgical practice by clergy. The persistent myth that all clergy were barred from these occupations is based on failure to distinguish monks (who were forbidden to study medicine *in universitates* because it would involve leaving the cloister) from secular clerics, and clerics from *priests*, who might be banned from officiating at mass if found guilty of causing a patient's death while performing surgery. The records, however, show that clerical practitioners were ubiquitous, and that dispensations from the letter of the law were commonplace. Teodorico's career is a conspicuous case, but not an unusual one.³⁵

In the mid-1240s Teodorico composed his first treatise on surgery, known from its incipit as *Vulnera*. Its organization is unsystematic, it boasts no preface or program, and is entirely about wounds, fractures, and dislocations. In 1252, however, Bruno Longobucco of Padua composed a similar work, structured according to a more intellectually ambitious plan. The first part of his *Cirurgia magna* dealt with *solutio continuitatis*, but the second was devoted to non-traumatic complaints, such as tumours, haemorrhoids, and ophthalmic surgery. Moreover, Bruno prefaced his work with a manifesto for a surgery grounded in reason and taught through public exposition of and debate about authoritative texts. Teodorico responded by issuing a new *summa*, entitled *Tractaturi*, which not only takes up Bruno's challenge by adding a book on non-traumatic surgery, but which enters into dialogue with the *Cirurgia magna* by quoting from it, while adding particulars drawn from experience. Teodorico's expanded edition of the 1260s, *Venerabili*, adds another book on internal diseases treatable by surgery such as paralysis, gout, and headache, and a final book on new medications and techniques.

The momentum increased with the publication of Guglielmo da Saliceto of Bologna's *Chirurgia* in 1268, and its revision in 1275. Guglielmo's critical innovation was the inclusion of a separate book on anatomy. This was an important weapon in his broader argument that surgery was a *scientia*, for Guglielmo was explicitly writing for an academic audience.³⁶ Anatomy is central to this academic turn, because the formal study of anatomy through reading Galen and participating in demonstrations on a dissected human cadaver could only take place in the university. Human dissection was introduced without fanfare or controversy in Bologna in the late thirteenth century, and Bologna's precocious tradition of Latinate surgery almost certainly played a role in this. The rational surgeons were the first to articulate an argument for the usefulness of anatomical study for medicine as a whole; anatomy also differentiated the learned surgeon from the empiric.³⁷ This issue would prove particularly significant in the career of Guglielmo's student, Lanfranc of Milan.

Lanfranc of Milan left his native land for regions beyond the Alps, teaching first in Lyons, and then in the Faculty of Medicine at Paris. His 1296 *Chirurgia magna* strikes a new note by lashing out against the pretensions of craft surgeons without academic credentials. Lanfranc underscores anatomy's role in aligning surgery with medicine against craft practice, by positioning

anatomy at the beginning of his treatise. By appending a surgical antidotarium, he makes yet another claim to parity with medicine: drugs were as much an instrument of surgery as of internal medicine. Henri de Mondeville, who may have studied under Lanfranc, and was certainly dependent on him, likewise emphasized surgery's close kinship with (even superiority to) medicine, and the chasm separating rational surgeons from those who operate without system or rationale. His Latin *Chirurgia*, composed between 1304 and about 1314, is noteworthy for this insistence on understanding the reasons behind surgical interventions, and applying Aristotelian logical analysis to decision making; the best-known passage in this vein is his strongly polemical discussion of the role of pus during wound treatment.³⁸

In some respects, the project of the rational surgeons was successful, both in inserting surgery into medical education (particularly in Italy) and in easing the way—and increasing the incentive—for craft surgeons to move up to academic status. But the tide began to move in the opposite direction in the latter part of the fourteenth century. Physicians were increasingly reluctant to engage in surgery, both because of its technical difficulty and because association with craft practice diminished their status as philosophers of the body.³⁹ Even in Bologna, lectures on surgery by the fifteenth century were reduced to surgical pharmacy, as boundaries hardened and the impetus to subordinate surgery to medicine intensified in the name of protecting the public and the reputation of the university.⁴⁰ In Paris, the creation of a company of sworn master-surgeons by King Philip IV in 1311 institutionalized surgery's character as a craft transmitted through apprenticeship, even though the surgeons adopted academic-style ranks (bachelor, licentiate, master) and by the mid-fifteenth century, were granted the status of scholars and permitted to attend lectures in the *studium*.⁴¹ The upshot was to place surgery outside the official sphere of physicians' interest, while not inhibiting academic doctors from engaging as much as they wished with surgical issues and problems, or collaborating with surgeons in their practice.⁴²

On the whole, however, craft surgery suffered little from the demise of the rational surgery project, particularly outside university centres. Craft surgery was deeply embedded in the social and economic fabric of European cities and towns by the thirteenth century, and in the process successfully organized into occupational guilds. This had the additional advantage, in a deeply Christian society, of lending surgery its own religious dignity.⁴³ Even the learned surgeons acknowledged that high-risk procedures like operations for hernia or cataract were best left to full-time specialists.⁴⁴ To put it another way, the people who were advocating in writing for the broadest and most ambitious claims for surgery, were conceding important tracts of the field in practice. It is not even certain how much of it they wished to own. The realities of surgical practice are hard to pry from Scholastic surgical writing, where textual authority and even personal anecdote could be made to simulate experience. Bruno, Lanfranc, and Guglielmo might discuss ancient techniques like paracentesis—a procedure not even mentioned by Roger and Roland—but they also advised against doing it.

Craft surgeons also constituted a market for surgical texts. Mondeville castigates empirics and barbers, but he also undertook to translate his book into French, and one of his students at Paris, the Fleming Jan Yperman (d. c. 1330), wrote exclusively in his native tongue. However, increasing vernacularization did not cement the triumph of the Latinate tradition of rational surgery; indeed, it can be said to have signalled its demise.⁴⁵ The consequences can be traced in the works of two later medieval authors, John of Arderne and Guy de Chauliac.

Universities in England were not located in major cities, nor were their medical faculties large or active. John of Arderne (1307–c. 1380–1392), learned about Scholastic surgery by reading, and despite only a grammar-school education, had a solid knowledge of Bernard of Gordon's *Lilium medicinae*, and Albucasis. However, he did not align himself with the rational surgery tradition. His *Practica* is not a comprehensive and orderly *summa* but a suite of detailed accounts of his own surgical practice, including his trademark operation for fistula-in-ano. John seems to expect his readers to learn the operation from his book. Indeed, he claims to be committing it to writing because he is retiring from practice: hitherto, this had been his 'secret' or patented technique, and the source of his income and reputation. Moreover, his illustrations, unlike the decorative and formulaic images in the Latinate surgeries, were designed to convey the steps of the operation with precision. And yet even though the fistula tract was translated into English, John remained an isolated figure; his work did not create a new surgical culture in England.⁴⁶ What might seem to us a very modern kind of surgical writing found no institutional purchase in a country with weak traditions of academic medicine and (as yet) no surgical guilds.

On the Continent, Guy de Chauliac's *Inventarium* (1363) stands as the last of the Scholastic Latin surgeries of the Middle Ages. And yet it too departs from the tradition of Bruno and his successors. Guy assumes rather than argues for the rationality of surgery, and is untroubled with any perceived dichotomy between the intellectual and the manual.⁴⁷ The reasons seem less ideological than personal. Though a physician trained in Montpellier, Guy specialized in surgery; he calls himself both 'master of medicine' and '*cirurgicus*' and appears to address his work to surgeons, for example by advising them what problems should be referred to physicians. His work was widely translated,⁴⁸ and enjoyed a long career of authority, well into the seventeenth century. Yet it would not be taken up as a manifesto for uniting surgery with medicine in educational or occupational institutions, because Guy himself made no such case.⁴⁹ The chain of rational surgery ends with a notably robust link, but it is the final one.

SURGICAL WRITING IN A WORLD OF PRINT

When humanists called for a return to ancient sources of knowledge in the original classical languages, one of the domains envisioned would be surgery. Celsus was re-discovered, and his fine literary style contributed to

the dignity of surgery; the Aldine Greek edition of Hippocrates printed in 1526 made available the riches of Hippocratic surgery; Aldus also published Paul of Aegina in 1528 and a flurry of other translations followed. An article of the humanist creed was that recovering ancient knowledge would improve modern surgery. Giulio Cesare Aranzi's commentary on the newly recovered *Wounds to the Head* was fulsome in its adulation of Hippocrates, because the truth of what he wrote could be confirmed in everyday practice. Jacques Daléchamps' *Chirurgie française* (1568) went further: not only do the greatest surgeons of antiquity and the modern age agree, but physicians as well as surgeons concur that ancient surgery is the source of practical progress.⁵⁰

The printing press and the expansion of literacy also accelerated the diffusion of vernacular and technically oriented literature intended for the craftsman-surgeon. Hieronymus Brunschwig's *Das Buch der Cirurgia* (Strasbourg, 1497), the first printed surgery book with illustrations, was rapidly turned into English (1525). Hans Gersdorff's *Feldtbuch der Wundartznei* (Strasbourg, 1517) with its illustration of an operation on the battlefield, is also remarkable for its images of Gersdorff's novel instruments, such as a tripod screw-elevator for raising depressed fragments of cranium.⁵¹ In 1460 the German Heinrich von Pfalzpaint discussed gunshot wounds for the first time, and treated them like any other wound.⁵² But Pfalzpaint never made it into print; it was Giovanni da Vigo's *Practica copiosa in arte chirurgica*, published in Rome in 1514 and rapidly running through numerous editions in French, Italian, German, Dutch, Portuguese, Spanish, and English, that created the orthodoxy that gunshot wounds were inherently poisonous and required cautery with boiling oil.

The surgeon who most brilliantly exploited the new medium of print was Ambroise Paré (1510–1590). Paré burst onto the world of medical letters in 1545 with *Le méthode de traicter les playes faictes par harquebutes et aultres baston de feu*.⁵³ The book records his experiences during a military campaign nine years previously, when (he says) he was forced to treat gunshot wounds without boiling oil. He applied a simple dressing, and discovered that the men so treated fared as well or better than those receiving conventional care. This, like many of Paré's alleged innovations, is less original than claimed, being a return to late medieval practice. What is perhaps new is how Paré framed this as a natural experiment enabled by the high concentration of similar trauma under battlefield conditions.⁵⁴ *Le méthode* cemented his fortune. Most of the rest of his life was spent in Paris, treating royalty and civilians and writing a remarkable series of books on every dimension of surgery, as well as on subjects such as zoology, monsters, and embalming.

Even before *Le méthode*, however, Paré had published a surgeon's anatomy focused on fractures and dislocations, *Briefve collection de l'administration anatomique; avec la maniere de conjoindre les os* (1539); however, influenced by the appearance of Vesalius's *Fabrica* he produced a more comprehensive *Anatomie universelle du corps humain* in 1561. Paré was ambitious and canny as well as brilliant, and he grasped the potential of anatomy as surgery's claim to grounding in theory. But he also recognized that Vesalius' novel emphasis

on muscles and bones, and the detail and dimensionality of the *Fabrica's* images, had particular salience for surgeons.⁵⁵ When occupational guilds of surgeons were established (e.g. London's Company of Barber-Surgeons in 1540, Amsterdam's surgeons' guild in 1552) they were allowed to conduct teaching dissections. The creation of dissection theatres for these surgeons (Amsterdam 1624, London 1638) further narrowed the gap between surgeons and physicians, for whom anatomy was also taking on the role of foundational science. Surgery's appropriation of anatomy—another index of the new terms of its dialogue with medicine—was sealed by the publications of the surgeon-anatomists of the seventeenth and eighteenth centuries, from Fabricius ab Aquapendente, through to Pierre Dionis and William Cheselden.

Unlike Paré, the German Wilhelm Fabry von Hilden (1560–1624) came from a relatively well-off background, and had a classical education. He was widely travelled, corresponded with savants and scientists, and earned a reputation as a surgical consultant. Like Paré, he traded on his experience, publishing six suites of *Observationes et curationes* in Latin (though swiftly translated into German and French), each containing one hundred case histories covering the entire field of surgery, with abundant illustrations of instruments, cases, and techniques. The possibilities of illustration were taken even further by Johannes Scultetus (1605–1645), a Padua graduate and the city physician of Ulm, whose posthumously published *Armamentarium chirurgicum* (Ulm, 1653) is a graphic extravaganza, with 43 full-page plates, each with multiple images of instruments, methods of bandaging and splinting, and operative procedures. The instruments included reconstructions of ancient tools, and even designs for hypothetical new ones. The formula was a huge success, and subsequent editors and translators (German, French, English) continued to add illustrations and textual material.⁵⁶

The demand for comprehensive treatments of surgery never abated, as witness the extraordinary success of the *Chirurgie* of Lorenz Heister (1739), professor of surgery and anatomy at the University of Altdorf. But it was overtaken by a new interest in the particular and the experimental. A representative example is Gaspare Tagliacozzi's exposition of skin grafting for rhinoplasty (*De curtorum chirurgia per insitionem*, 1601). Tagliacozzi was a medical graduate and professor of surgery at Bologna; but the operation he described was based on a secret technique employed by family firms of specialist operators, the Branca of Catania and the Vianeo of Calabria.⁵⁷ This signals the growing chasm between a surgery where reputations were made by publishing, and a more traditional surgery where fortunes depended on guarding methods from imitators. Enlightenment ideology, which embraced transparency and opposed privilege, further eroded public sympathy for craft secrecy.

These streams converge in the eighteenth century, and are particularly visible in France. The milestones are the dismantling of older guild and college structures based on the division of surgeons from physicians, the erasure of craft-trained categories of surgical practitioner, and the empirical turn in the

ideology of medicine itself, which brought its goals and methods and those conventionally adopted by surgery into closer alignment.⁵⁸ But the dramatic changes and exceptional prestige of French surgery is as much a triumph of communication as of technical improvement of institutionalized government support. Two examples will illustrate this. First, the eighteenth century saw an unprecedented outpouring of surgical publications in France. The publication of operative techniques not only supported and justified the shift to formal teaching for surgeons, but raised the bar of what was expected of candidates for the surgical license all over the kingdom. It also proved easy to assimilate into the knowledge networks of the *philosophes*. For instance, Pierre Flouber (1696–1766) is not one of the most prominent lithothomists in this age of competing techniques, but his particular refinements achieved unprecedented public currency when they were commemorated and illustrated in Diderot and D’Alembert’s *Encyclopédie*. Secondly, the stated aim of the Académie royale de Chirurgie at its foundation in 1731 was to publicize observations and discoveries—a project that resonated with Enlightenment values of openness and amelioration. Initially the goal was to produce an authoritative code of practices, but this rather *ancien régime* ambition was quietly shelved in favour of timely dissemination of surgical news. In addition, by publishing *éloges* of their departed members in imitation of the established academies, the surgeons elevated their moral and social status. Finally, reports of the Académie’s proceedings were for some time published in the principal periodical of the learned public, the *Mercur de France*.⁵⁹

CONCLUSION

A history of pre-modern surgery based on the history of the profession, of surgical pathology and of surgical technique may indeed be ideal, but it risks suppressing whole periods of this history. There was no surgical profession in Antiquity, and almost no surgical pathology before the Early Modern period; focusing on procedures and instruments would leave much of the Middle Ages out of the picture, and most of wound surgery *tout court* since Hippocrates, with the exception of amputation. When read through the lens of its textual record, however, one can glimpse a distinctive shape for the history of pre-modern surgery as a whole. The tension between the transferrable schemata afforded by texts and the imperative to teach and learn by direct, particular experience shaped the medieval and Early Modern debates over the relationship of surgery and medicine, and the status of the profession of surgery. Procedures and techniques which may not have been used, but which entered and remained in the written record (e.g. techniques of general anaesthesia administered orally or by soporific sponge) kept the possibility of such pain relief in circulation, even when the writers declined to endorse it. The appeal to past authority might be a brake on change, but could also excuse it, as when medieval practitioners used manuscripts of Albucasis to sell their competence in resolving difficult births. Finally, the styles, genres,

languages, and formats of surgical communication, as much the content of what is communicated, are part of the wider process of historical change over these two millennia. Pre-modern surgery is ‘traditional’ precisely because of the role of transmitted texts in framing the surgery’s discourse; but as anyone who has studied ‘traditional’ societies can attest, tradition is the idiom in which these cultures create, justify, and explain change. Even quoting an ancient authority is more often than not a way of saying something new. Celsus created surgery as a concept by placing it under the aegis of Hippocrates; the medieval ‘rational surgeons’ pointed to the Arabic encyclopaedias as evidence that their activity was inherently Galenic and scientific; the Early Modern surgeon-anatomists leapt aboard, and openly imitated, Vesalius’s project to depict dissection as the primordial medical science. Traditional cultures conquer the present by owning the past.

NOTES

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2. François Quesnay and Jean Louis Girodat, *Recherches critiques et historiques sur l’origine, sur les divers états et sur les progrès de la chirurgie en France* (Paris, 1744). On the controversy between the surgeons and the Faculty, see Toby Gelfand, *Professionalizing Modern Medicine: Paris Surgeons and Medical Science and Institutions in the 18th Century* (Westport CT: Greenwood Press, 1980), ch. 4. On the defects of Quesnay, see Danièle Jacquart, *La médecine médiévale dans le cadre parisien* (Paris: Fayard, 1998), pp. 16–47. The *Histoire de la chirurgie, depuis son origine jusqu’à nos jours* by M. Dujardin (vol. 1) and Bernard Peyrilhe (vol. 2) (Paris: L’Imprimerie royale, 1774–1780) took a universal rather than national approach, and so began with the Bible and Hippocrates, but never progressed beyond Paul of Aegina (seventh c.). The most widely diffused of these Continental ‘long histories of surgery’ was Kurt Polycarp Joachim Sprengel, and Wilhelm Sprengel, *Geschichte der Chirurgie* (Halle: Kümmel, 1805–1818).
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 7. Demonstrated in the context of the Hippocratic Corpus by Iain M. Lonie, 'Literacy and the development of Hippocratic Medicine', in *Formes de pensée dans la collection hippocratique. Actes du IVe Colloque hippocratique* (Lausanne, 21–26 septembre 1981), ed. François Lasserre and Philippe Mudry (Geneva: Droz, 1983), pp. 145–161; see also Gordon Miller, 'Literacy and the Hippocratic Art: Reading, Writing and Epistemology in Ancient Greek Medicine', *Journal of the History of Medicine and Allied Sciences* 45 (1990): 11–40. For this see also the chapter on images in surgery by Harriett Palfreyman and Christelle Rabier (chapter 'Visualizing Surgery: Surgeons' Use of Images, 1600–Present' in this handbook).
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 13. *On Joints*, ed. and trans. E.T. Withington (Cambridge MA: Harvard University Press and London: Heinemann 1928), p. 377.
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Medicalizing the Surgical Trade, 1650–1820: Workers, Knowledge, Markets and Politics

Christelle Rabier

In 1729, William Cheselden (1688–1752), prominent member of the London guild of barbers and surgeons, published a most interesting case in the *Philosophical Transactions*.¹ Cheselden had operated on the eye of a young blind man who consequently recovered his sight. His ‘Account of Some Observations Made by a Young Gentleman, Who Was Born Blind’ narrated the various steps in the case: his young patient’s decision to undergo surgery, the success of the operation and the slow process of learning to see figures and perceive perspectives. Furthermore, ‘An Account of the Instruments Used’ detailed the technique of iridotomy or the creation of an artificial pupil (Fig. 1). Throughout Europe, philosophers or men of letters from Voltaire (1694–1778) to Immanuel Kant (1724–1804), including Denis Diderot (1713–1784) in his *Letter on the Blind for the Use of Those Who See*, bestowed an extraordinary degree of fame upon the London surgeon; they declared that surgical healing had supplanted magic cures, opening the path for unprecedented progress in the knowledge and healing of the bodily functions of humans and a new era for heroic surgeons.

‘Modernity’ and ‘progress’ sum up the central narratives conveyed by the first historians of surgery, who equated the history of surgeons with the rise of modern medicine.² In 1951, in a remarkable article, Owsei Temkin suggested that surgery was critical to the ‘rise of modern medical thought’, for the very reason that it located disease in human anatomy.³ At that point the history of surgery—more concerned with local studies or individual careers—had not yet entirely embarked onto the frigate of medical progress; soon, however,

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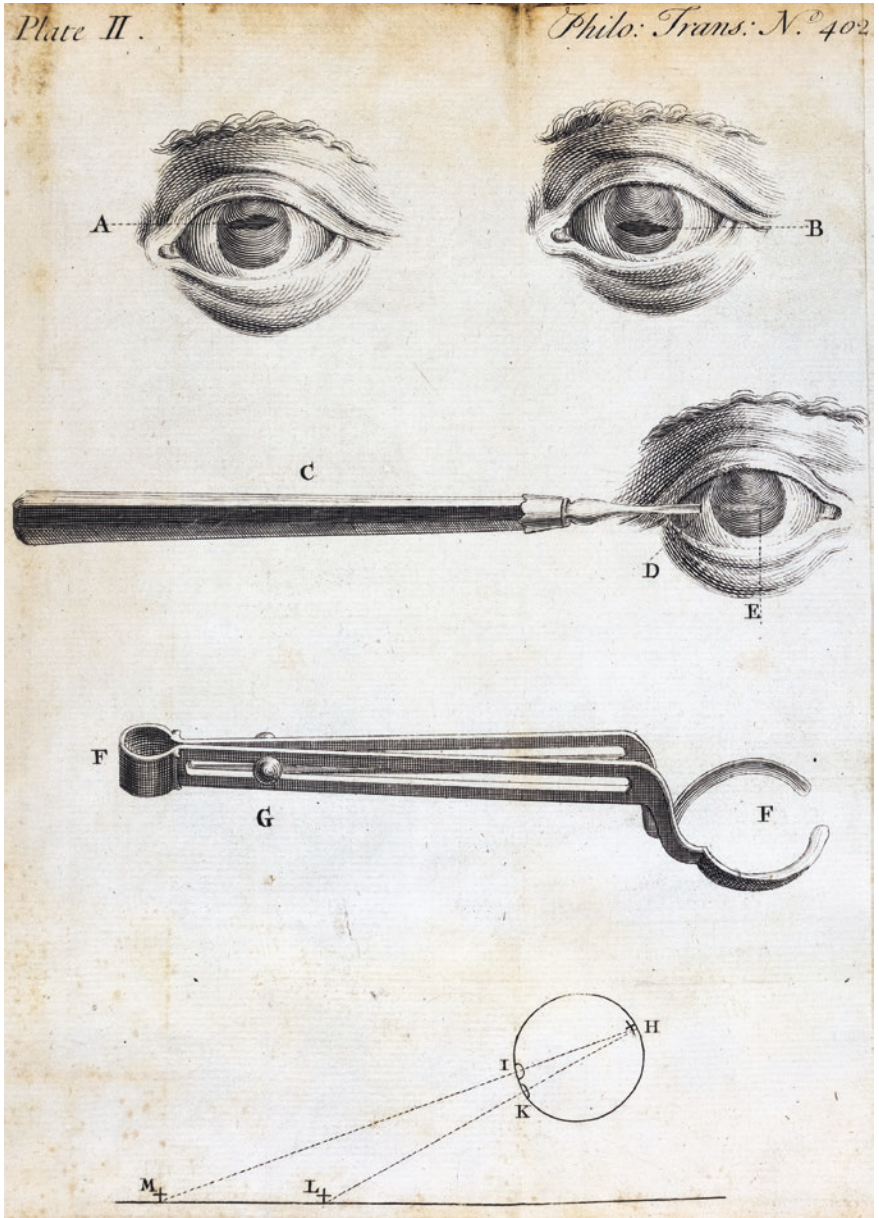


Fig. 1 William Cheselden, 'An Explication of the Instruments Used in a New Operation', plate 2, *Philosophical Transactions* 35 (1727): 451–452, The Royal Society, London (A and B represent two eyes on which a new operation was performed, making an incision through the iris)

surgery was seen as endorsing revolutionary change in medicine. In the eyes of Michel Foucault, followed by Erwin Ackerknecht, Parisian surgeons and hospitals made the French revolutionary wars a turning point even more strongly than had anaesthesia.⁴ Drawing on the sociology of professions from the 1970s, Toby Gelfand proposed an analysis of the path followed by Paris surgeons in the Enlightenment as one of professionalization, alluding to the major transformation from a ‘guild’ into a ‘profession’ that occurred during that period.⁵ Gelfand identified two distinctive levers for the ‘modernizing’ of medicine: the development of anatomical practice and the support of the French crown. The Canadian historian later compared his well-documented tale of Paris with a second city, London, where he identified similar anatomical training.⁶ Paris and London, accordingly, were singled out as the locales of modernity in which modern medicine was generated, with anatomical research as its fuel.

Since Gelfand’s *Professionalizing Modern Surgery* (1980), research into surgeons’ changing position in society has taken up a second line of inquiry: surgeons’ identities and their role in the Early Modern world. While epitomizing surgical work in history, surgeons’ use of the hand—for touching, opening and curing—could not completely explain the intricacies of social hierarchies within medical practice. Historians have continued to examine critically the exact boundaries between surgeons, physicians, apothecaries and other medical practitioners, as well as their evolutions, considerably modifying our understanding of surgical practice, the legal constitution of trades and the dynamics of social change. Significantly, the study of the actual practice of surgeons has contributed to re-situating surgical practitioners and their skills within a world of commerce and manufacturing. Stepping out of shops and hospitals, historians have investigated the roles of surgeons in the vibrant Early Modern world, its administrations and imperial endeavours, reconsidering the status of surgical knowledge.

Cheselden’s experiment and its literary fame contradict many interpretations of surgery’s ‘prehistory’ as a supposedly dark age before the nineteenth-century’s invention of anaesthesia and antisepsis, illuminated by individual pioneers, such as Ambroise Paré. Recent studies of Early Modern surgeons have painted a much more differentiated and interesting picture of Early Modern surgery and have placed the topic at the crossroads of many historical disciplines, from the history of science and technology to social and political history. Three major questions have emerged from research carried out since Gelfand’s ground-breaking work: who were the surgeons, what did they do, and to what end?

LOOKING FOR SURGEONS IN THE EARLY MODERN WORLD: CONFLICTING IDENTITIES

Who was a surgeon in Early Modern Europe? Historians no longer assume that there is a natural and fixed category of surgeon, to be distinguished from barbers, providers of baths, *renoueurs* (bone-setters) and the rest. Surgeons and practitioners of surgery belonged to the Early Modern world of healers.

Although occupational bodies spent a significant part of their activity enforcing titles and jurisdiction over specific healing practices, it appears that in the eyes of patients or at least clerks, the terms barber, surgeon or even barber-surgeon were quite interchangeable categories—not to mention the fluidity of the occupations or healing tasks of any single practitioner over a lifetime.⁷ Consequently, the definition of surgeons' identities combined often conflicting perspectives of governing authorities, of patients and of fellow or competing practitioners of medicine.

Urban guilds have proved a useful experimental site for renewing the history of surgery. In her outstanding work Margaret Pelling creatively used the archives of the Norwich barber-surgeons to investigate the profiles of guild members and their occupation; she thus put an end to the fixed conception of Early Modern medical social categories and invited a further exploration of trade organizations in Europe.⁸ We lack a comprehensive survey of occupational organizations in different European towns, or even in a single country, except for a few broad brushstrokes. From the late Middle Ages, many cities relied on corporate bodies to organize the work of different occupational groups and their relationships with government; the comparative study of early corporations attests to both institutional diversity and geographical differences, but further investigation is required. In London, the Company of Barbers and Surgeons still maintained the statutes it acquired in 1544; in Paris, a corporation of *chirurgiens jurés* merged with the guild of barber-surgeons in 1655; in the German empire and the Italian states, city practitioners would undertake tasks managed by guilds based elsewhere; capital cities like Turin or Rome did not have formal organizations for surgeons.⁹

Most guilds showed similar attitudes towards membership definitions, rights and duties, including religious obligations towards poor brethren and their families. A few institutions established rules about fair trade and support among members, as well as rights to employment and to inheritance; in Utrecht, a *Collegium medico-chirurgicum* published a tariff list for surgical services.¹⁰ Guild membership did not necessarily imply actually practising as a surgeon: for instance, the Barber-Surgeon Guild in Norwich included a physician, barbers, barber-surgeons, surgeons, midwives and bone-setters.¹¹ There and elsewhere, 'occupational diversity' within barber-surgeons' guilds matched change in individuals' careers: a school-teacher in sixteenth-century Norwich or a watch-making entrepreneur in eighteenth-century Paris could both adopt the profession of surgeon.¹² In France, François Quesnay (1694–1774), more famous for his treatises of political economy than for the surgical services he had dispensed to his clients and peers in his early career, was not alone in transforming himself from a prominent surgeon in a Paris guild into a physician and councillor to the state.¹³

Historians of medical work have revealed that surgical practice involved many more practitioners than merely guild members or holders of hospital or court positions. These arguments slowly emerged through the use of original archives—notably fiscal sources, censuses or justice records. Concerning

late seventeenth-century London, Patrick Wallis noted that although surgical shops tended to be small, more than four-fifths of them included an average of two employees and one apprentice; work was most likely also carried out with support from the surgeons' fairly large households, with wives in three-quarters of the cases and children in half of the cases.¹⁴ Surgeons' shops consequently were very sensitive to what Wallis called 'the opportunism of apprentices', and even more so of employees, who could easily abandon master or employer.¹⁵ In the late 1720s, masters in Paris complained about the massive influx of 'would-be surgeons' attracted by free surgical courses sponsored by the king, as these developed their own clientele against the guild's rules; masters deemed this situation dangerous for the safety of the public and for their own businesses.¹⁶ Not only did young surgeons leave surgery for other trades but they could also become a competitive threat for the shops in which they had trained. However, as confirmed by the ledgers of individual surgeons, employees were a necessary complement to the operating of the surgeon's family shop, a fact that hints at the economy of services of which surgeons were part. Guilds, consequently, did not encompass all of the many workers involved in surgical practices; nor did all cities or villages provide an occupational and institutional corporate framework for all healing practitioners.

Kinship could be an even more powerful institution. Along these lines, guild regulations that limited the payment for freedom to sons of masters might be a result, not the cause, of the family's pervasive role in trade reproduction. In this regard, Sandra Cavallo's ground-breaking study, *Artisans of the Body*, offers an original interpretation: 'In the case of barber-surgeons', she argued, 'marriage brings about such a profound penetration into the wife's kinship group because, as we have seen, it merely consolidates pre-existing bonds that are professional, friendship-based, grounded in the shared locality and often founded on common interests and a common language, relating to the care of physical appearance and the health of the body.'¹⁷ For the workers whose activity addressed body care, kinship and locality combined to form an organizing principle of an occupational milieu which included barbers, jewellers and upholsters. On the basis of a high turnover of surnames, Cavallo observed many non-patrilineal forms of transmission. Although material assets would normally be transferred from father to son, such professional inheritances as shops or positions within a hospital or an elite household could be transmitted within a broader kinship group: they might be passed down through a daughter's marriage—as sons might undertake other occupations or enter religious orders—or even more interestingly through 'diagonal' ties between masters and *giovanni* as pupils or employees. Urban immigration consequently offered significant opportunities to would-be surgeons, even to those born without family ties to the profession.

Entry into surgical trade, according to historians of professions, rested on formal education, and acquisition of mastership was a main route; economic historians have mostly looked at apprenticeship as a way of organizing

practical training and as cheap labour. Even though their views were often in conflict with each other, these studies have considerably nuanced the role of education in the early career of surgeons. The study of individual surgeon's careers and prosopographical scholarship has added depth and complexity to our view of career patterns, suggesting that few apprentices became masters or, in fact, surgical practitioners.¹⁸ Furthermore, in the sixteenth-century Venetian state or in France, academic education was not undertaken independently of practical training; these were rather two stages of one's career, which prized further theoretical education.¹⁹ Although apprenticeship did not automatically lead to freedom, it was considered the golden road to mastership, as one can see from the expensive premiums young men and their families were willing to pay in Paris and London in the late seventeenth century to settle an apprenticeship contract. Still, even if they were necessary to acquire master status, the years spent as an apprentice were usually not sufficient; full compliance to the exact terms of the guild rules might require additional years in service to a master or in the army.²⁰ Guilds thus organized and regulated occupational education, sanctioned by long and costly series of examinations, complementing it with formal knowledge, such as anatomical lessons with corpses legally obtained from the gallows. Scholarly diplomas also existed; the University of Montpellier offered a doctoral grade in surgery, as did Rome and Padua. University education was offered to surgical students in most Mediterranean towns, where surgeons would qualify on a similar footing with physicians.

The eighteenth century saw significant changes in these educational patterns. In 1724, the French crown offered free lectures in Paris—obstetrics, instruments and so on—intended to provide rudimentary training to young surgeons. This initiative brought two major consequences: fierce opposition from the medical faculty and the arrival of hundreds of would-be surgeons, mostly from Gascoigne in South West France, who soon represented a strong competition for Parisian masters.²¹ Anatomy classes multiplied, littering Paris streets with anatomical bits in the late 1780s.²² In London, Cheselden may have been a pioneer in setting up anatomical classes outside the Barber-Surgeons' Hall in 1711, before his condemnation by the guild's Court of Assistants.²³ Soon, however, dozens of paying anatomy courses—such as those at Great Windmill Street, founded by the Hunter brothers and Charles Bell—met the demand for theoretical classes to comply with the requisites set by the College of Surgery's examiners.²⁴ Surgical students knew how risky their trade was, as their fellow students regularly passed away, presumably from the deadly consequences of injuries incurred during dissection.²⁵ More interestingly, some innovations also came from the initiative of students. In the 1740s, as historian Susan Lawrence demonstrated, young surgeons and, at a later date, physicians staffed hospital wards; under pressure from students, governors slowly authorized the presence of surgeons and their assistants, as well as the fee senior hospital surgeons later requested to attend their service. Lawrence showed how by the end of the eighteenth century hospital surgeons' service

certificates had become a valuable currency in the job market.²⁶ This London phenomenon was similar to what happened in Paris, where flocks of students became followers of major surgeons such as Pierre-Joseph Desault (1738–1795) at the Charité, compiled their cases and promoted their publications. Hospital medicine, the distinctive mark of modernity for Ackerknecht and Foucault, was in fact merely the last step of major changes in surgical education.

In addition to institutions, their members or simply young men ‘desirous of improvement’, literary representations and other media constructed the identity of surgeons.²⁷ The seventeenth-century playwright Molière had ridiculed physicians; eighteenth-century writings promoted surgeons as heroes of a new world. Newspapers repeatedly included surgeons in descriptions of accidents, murders or duel scenes, bravely attending the injured night and day. The new genre of the novel made a special case for surgeons’ characters, which served many purposes for novelists. Nameless surgeons marked the rhythm of plots, often presented at the hero’s deathbed, providing miraculous cures or announcing certain mortal fate. More interestingly, surgeons and their operations provided a dimension of realism on ships, as in *Roderick Random*, by Tobias Smollet (1721–1771), verging into humour and parody in the case of Diderot’s *Jacques le Fataliste*.²⁸ Last but not least, individual surgeons, sometimes fully identified by their names and descriptions, came to embody social mobility not only through work and talent but also through moral elevation: *Roderick Random* exemplifies the career of a young man who overcame a series of ordeals and tests before acquiring the stature of a fully educated surgeon endowed with fully developed ethics. These Enlightenment moral narratives offered an illustrious stage for modern surgical healers—an embodiment of masculine virtues.²⁹

Novels were not the only source that contributed to the gendering of expectations of surgical practitioners. Yet women were not absent from the surgical trade. Gianna Pomata has suggested that women practised in close relation to barbers, attending patients at their beds, thus acting as first-aid suppliers or as nurses, educated enough to provide the *protomedico* court with medical information on the patient or the treatment.³⁰ Late sixteenth-century guild regulations, as in Paris, included surgeons’ daughters as apprentices; in London, Henri VIII, who had first authorized only surgeons to practice surgery, considerably lightened the guild control over female healers, as long as they did their art for free, meaning that they regularly paid some tribute to the male medical guilds in the form of fines.³¹ In seventeenth-century Paris, female practitioners more or less disappeared from full guild membership, forming a group of midwives excluded from the guild government but paying annual membership. The general trend of excluding women from trade institutions and employment had one significant exception: widows. Masters’ widows were allowed to continue their shop business and direct employees after their husband’s death—a privilege that was abolished during the French Revolution. In late seventeenth-century Turin, young surgeons or *garzoni* were part of the master’s household; marriage was the seal of an ongoing relationship, through

which surgeons promoted their workers, thus bequeathing more than their shops to a worthy companion. Cavallo, who noted the ways shops were passed on to male in-laws, was not alone in gathering indirect evidence of female surgical work, confirming hints of female practice that exist in legal notarial and commercial sources.³² In mid-eighteenth-century Paris, a few surgeons put their wives into apprenticeship with midwives; London shops advertised their services, with special mention of a ‘Mrs’ attending to female patients. Midwifery, in such cases, could well have been used by practising couples, either to combine skills in the care of female and male patients, or as a cover for female surgical practice.³³ In places where surgical offerings were scarcer, such as in rural England, female practitioners seemed to have been common, at least according to administrative records.³⁴ In the ‘urban crucible of Early Modern London’, argued Pelling, ‘issues of status are intimately related to issues of gender’—which requires further investigation.³⁵ By contrast, on battlefields and in novels, surgeons acquired a long-lasting masculine identity.³⁶

Surgeons’ institutional identities, ‘compromised by gender’ (Pelling), underwent changes linked to class and political changes, as asserted by social historians. The disappearance of ‘barber-surgeons’ from trade regulations and from common parlance represents an interesting case for understanding the complex dynamics of the trade’s transformations. In the Early Modern period, as the term ‘barber-surgeon’ attests, barbering was considered an integral dimension of surgical care until the late eighteenth century. The convergence in practice rested on the use of sharp instruments—and likely, a collaboration with their makers—and the medical theorization of hair as bodily *excreta* or *secreta*, which belonged to the surgical realm.³⁷ Archival material confirms that barbering could represent a significant income of a shop, thus subsidizing other activities; it also was considered one of the first stages of surgical learning, of which apprentices and students took charge. During the seventeenth century, with a growing economy of self-care, beauty products and wig-making, surgical shops could no longer meet the demand for hair-related services which had exploded and offered employment opportunities for many journeymen.³⁸

Whether carried out by men or women, young or experienced surgeons, in shops or on the roads, in trade guilds or learned colleges, surgical therapeutic practices invited new questions from historians uncovering the making of a new medical industry and the establishment of healthcare systems during the Early Modern period. Their most significant contribution has been the revision of the view that practitioners of surgery only offered surgical cures.

EARLY MODERN SURGICAL SKILLS AND SERVICES

Early Modern dictionaries’ definitions epitomized the surgeon’s hand as the most discriminating tool of medicine. In 1751, in the *Encyclopédie, ou Dictionnaire raisonné des lettres, sciences et des arts* Antoine Louis (1723–1792), a surgeon at the Charité hospital, defined surgery as the ‘science which studies

and cures external diseases, and provides treatment for all of those which need for their cure the operation of the hand or the application of topics [ointments] ... The name of Surgery comes from the Greek χειρουργία, *manulis operatio*, from χείρ, *manus*, hand, and ἔργον, *opus*, operation. See Surgeon'.³⁹ For Louis, who was to become permanent Secretary of the Académie Royale de Chirurgie, surgical knowledge and surgeons' practice coincided. Nearly a century later, in 1869, Pierre Larousse noted that the clear-cut distinction of surgery's role within medicine, 'as defined by classical treatises or official teaching, was not philosophic or natural, but resulted from convention and custom'.⁴⁰ Surgery as a therapeutic activity was thus not fully identical with the knowledge taught or learned by surgeons. In order to capture its practical dimension, historians depend on records of surgical practice or indirect evidence.

The main evidence for surgical practice has come from treatises about surgery, a genre that flourished from the late fifteenth century onwards and provided detailed testimonies of treatment practices. Published in London, *The Art of Surgery* (1722) presents 110 cases of patients under the care of its author, Daniel Turner (1667–1741). There, he related the cure of fractures (19), wounds (22), female diseases (14) and tumours (48), the last requiring greater detail in diagnosis and treatment—including hernias (12), cancers (6), hydroceles (3), polyps and bladder stones (19) and ulcers on the skin (8). Turner recorded in his treatise numerous therapeutic strategies at hand: blood-letting, unspecific but non-systematic therapy, ointments for skin conditions, purging and diet advice.⁴¹ Engaging with his patients' ailments and histories in an interesting way, Turner's published work is not unique among the many printed treatises and learned periodicals that document what surgeons and barber-surgeons did for a living.

Nevertheless, treatises are difficult sources, not only because texts give a limited understanding of hands-on activity, in words or in images, but also because they usually provide a limited view of the extent of surgical practice.⁴² Few surgeons published, and if they did, they usually only included a limited number of cases: Thomas Baynton (1761–1820), who owned an affluent Bristol shop, had a small opus printed on leg ulcer treatment in his *Descriptive Account of a New Method of Treating Old Ulcers of the Legs* (1797), describing a method that is still in use today.⁴³ Treatises, in addition, presented 'surgery in a distorted light', especially in their 'tendency to portray the surgeon as someone who theorizes about the body, rather than just repairing it'.⁴⁴ Yet historians have taken 'these strategies seriously, as evidence of alternative ways of conceptualizing surgery', knowing however that printed works provided only the intellectual framework for surgical practices and needed to be combined with other sources—such as inventories, ledgers and police or legal records—to present historical accounts of surgeons' cures.⁴⁵

Emergency care was the exemplary realm of surgical practice. The general press portrayed surgeons as practitioners regularly called upon for injuries and accidents. One ledger, that of William Pulsford in Somerset—recording 334

cases between 1757 and 1760—attests that emergencies represented a very significant part of surgical activities (one third), although the practitioner attended to other minor or chronic health problems. Indeed, wounds, fractures, burns and sprains were submitted to the care of surgeons in the countryside and in town.⁴⁶ According to Paris police records and London inquests, surgeons and their apprentices or employees were summoned for road or work accidents by *commissaires* or coroners, or by common people passing by. Hospitals in sixteenth-century Florence or eighteenth-century Marseilles provided care for workers.⁴⁷ Even Jacques-François René Tenon, in his project for reorganizing hospital care in Paris after the Hôtel-Dieu's fire, specifically designed a central building which would welcome the injured day and night.⁴⁸ Hospitals thus proved refuges for the injured workers who had recently migrated to towns.

Barber-surgeons and surgeons were at the forefront of trauma care—the treating of wounds and injuries—on battlefields and on ships: the earliest printed surgical works—such as the *Feldbuch der Wundtartzney* (Basel, 1517) by Hans von Gersdorff, illustrated with beautiful wood-cuts by Hans Wächtlin from Basel, as well as *La maniere de traicter les playes faictes tant par hacquet-butes, que par fleches* by Ambroise Paré (Paris, 1551)—may be read as a medical practitioner's response to the wars raging in Europe at the time. Wound treatment had considerable implications for surgical work: not only did most surgeons' careers include military experience as travel partners to soldiers and noble heads of armies; surgeons were invested in new therapeutic arenas, such as the cure of syphilis, a major epidemic in Early Modern Europe which affected the soldier and city dweller alike. Health emergencies varied by locality depending on the environment and on the epidemiological prevalence of disease. In Mediterranean ports, practitioners of surgery were in charge of plague-struck patients and enforced quarantine orders in the seventeenth century; in towns, which went through a process of industrialization, surgeons were involved in the care of ailments specific to workers.⁴⁹ As urbanization and industrialization advanced in late seventeenth- and eighteenth-century European cities, surgeons provided care for growing numbers of induced fractures and accidental wounds, and not just in public work, building and transport situations.

In the 1990s, historical attention turned not only to manual treatment but also to the services and goods provided along what Colin Jones has called the 'great chain of buying', whose links were advertisements in print.⁵⁰ In the seventeenth century, some surgical treatises promoted their authors' services, sometimes with catalogues or details of services rendered; others, in a do-it-yourself manner, defined the boundaries of self-care, delineating a market for both self-care and professional service. Medical prints, arguably, represented no small part of the thriving English book trade—and even more so of the medical goods purchased; among them, surgeons authored books not only on surgery but also on venereal disease, gout, smallpox, midwifery, trusses and the like.⁵¹ Cheselden himself was the author of *The Anatomy of the Humane Body* (1723), which went through 13 editions, a quite successful commercial venture. Surgical commerce encompassed a complex net of

goods and services, which are detailed in remaining invoices, arbitration cases or ledgers: it included ‘operations’—that is, surgeons’ medical operations, second-hand sale of drugs from apothecaries, visits and medical advice, primary care at the site of an accident or at the surgeon’s shop, accommodation and advice to colleagues.⁵² Such materials have opened the rich social world on which surgeons relied to build their businesses. Surgical services were provided not only by surgeons at different stages of the *cursus honorum*—from apprentice or student to master—but also by apothecaries, nurses or *garde-malades*, instrument-makers, physicians, midwives and other tradespeople, working in close relation with surgeons. Their working relationships might have been formalized through marriage, family ties or contracts, as Cavallo interestingly pointed out, and could have materialized through salaries, one-off payments or indirect returns, as in the case of instrument development. These rich working ties constituted a resourceful environment for surgeons, who acted as middlemen between patients and other elements of the medical sector, from individual shops and institutions of healthcare provision, such as hospitals.

Historians following the ‘spatial turn’ in historiography have investigated the locations of surgeons’ commerce. Surgical services in towns were dispensed in shops, whose advertisements—street-signs, glass windows and so on—prompted repeated regulations from the sixteenth century onwards, while surgeons defended their necessity by insisting on the public service they provided. Their urban location was partly determined by trade routes in towns and crossroads, the vicinity of hospitals or the presence of family.⁵³ Invoices and inventories spell out the conditions of urban settlement: Parisian street shops were complemented by lodgings on the upper floors, where a bed and some instruments located in one room set the stage for indoor care provided to individual patients. They reveal the provision of services on site in affluent urban shops, as in more modest settlements and in small villages; yet, surgeons also travelled to dispense their prescriptions, when not shipping their cures or their advice at a distance. In rural settings, surgeons attended to their wealthy patients at home, travelling on horseback to their patients abodes.⁵⁴ Additionally in the countryside, a range of non-medical activities for surgeons was not uncommon: farming, notarial work and, money lending. In seventeenth-century Kent, however, an interesting change occurred, brought to light by Ian Mortimer: surgeons slowly left major towns for smaller villages, moving their residences to develop a trade service for medicines, acting as retailers to apothecaries who kept their businesses and their stocks in the main Kentish towns.⁵⁵ In Italy, well studied by David Gentilcore, patients also resorted to itinerant practitioners who pursued efficient strategies in their pricing policy, the careful use of trade routes and the promotion of their skills in print. Patients also accessed these practitioners at fairs, just as clients with a tooth ache had done when they sought the Grand Thomas, a flamboyant practitioner of dental care at the Pont-Neuf in early eighteenth-century Paris.⁵⁶ To supplement their local service, surgeons made

use of the growing postal network to sell their own products and provide long-distance advice and retail—sometimes throwing their commercial nets over Europe and to the colonies.⁵⁷

Surgeons were also at the forefront of the major scientific endeavour of the Early Modern world: anatomical research on the structures of different life forms. The fever for dissection invaded northern Italy in the sixteenth century, before spreading to the rest of Europe. Anatomical dissection inaugurated the spectacles of modern science, in which practitioners, students and amateurs mingled and prominent surgeons achieved star status.⁵⁸ Andreas Vesalius (1514–1564), after initial training in anatomical dissection in Paris, went to Padua where he served as professor of surgery, conducting dissections by himself in several cities.⁵⁹ As an urban event, the anatomical spectacle and its by-products—anatomical models and museums—were a strong component of the market of learned consumption. Later debates on the ‘origins of Negroes’ colour’, as it was, for example, organized through the Académie de Bordeaux in 1739, fostered the emerging science of race in the eighteenth century, based on intense circulation of anatomical specimens.⁶⁰ By the turn of the nineteenth century, anatomy linked surgical science with progress.

With recent historical scholarship, the study of surgical skills emerges as part of the history of commerce and technology in Europe. The history of surgery followed the ‘material turn’ prevalent in the history of science: historians such as Colin Jones, Liliane Hilaire-Pérez and myself have insisted that surgery depended on an understanding of materials and their adaptation to body care and cures. They have described the active roles of practitioners and patients, have analyzed the reconfiguration of labour and changes in technologies and have emphasized surgeons’ inclusion in local and world economies.⁶¹ An example is syphilis, a by-product of Renaissance wars, which induced innovation in surgical cures through exotic medicines, orthopaedic devices and operations.⁶² The early development of rhinoplasty, the reconstruction of the nose as a means of ‘curing’ syphilis, or rather the damage it inflicts on the body, is one such example of the development of plastic surgery and the making of artificial limbs from the sixteenth century onwards.⁶³ Another such development in the late eighteenth century is that of electricity, which provided a new method for curing paralysis, developed through the combined efforts of surgical practitioners and machine-makers in response to patient demand.⁶⁴ As industrialization and warfare affected Early Modern bodies with traumatic injuries, surgeons contributed to technological answers.

Historians of medicine, in the footsteps of science-studies scholars, have pointed to the continuities that existed between artisanal activity, therapeutic practices and learned science.⁶⁵ Thus, researchers have conceptualized the body’s workings, for instance, on the basis of their first-hand knowledge of hydraulic machines: William Harvey (1578–1657), who studied medicine in London and Padua, observed the operating system of locks for the Contarine Door in Padua before describing the system of valves in the veins determining the direction of blood flow.⁶⁶ Yet, he referred to blood-letting when providing the narrative of the experiment which grounded his theory. Phlebotomy,

during the Renaissance, may have been the most common form of curative and prophylactic treatment. It was used to cure ailments, fevers and epidemic diseases, to clear up urines, improve digestion and strengthen memory and hearing; it was even used to relieve anxious states. In order to convince his readers, Harvey invited them to replicate the experiment: first, he asked them to strap the arm of a lean man after he had done some physical exercise, ‘just like for bloodletting’, in order to see the bumps caused by the valvulae; second, they should push their finger along the vein to empty it. He then invited them to note that there was no reflux of the blood. Thus, in Harvey’s case, a common treatment method was used to establish a theory. The circulation of blood is one example of analogies drawn between mechanical arts, therapeutic practices and the anatomical body: Vesalius made frequent use of metaphors from military engineering; other authors adapted their mechanical understanding from clock-making to explain what was happening in ailing bodies, amputated or deformed.⁶⁷

Similarly, one can see the gradual appropriation of codes from technical drawing to the illustration of cutting operations or to the mechanized body more generally—the dotted line to show transparency and operative sequences shown simultaneously in the same drawing, both of which contributing to the transformation of surgical healing into a mechanical art.⁶⁸ Testing and adapting devices to the patients’ bodies was integral to the manufacturing processes of surgical technologies, as dissection had become for physiological knowledge, but not without strong resistance concerning the epistemological and moral relationship between anatomical knowledge and dissecting practice.⁶⁹

Surgeons, as Gelfand asserted and more recent scholarship has confirmed, endorsed an occupational identity of learned yet manually skilful practitioners. In Early Modern German-speaking territories, surgeons and their families slowly assimilated academic standards in their training and lifestyle but maintained an identity of ‘medical artisans’; as a token of evolving identities in the eighteenth century, guilds changed into ‘colleges’.⁷⁰ In Enlightened Venice, the official recording of debt blurred occupational identities to a certain degree under the generic *medico*.⁷¹ In Paris and London, interestingly, this radical reconfiguration transformed guild institutions in the early 1740s from corporation to ‘college’ or ‘royal academy’.⁷² This process was supported by the French monarchical administration and the British parliament, who provided political justification for the separation of barbers and surgeons and elicited surgeons’ services for the imperial states.

THE POLITICAL ECONOMY OF SURGERY

Town governments, the courts, the justice system, parishes and military services have all increasingly become objects of attention for medical historians, revealing the part played by surgeons in the operating of Early Modern states. Surviving records of trade regulations for guilds suggest that surgeons, as primary carers, were at the forefront of coping with major epidemics and were supported by the towns to serve that function. Yet a comparative history of

surgeons' involvement in European government ought to take into account the strong dependency on local conditions and examine forms of opportunistic arrangement with other trade guilds and local governments for economic or administrative reasons, often in subtle combinations.

Towns, as the major sites of care for epidemics and for everyday health treatments for workers, have been the focus of major recent studies of surgical care. Primary care in Europe was dispensed in hospitals, where they existed. It was also often subsidized by local governments. In England, by the beginning of the seventeenth century, the Poor Laws established social taxation at the parish level: these taxes were to be used as a means of providing medical aid to needy families, notably to heads of households.⁷³ Such support for emergency surgical aid could be explained in part by a 'help thyself' ideology; by funding medical treatment, the parishes contributed to put the poor back to work and hence prevent them from becoming full-time pensioners.⁷⁴ By and large, investments in medical care provision early on concerned accidents occurring in a work environment or those that would have consequences for the workers' ability to work—wounds, fractures and so on. Such charitable and public investment in surgery went hand in hand with an increased importance of the certification of qualified practitioners and campaigns against charlatanism.⁷⁵ In addition to providing primary care, surgeons were at the forefront of responding to major epidemics: special positions of 'plague surgeons' were, for example, created in the Mediterranean cities and ports.⁷⁶ Surgeons developed techniques for diagnosing and treating scrofula, a skin disease which was prevalent among milk-processing workers, mostly women and children.⁷⁷ The treatment of syphilis, according to Kevin Siena the major epidemic of eighteenth-century London, involved different surgical workers summoned according to patients' class and gender: the wealthy resorted to private and confidential practice; most male patients to surgical care in the royal hospitals of St Bartholomew's or St Thomas'; female domestics to major workhouses, like St Martin-in-the-Fields, which developed infirmaries during the course of the century. In the face of such demand, the surgical entrepreneur William Bromfield set up the Lock Hospital, a charitable institution in 1747 to care for married women, wet nurses and infants.⁷⁸ Siena has thus documented the complex and hierarchical system of surgical care that was gradually set up over time, according to age, gender and class, in which surgeons operated, acting as students, carers, entrepreneurs or, in the case of Bromfield, public medical figures.

Surgeons, as an occupational group, helped themselves to a sizeable share of public spending on healthcare. Towns developed a wide sweep of arrangements with surgeons in order to cover what they deemed as their population's needs, as documented in various by-laws, city hall archives and guild records over the years. Some towns—in the Netherlands, the German States and Italy—appointed civic surgeons, whose duties included care for the poor, legal advising and hospital consulting. In the case of the 1722 plague in Marseilles,

urban authorities not only advertised local positions needing to be filled but also printed the sum of the salaries paid as a token of the city's recognition, adding the promise of giving them master status when the plague was over. In Paris, such duties were carried out by the guild masters, who offered free consultation for the poor. In England, taxes imposed by the Poor Laws funded surgical care. The expenditure of English parishes for medical care became a substantial part of total expenses for their governors or 'overseers of the poor', reaching up to 10% of their budget by the end of the eighteenth century, according to Samantha Williams. Costs included contracts with individual surgeons, cash for the medicines they supplied, medical care provided in workhouses and annual agreements with hospital charities.⁷⁹ For the Netherlands, Heidi Deneweth confirmed and nuanced the extent to which surgeons got their share of households' expenses over the long eighteenth century: she found that, for families in maritime regions, surgeons represented the first point of resort until 1800, while further inland the sick relied more heavily on medicines and services provided by apothecaries.⁸⁰ Deneweth explained such contrast by the many naval and military opportunities that surgeons had at the ports. Patterns of covering medical expenses in Dutch households changed during the eighteenth century, as families resorted to voluntary societies and insurance schemes. Elsewhere the growing cost of surgical goods and services sometimes led to new economic arrangements, such as annual payments by parishes or coverage of delayed payments through friendly societies' schemes. The surgical trade was thus fuelled by opportunities provided by town governments as well as expanding capitalist firms and imperial states.

Urban governments relied on surgeons to carry out several critical functions in town administration, which developed over time, notably in the administration of justice. The mayor and aldermen of London delegated in 1790 the examination of people 'perilous of death' to four surgeons, inviting expert testimonies in court. A study of Paris and London surgeons' involvement in justice confirms similar practices, although institutions differed.⁸¹ Surgeons and their employees, as records from the London criminal court of Old Bailey suggest, were easily summoned by coroners' for their inquests on criminal affairs and infanticide. In Paris, where avid debates about legal surgery took place in print, at the occasion of the famous Calas or Lerouge affairs, official positions at the Châtelet, the court of criminal justice, existed to provide expert advice on criminal cases (injuries, death, etc.) at the request of the chief justice. Police officers also heavily relied on practising masters, requesting their services both for care and expert testimony, remunerating them through higher payments than those made to normal witnesses, thus putting a service of public emergency care into effect.⁸² In early eighteenth-century Rome, even more authority was given by the pope to surgeons investigating the causes of sudden deaths.⁸³ Civic service by surgeons in many places included free care for the poor or emergency treatment. In several towns, members of surgical guilds were exempted from paying local taxes or

serving in municipal offices, sometimes explicitly as a compensation for the services they offered to the town. In that sense, the surgical trade contributed to the making of urban authority and political legitimacy, as it did for monarchies.

Surgeons were the object of growing legislation that protected their fiscal interests and supported their education and its quality, and regulating and ensuring surgeons' employment in civic, military and imperial administrations. As far as the organization of the trade was concerned, studies across several European regions have investigated the appearance of significant administrative surveys to document the number and qualification of practitioners. These studies have looked at the evolution of the population of both practising and training surgeons over time, paying close attention to their workplaces in cities or urban surroundings, as well as the more general, state-level plans to set up territorial policies for surgical practice. Recurrent battles against charlatanism, readily funded by European states, exemplify the quite extraordinary move of governments into the realm of what could be considered a form of trade jurisdiction, passing national laws and enforcing them.⁸⁴ In light of the political dynamics in Europe, such policies may be seen as a trade-off between authorities' wishes to gain support from subjects and local governments, and their commitment to protect the surgical trade, which had become a strong component of state policy.

The curious historical phenomenon of 'the royal touch' exemplifies the growing political enlistment of surgeons. Thaumaturgic ceremonies, as they had been revived in Early Modern England, heavily relied on surgeons in the parishes and in court to implement the king's renowned capacity for effecting cures of scrofula. At the local level, surgeons certified the incurable nature of the disease, allowing local parishes to subsidize travel expenses to the court; there, court surgeons checked symptoms to make sure the suffering individuals in question were afflicted with scrofula, before admitting them to the healing presence of the monarch. In the process, they provided thousands of subjects with access to the king—some 100,000 patients alone during Charles II's reign (1660–1685).⁸⁵ These ceremonies helped to construct the divine legitimacy of the English and French monarchy, while surgeons, as a trade group, and as advisors to the king, saw their own status rise by offering learned discussions and definitions of the disease, clinical support and in the late seventeenth century, testimony of clinical results.

Such extraordinary cases of co-construction of political power and surgical expertise have been explored by scholars in the last decade and in a variety of national contexts. At the cardinal courts in Rome, surgeons were in charge of diagnosing illness and recovery in cases of claims of miraculous cures. This included the performance of both health exams and post-mortem dissections, furnishing supporting arguments in favour of the individual ecclesiasts' sanctity.⁸⁶ Philip II of Spain, facing an outcry from the towns against a shortage of qualified surgeons, sought to improve the number and quality

of practitioners by funding additional training courses in surgery and anatomy.⁸⁷ In the Netherlands, from the late sixteenth century onwards, the Vereenigde Oost-Indische Compagnie (VOC) or Dutch East India Company depended on a growing population of naval surgeons to limit the mortality of its crews.⁸⁸ Specialized hospitals, like the Invalides in seventeenth-century Paris, the Royal Hospital Chelsea—where Cheselden held the position of chief surgeon—or La Charité in eighteenth-century Berlin in Prussia, each offered military surgeons opportunities for practical experience, provided homes for mutilated soldiers and enabled experiments for finding and evaluating orthopaedic devices and cures. By and large, surgeons actively engaged in war and naval campaigns as opportunities for education and employment, notably for foreigners: many Scottish surgeons went south, on the ships of the navy or the East India Company, in hope for a better future and opportunities abroad; so did many surgeons from North Germany, working as mates on VOC ships.⁸⁹ In 1629, a new charter by Charles I established a Court of Examiners with a view to regulating surgeons enrolled in the navy.⁹⁰ In light of parliament records, the split between the two London companies of barbers and surgeons in 1745 primarily arose as an attempt to overcome the constant shortage of practitioners and to supply better-educated surgeons for the king's ships; the separation was strongly supported by those members of parliament who possessed a financial interest in imperial warfare and expansion.⁹¹ Among them, Cheselden, Surgeon to the Queen since 1733 to become Senior Warden in the new company, lobbied to keep exemption from service in the new college. The main activity of the Royal College of Surgeons until the end of the eighteenth century, lay in certifying and promoting the surgeons of the army, navy and East India Company; the Court of Examiners was presided in its early years by Cheselden, who led the anatomical examination to be caricatured in Smollett's *Roderick Random*, before forcefully engaging in the building of the new anatomical theatre.⁹² Warfare, international commerce and imperialism created a strong demand for surgical workers—whose own professional and epistemological status grew in direct relation with the growing power of national and imperial states.

At the margins of debates on air-pumps and celestial bodies, in the Paris of the Grand Siècle, dissection, run by expert operators, represented one major site of modern experimentation on living beings, animal or human.⁹³ More than any other learned practice, dissection organized in society, in the animal world, a political order that contrasted bodies and corpses of lowly birth (*ignobile*) or of the alien or the unknown (*ignoti*)—subject to dissection and other experimentations, including inoculation—and those of noble origin.⁹⁴ To that extent, Cheselden's 'An Account of Some Observations Made by a Young Gentleman, Who Was Born Blind' was quite unique, although surgeons regularly published cases in the *Philosophical Transactions*.⁹⁵ It pinpointed one emblematically successful operation carried out on a member of the nobility, one who could reliably testify to his own cure, while it relegated

to the shadows the several children and commoners with post-operative symptoms, on whom the British surgeon had allegedly developed the procedure. Cheselden constructed his account of this human experiment along the lines of Robert Boyle's air-pump experiments: plates depicted the instruments used and the procedure followed, and an interpretation was verified by gentlemanly opinion, frequent restatement and the promise of replication. The promise of a surgical—and magical—cure allowed new steps towards defining who, among animal and human beings, was to be subjected to experiments and who had access to civic rights.

From the survey of recent investigations on the history of surgeons, one may draw several conclusions. These investigations have given surgeons their place within the buoyant societies of the Early Modern period; they have investigated the evolution of surgeons' population over time, paying close attention to their workplaces in cities or rural surroundings and their circulation for training or employment. Economic historians have considered surgeons' 'entrepreneurial' activities, as manufacturers of remedies or orthopaedic instrumentation, as well as their place in medical distribution systems. Critically involved in fighting epidemics, such as London's venereal outbreak or Marseilles' plague in 1720, or supporting imperial efforts in the navies or the East India Company, surgeons were the object of a growing legislation that protected their fiscal interests and supported their education and its quality while securing surgeons' employment in civic, military and imperial administrations. Furthermore, historians have become increasingly concerned with surgeons' non-therapeutic practices—in justice courts as expert witnesses or as councillors in European governments. Modernity, as a result of the Enlightenment—and its related dimensions of urbanization, industrialization, warfare and colonization—refashioned surgery as much as surgery changed medicine.

NOTES

1. I express my debt to Thomas Schlich for his enduring patience and my warm thanks to Cathy McClive and John Tresch. I also offer my special gratitude to Margaret Pelling, Sandra Cavallo and Anita Guerini for their inspiring intelligence on Early Modern societies. The research for the chapter was partly funded by the Wellcome Trust [WT090617]. William Cheselden, 'An Account of Some Observations Made by a Young Gentleman, Who Was Born Blind, or Lost His Sight So Early, That He Has No Remembrance of Ever Having Seen, and Was Couched between Thirteen and Fourteen Years of Age. With an Explanation of the Instruments Used, in a New Operation on the Eyes', *Philosophical Transactions of the Royal Society of London* 402 (1728): 447–451.
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Surgery Becomes a Specialty: Professional Boundaries and Surgery

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As the name suggests, surgery (literally ‘hand work’) has long embodied a specialized set of tools and skills. This is surgery as a therapeutic method or practice. But surgery is also the name given to a discipline with an organized, institutional framework. During the Middle Ages, the roles of physician and surgeon separated. Roughly speaking, the physician, educated at the university, became a member of one of the learned professions. The majority of surgeons were of lower socio-economic status. They trained by apprenticeship and became members of a skilled craft. From the eighteenth century onwards, the development of surgery as a specialty went through three broad stages.¹ First came an elevation in the status of the surgeon, separation from competing occupational groups (empiric, barber-surgeon, and Wundärzte), and a ‘union’ with medicine—defined by George Weisz in his comparative history of specialization as ‘two branches of practice with a common knowledge base’.² Second, surgeons defined themselves as a specialty in the modern sense, distinguishing themselves from other medical practitioners who might sometimes employ surgery as a therapeutic technique (specialization *in* surgery). Third, this process has been repeated as new specialties and subspecialties emerged from within surgery (specialization *within* surgery), and newer interventional specialties arose.

This chapter summarizes the history and historiography of surgery and surgical specialties in the UK, France, Germany, and the USA. It broadly frames professionalization (and specialization) as a question of jurisdiction

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(following Andrew Abbot).³ Thus the development of surgery as a specialty can be seen as one of the continuous defining and redefining of professional boundaries. Two broad types of often overlapping organizational structures can be distinguished in this process—elite surgical societies and surgical organizations that claimed authority to regulate. Although surgeons in all four countries faced roughly similar challenges, in each case national responses were shaped by pre-existing structures (or their absence) and by local contingencies.

Because of the significant position surgery holds in modern medicine, it has featured prominently in histories of medical specialization both at the national and comparative level. Examples are Rosemary Stevens' two studies (from a public policy perspective) of medical specialization in the UK and the USA, Hans-Heinz Eulner's comprehensive study of German academic medicine, and Weisz's recent comparative study of specialization in France, Germany, the UK, and the USA.⁴ A number of studies of individual surgical specialties exist, including George Rosen's classic *The Specialization of Medicine with Particular Reference to Ophthalmology*, the first modern study of specialization.⁵ Others include Roger Cooter's study of British orthopaedics, and historian and neurosurgeon Samuel Greenblatt's edited volume on the history of neurosurgery.⁶ To date, however, there has not been a general study of surgical specialization.

The development of surgery as a specialty fits into a larger story of specialization and professionalization. A detailed review of the debates surrounding the sociology of professions is beyond the scope of this chapter. Over the last half century, attention has turned from identifying criteria (including prolonged training, specialized knowledge, control of entry, and so on) to more dynamic functional models emphasizing the process by which professions form and defend their interests.⁷ In particular, several modern studies of medical specialties see specialization as a variant of professionalization.⁸ Others have explicitly drawn on Andrew Abbott's work on professions and have looked at how the boundaries between different groups performing similar work (what Abbott calls a profession's 'jurisdiction') are established and contested.⁹

In his comparative study of specialization Weisz extends Abbott's concept of the 'system of professions' to take a more politically oriented approach, examining 'how specialization is integrated into existing national medical organizations'.¹⁰ Weisz makes two arguments. First, specialties emerged from the union of medicine and surgery as part of broader nineteenth century trends in scientific disciplines and administrative rationality.¹¹ In this phase, characterized by a focus on research and teaching, specialists collaborating with existing institutions and patients, by their own accord divided evolving medical tasks. Second, as specialization became a widespread practice, the profession then imposed a significant degree of control through networks of institutions, which included hospitals, medical schools, and professional bodies.¹²

At the same time, Rosemary Stevens, in her analysis of specialization in the US context, reminds us that there are different ways of looking at

specialization.¹³ The story can be told from the perspective of educational reform or of turf wars (jurisdiction), patient care or scientific and technological change, or through the larger lens of policy, culture, or economics.

THE SEPARATION FROM THE BARBERS AND THE UNION WITH MEDICINE

From the late seventeenth century, surgeons would begin to separate from the barbers and gain a distinct professional identity.¹⁴ This would culminate in a unified profession. In this handbook, Christelle Rabier (Chap. 4) reviews the re-evaluation of Early Modern surgery that began with Toby Gelfand's ground-breaking work on French surgery during the 'long' eighteenth century.¹⁵ Here I will briefly draw attention to three important facets of that transition. First, nineteenth-century surgeons, as part of their own profession building process (for example Sir James Paget and John Flint South in England, and Georg Fischer in Germany), denied that there had ever been any meaningful connection between surgeon and barber.¹⁶ They wrote at a time of transformation in surgery as full-time surgeons attempted to distinguish themselves from the occasional operator (see next section).

Second, the concept of a union of medicine and surgery applies most clearly to France, where administrative fiat accomplished this in 1795. In both Germany and the UK the process evolved over at least a century. In Britain the work of surgeon anatomists in the eighteenth century helped produce a common body of knowledge—a *de facto* union well in advance of any administrative union with the Medical Acts of 1858 and 1883.¹⁷ A similar prolonged process, in which the state played a greater role, occurred in the German speaking countries.¹⁸ In Colonial America and the antebellum USA, by contrast, no formal distinction had ever existed between 'physician' and 'surgeon'.¹⁹

Third, alone among the countries under discussion, Britain and Ireland entered the nineteenth century with pre-existing institutions (the Royal Colleges of Surgeons in London, Edinburgh, and Dublin) theoretically capable of distinguishing surgeon from non-surgeon. Growing out of the guild system, these colleges stood on the border between Early Modern and modern professional organizations. Jeanne Peterson argues that as the old order crumbled, the professional elite in both medicine and surgery established a new source of authority through control of the medical school and the hospital.²⁰ The Royal Colleges would have a strong influence on the development of specialism in Britain.²¹

WHO IS A SURGEON?

By the latter half of the nineteenth century medicine had become unified in all four countries in Weisz's sense of a shared body of knowledge with a common preliminary education and basic state qualification. One consequence was that any qualified doctor had the legal right to perform any medical or

surgical procedure. As long as surgical intervention remained limited and ‘pure’ surgeons uncommon and associated with metropolitan teaching hospitals, this remained relatively uncontroversial. But when, in the later decades of the nineteenth century, the interior of the body became the site of surgical interest and intervention, surgery essentially re-entered Weisz’s first phase of specialization—one characterized by a focus on research and teaching. Diseases of internal organs were redefined as ‘surgical’ (amenable to operative cure) as leading surgeons, particularly in Germany, developed research programmes and produced trainees.²² The type and number of operations and surgery as a practice expanded rapidly—Weisz’s second phase of specialization.²³

Coincident with this, two of the distinguishing features of the institutionalization of a specialty, as described by Ulrich Tröhler, specialty journals and specialty societies, emerged in surgery.²⁴ Four German language journals appeared between 1861 and 1884 starting with *Langenbecks Archivs für klinische Chirurgie* (1861–present).²⁵ The first US journal, the short-lived *Archives of Clinical Surgery*, appeared in 1876.²⁶ The *Annals of Surgery* appeared in 1885 making it the senior English language surgical journal today.²⁷ Three other journals followed between 1905 and 1921. In France and Britain, *Journal de Chirurgie* (now *Journal de Chirurgie Viscérale*) appeared in 1908 and the *British Journal of Surgery* in 1913.

Specialty surgical societies (consisting of the professional elite) also began to form in the latter half of the nineteenth century.²⁸ Examples are the German Surgical Society in 1872 and the American Surgical Association in 1880. The Italian society followed in 1882, the French in 1884, and the British in 1920. These elite societies, in Stevens’ words, ‘represented the specialty rather than the specialist’.²⁹ In other words, they represented an area of professional interest rather than the collective political interests of the specialists.

In all four countries, the rapid expansion in the number and type of operations occurred at a time when the boundaries between specialist and general practice were still fluid. The diffusion and adoption of these procedures by the part-time specialist and the occasional operator meant economic competition for ‘pure’ surgeons, particularly in the USA. They also presented a trap for the unwary, ill-trained, or over-confident. Consequently, in all four countries, as Weisz documents, surgeons would be among the first to demand a formal distinction between specialist and non-specialist.³⁰ And in all four countries, general practitioners resisted what they saw as a relegation to second class status.³¹ Beneath the debates lay a fundamental question—should surgery be a therapy available to any licenced doctor at his or her discretion or should it be a specialty to be restricted by training and certification? The second phase in the development of surgery as a specialty would be fraught with the question of defining the surgeon. How would the demarcation between surgery as a specialty and surgery as a therapy be drawn?

With the pre-existing structure of the Royal College of Surgeons, England saw the first attempt to distinguish the surgeon from the general-practitioner. In the early decades of the nineteenth century, the most frequent qualification for aspiring medical men (out of approximately 19 different licensing options) was to combine the Licensure of the Society of Apothecaries (LSA) with the Membership of the Royal College of Surgeons of London (MRCS).³² Elite London surgeons sought a further credential to distinguish the teachers of surgery. A new charter in 1848, which reconstituted the College as the Royal College of Surgeons of *England*, provided the opportunity. Not without significant controversy, a ‘higher degree’—the Fellowship—was established.³³ As British medicine stratified between consultants and general practitioners, the fellowship became the qualification for the ‘pure’ surgeon.

Because of the focus on pure, and often prominent, surgeons, there is a tendency to overlook the general practitioner in the history of British surgery. In their prosopography of 1000 Scottish graduates from 1866 to 1874, Anne Crowther and Marguerite Dupree identified the central position of surgery in general practice for that generation who felt that their adoption of Joseph Lister’s system of antiseptics made them safer operators than senior surgeons who rejected antiseptics.³⁴ Anne Digby, in her study of British medicine between 1850 and 1948, identified five career categories from ‘classic GP’ to ‘pure’ consultant, including the GP-surgeon who combined general practice with a part time hospital appointment.³⁵ Although the development of a referral system in which the GP controlled the patient gave British GPs less incentive to operate, Stevens also observes that in the first half of the twentieth century, a GP specialism was developing alongside hospital specialism—although one more difficult for GPs interested in surgical specialties to pursue because of the dominance of consultant surgeons.³⁶ Frank Honigsbaum builds on this observation to show that the distinction between physicians and surgeons on the one hand and general practitioners on the other was breaking down in the interwar period driven by the provincial hospitals’ need for part-time specialists, including surgeons.³⁷

GP-surgeons, however, faced mounting criticism from consultant surgeons and the Royal College of Surgeons.³⁸ Despite these intraprofessional jurisdictional disputes Honigsbaum argues that only with the creation of the National Health Service, when the general practitioner lost access to hospital beds, did the GP-surgeon finally disappear.³⁹ While the College had significant political power, Digby argues that Aneurin Bevan, the minister of health, also privileged consultant specialists in his desire for a ‘first class service’.⁴⁰

Surgeons also took the lead in the USA where, as Stevens has observed, there was no pre-existing framework in which to fit specialization.⁴¹ Geography and economics encouraged (or required) the general practitioner to operate.⁴² Further, this perceived readiness of the ‘American medical man ... to meet any and every emergency’ in the words of a leading mid-century surgeon, Samuel Gross, was a point of pride.⁴³ (The same tropes of rugged

individualism and frontier virtue would also, as Christopher Lawrence has shown, be central to the identity of late nineteenth century American surgeons.)⁴⁴ Only with the expansion of surgery in the last two decades of the nineteenth century did full-time surgeons appear in the larger cities.⁴⁵ By the turn of the century, Dale Smith identified a 'topography' of American surgeons: a very small, primarily East Coast elite represented by the American Surgical Association (ASA) (established in 1880); a larger group with a primary interest in surgery; 'part-timers' with some surgical practice; and a mass of general practitioners doing occasional operations.⁴⁶ Apart from the exclusive ASA, the boundaries between these groupings remained open and fluid. Further, the weaknesses of medical education; the financial rewards of surgery; the ease with which a hospital could be established; and an over-crowded profession, all encouraged, in the words of a contemporary muckraker, 'medical chaos and crime'.⁴⁷ Thus, in her study of specialization in American medicine, Stevens framed the overriding question as how were qualified specialists to be identified within a historically egalitarian profession?⁴⁸

In answer, facing the possibility of state licensure for surgeons and the political impossibility of action by either the ASA or the American Medical Association (AMA), a small group of leading surgeons established the American College of Surgeons (ACS) in 1913.⁴⁹ The accomplishment owed much to the drive and organizational abilities of a Chicago gynaecological surgeon and institutional entrepreneur, Franklin H. Martin (1857–1935) who within the course of a year organized, incorporated, and convened the ACS. Modelled on the Royal College of Surgeons of England (or, perhaps more accurately, Martin's impressions of the Royal College), the new College offered a Fellowship based on an examination (case reports, local reputation, and ethics) to distinguish the 'qualified' surgeon. Its annual Clinical Congress and regional meetings offered continuing education. Its 'Hospital Standardization Program' inspected and approved hospitals.⁵⁰ This represented the first attempt to define a qualified specialist for the American profession and public.⁵¹

Neither the ACS nor the later examining board, the American Board of Surgery (ABS), however, had any authority, legal or otherwise, over the practice of surgery at the community level. Hospital privileges remained a matter for each individual hospital. David Adams' study of Cincinnati shows the tenacity and success with which GPs in the 1940s could resist attempts by hospitals or specialists to deny surgical privileges to non-certified surgeons.⁵² In my study, I was able to document the persistence of GP-surgeons even in a medically sophisticated community into the 1970s.⁵³ As late as 1969, almost half of all operations were not performed by board-certified surgeons.⁵⁴ In the decentralized and entrepreneurial US system, change would come as the last generation of GP-surgeons retired and increasingly hospitals, particularly in urban areas, made board certification a prerequisite for surgical privileges.

In France the first calls for credentialing also came from the surgeons. Weisz, in his comparative study, observes that while as a whole specialist

regulation was, for a number of reasons, not a priority in France, the trade union representing surgeons began at least considering a special diploma in the decade before World War I.⁵⁵ The question of credentialing was deferred by a number of factors: the dominance of academic specialists whose status came from their positions; conflict between this elite and the rest of the profession; the perception that specialism was a voluntary limit on practice; and the lack of a nationally representative body. By the 1920s, as the profession became more crowded, the issue returned. Again, the surgeons were the first to demand some form of certification and threatened independent action. A short-lived proposal to incorporate specialty certification within the medical degree came and went in the 1930s as did a proposal for special schools for surgeons during the war.⁵⁶ A full system of national certification would not be introduced until the 1950s—a ‘cumbersome one’, in Weisz’s words, that was revised in the 1980s.

The strong, widespread university system in Germany favoured an early movement of major surgery to large, hierarchical, and academically oriented hospitals and clinics.⁵⁷ Further, German hospitals, unlike many in the USA, had closed staffs.⁵⁸ For this reason, leading German surgeons may have felt less urgency about specialist certification than their contemporaries in the USA.⁵⁹ But by the early 1900s the threat of state intervention, one more potent than in the USA, seems to have spurred the profession to consider certification seriously.⁶⁰ Overcrowding, economic crisis, and unlicensed competitors in the Weimar period provided an added incentive. At its Bremen annual meeting (*Ärztetag*) in 1924 the German Medical Association (*Deutscher Ärztevereinsbund*) adopted a set of guidelines that were widely accepted. Significantly, unlike the UK and the USA, credentialing would be the responsibility of the local medical societies with generalists and specialists equally represented on examining committees. Candidates had to demonstrate adequate training (4 years for surgeons) and agree to limit their practice to the specialty. In a sense, these requirements bore something of a resemblance to the original American College of Surgeons scheme, which stipulated length of training, limitation of practice, and experience. The crucial difference was that the guidelines would apply across 14 different specialties.⁶¹ The system spread rapidly—by 1926 an estimated 85–90% of specialists had the appropriate credentials. The system helped ensure technical competency in surgery—an outcome to which the sickness funds (*Krankenkassen*) with their own criteria also contributed.

In all four countries, surgeons had attempted to define the boundary between the surgeon and general practitioner. With the exception of the UK, with its pre-existing colleges, the efforts had followed the establishment of elite surgical societies and specialty journals. Perhaps because of its decentralized and entrepreneurial medical culture, the USA had been the first of the other three countries to offer a form of certification. But as the next section will show, surgery itself is not a stable category.

SUBSPECIALTIES, FRAGMENTATION, AND JURISDICTIONS

So far this chapter has considered surgery as first an institutionally separate body of medical practice and then as one of the two fundamental divisions of a unified profession.⁶² But general surgery, like internal medicine, has had to contend with increasing fragmentation into specialties and subspecialties, as Stevens, Weisz, and others have observed.⁶³ Recent years have also seen the expansion of ‘interventional’ specialties into ‘territory’ traditionally claimed by the surgeon.

Even the meaning of the term ‘surgeon’ has been problematic.⁶⁴ For much of the period under discussion surgeon and general surgeon were used interchangeably and in distinction to urologist, orthopaedist, and so on. In the nineteenth century, general surgery meant operative surgery, particularly in the USA.⁶⁵ In fact, the founders of the ACS made the operating room the defining feature of the surgeon, whether in a ‘special field’ or in ‘surgery’. Thus, urologists, ophthalmologists, and orthopaedists who operated were considered surgical specialists eligible for the College fellowship. Those with purely office-based practises were not. On this basis, dermatology was considered and rejected as a surgical specialty by the ACS’ founders.⁶⁶ Only in the 1960s, in the face of growing specialization, did ‘general surgery’ replace ‘surgery’ as a specialty designator in the AMA and ACS membership directories.⁶⁷

Surgical specialties have multiple origins, which have been described and analysed by historians in different ways. George Rosen, in his classic 1944 study of ophthalmology, stresses the importance of the development and mastering of the specialized instruments that began to appear in the mid-nineteenth century as well as, following Emile Durkheim, social factors like urbanization.⁶⁸ The surgeon-historian Owen Wangenstein divides surgical specialties into two categories—an original group consisting of ophthalmology, otology, and laryngology, based, following Rosen, on instrumentation, and a second group of ‘secessionists’ which subsequently broke away from general surgery.⁶⁹ Weisz places the intellectual origins of specialization in Paris where the union of medicine and surgery created a collective effort for knowledge production, making division into subfields rational, and where ‘administrative rationality’ sorted patients by disease.⁷⁰ Marian Döhler in a review of specialization in the USA, UK, and Germany identifies five major variables in the development of specialties—technological innovation/progress; market forces; academic research; governmental facilitation; and the organization of the health care system.⁷¹ Thomas Schlich, in his study of the coevolution of trauma surgery and traffic policy in Germany shows that the development of an area of surgical interest may be closely intertwined with other aspects of society—in this case the existence of particular insurance models for industrial and traffic accidents.⁷² If there are national differences, they lie in the centrality of the hospital/university in France and Germany, the strong generalist ethos of the British colleges, and the entrepreneurial culture of US medicine.

As a history of each specialty and subspecialty is beyond the scope of this chapter, a few examples will illustrate these points. Interest in problems of the eyes, ears, nose, and throat, for example, began in the latter part of the eighteenth century. The first chair in ophthalmology was established in 1812 in Vienna.⁷³ In France, the unification of medicine and surgery resulted in a temporary abolishment of the specialist chairs in eye, obstetrics, and bone of the old College of Surgeons.⁷⁴ Subsequent developments in Germany, however, stimulated the French interest in the eye, which led to the opening of a private clinic in 1830.⁷⁵ A chair was established at Paris in 1879. In Britain, a special interest in eye, ear, or even skin might, throughout the nineteenth century, be a means of establishing a surgical career with, however, the ultimate goal of ascending to the generalist positions that dominated the surgical establishment.⁷⁶ In the USA, despite an initially ambivalent attitude on the part of the profession, specialization would become a means of differentiation in a crowded marketplace and arise from an undifferentiated medical profession rather than ‘surgery’. The small, elite societies that formed around specialties after the Civil War had no control over this entrepreneurial spread.⁷⁷

Orthopaedics demonstrates how surgical specialties can have histories that are both entwined with and distinct from operative surgery. From its origins, orthopaedics had been closely linked to societal concerns about child health and well-being.⁷⁸ Much of the work involved the application of mechanical appliances. By the 1880s, as operative surgery expanded, orthopaedists feared encroachment by the general surgeon and some older orthopaedists felt that operating was best left to the general surgeon.⁷⁹ In France, Alexandre de Saint Germain’s appointment as surgeon at the Children’s Hospital in Paris in 1873 began the redefinition of orthopaedics as an operative specialty in that country, one that would come to include adults as a result of World War I.⁸⁰ In the UK and the US, war and, in peacetime, concerns about industrial health by the state would have a similar impact, building as Cooter has shown, on the work of surgeons like Robert Jones who on his part was trained in both orthopaedics and operative surgery.⁸¹ But in Germany, operative and fracture care would remain the work of the general surgeon, despite fierce debates in the interwar period, a fact that demonstrates the basic negotiability of specialty boundaries.⁸²

Similarly, urology which, like otolaryngology, had had an outpatient focus, one often linked to venerology, expanded as a surgical specialty as surgeons turned their attention to the genitourinary tract. In France, Félix Guyon who, starting as an associate professor (*professeur agrégé*) in 1867, developed a comprehensive urological surgery service at the Necker Hospital and occupied the University’s first chair of urologic surgery in 1890.⁸³ At Johns Hopkins, Hugh Young began his distinguished career in urology when William Halsted assigned him to run the urological service as a surgical resident.⁸⁴ Along the same lines, over the twentieth century other anatomically bounded specialties like proctology and otolaryngology expanded into areas previously ‘claimed’ by the general surgeon.

General surgery itself began to fragment into new specialties—Wangenstein's 'secessionists'—by the first decades of the twentieth century. Contemporaries interpreted this as a natural result of the growth of knowledge. In 1927, a leading US surgeon, William Mayo, would tell his physician audience that 'there are few men who can be trusted to perform all the many different kinds of operations successfully'.⁸⁵ One of those new areas was the brain.

In her chapter 'Opening the Skull: Neurosurgery as a Case Study of Surgical Specialisation' in this handbook, Delia Gavrus provides a comprehensive review of the history and historiography of neurosurgery. It is worth emphasizing three points here. First, neurosurgery, like many surgical specialties, in part developed out of research programmes encouraged by department heads (Weisz's first phase). Theodor Kocher in Bern, Switzerland encouraged his young visitor Harvey Cushing to work on intracranial pressure, a necessary step for the development of neurosurgery, and Halsted offered Cushing (probably at the latter's prompting) the neurosurgical cases at Johns Hopkins on his return from Europe.⁸⁶ Second, as Greenblatt argues in his study of the rise of neurosurgery, understanding intracranial pressure would become a cornerstone in Cushing's own argument that neurosurgery could not be left to the general surgeon, a claim reflecting a more general shift from surgery as applied anatomy to surgery as applied physiology.⁸⁷ In this new world, surgical authority and operative success required more than a 'mere' mastery of the technical and anatomical details of the operation but also an understanding and control of physiological function.

Third is the development of a series of special societies, beginning with highly selective elite societies and followed by progressively more broadly based organizations, which Gavrus discusses in her chapter. Thoracic surgery, cardiac surgery, and vascular surgery would follow similar trajectories. As Tröhler has observed each new specialty develops trainees, academic chairs, journals, and special societies and generates debates about part-time and full-time specialists.⁸⁸

Specialty certification tended to follow these developments as part of Weisz's second phase—the expansion of a field as a widespread practice and the subsequent imposition of some degree of control. The question was particularly pressing in the USA because of the relatively unregulated market for surgical services as discussed in the previous section. Unsurprisingly, then, the USA developed the first system of specialty certification. This proceeded on a specialty by specialty basis as elite specialists and organizations attempted to define the pure specialist. The ophthalmologists, under threat from part-time specialists, general practitioners, and non-MDs, went first, founding the American Board of Ophthalmology in 1916. A series of specialty boards for both surgical and medical specialties followed, including an American Board of Surgery for general surgery.⁸⁹ In the UK, the Royal Colleges showed sufficient flexibility and political power to maintain surgical certification under their aegises.⁹⁰ In France and Germany, where hospital appointments figured more prominently in identifying specialists, certification would develop later.⁹¹

The fragmentation of general surgery has caused significant concern for both its leaders and practitioners in the last several decades.⁹² In fact, Wangenstein, reflecting an academic surgeon's viewpoint, speculated that general surgery's most important function might be the 'spawning of new disciplines'.⁹³ Further, many practising general surgeons increasingly believed that their national surgical organizations no longer represented their specific interests. As a reaction, in 1977 general surgeons in Canada organized a Canadian Association of General Surgeons.⁹⁴ In the USA, the American Society of General Surgeons was established in 1992, creating considerable concern about this unwanted challenge on the part of the leadership of the ACS.⁹⁵ In Germany, the *Deutsche Gesellschaft für Viszeralchirurgie* (German Society for Visceral Surgery) was founded in 1998 to represent general surgeons with a similar mandate to 'support and promote visceral surgery as a science, in clinical practice and in medical politics'.⁹⁶ The name, like that of the French *Collège de Chirurgie Générale, Viscerale, et Digestive* (College of General, Visceral, and Gastrointestinal Surgery) clearly reflects the narrowing focus of the 'general' surgeon in the latter half of the twentieth century.

In those same decades, the rise of interventional specialties from outside the surgical tradition posed a growing challenge to general surgery and the specialties directly derived from it. Focused on the operating room, they had either ceded diagnostic tools to others or failed to adopt them widely (e.g. endoscopy for the general surgeon and angiography for the cardiovascular surgeon). This would produce boundary and jurisdictional disputes when a diagnostic technique developed into a therapeutic technology—surgeon and gastroenterologist with therapeutic endoscopy, vascular surgeon and interventional radiologist or cardiac surgeon and cardiologist with angioplasty and stenting.⁹⁷

CONCLUSION

This chapter has traced the history and historiography of surgery as a specialty over the past 300 years. During that time its boundaries have been continually defined and redefined. By the middle of the eighteenth century, surgeons had an institutional and professional identity distinct from the barbers. The union of medicine and surgery eliminated the Early Modern distinction between physician and surgeon but surgery continued to be seen as one of the two fundamental divisions of medicine.⁹⁸ From the mid-nineteenth century to the mid-twentieth century the question of whether surgery was a therapeutic modality available to all doctors or a distinct specialty would be answered in favour of the latter. Conflicts over specialization and sub-division feature prominently in the twentieth-century history of surgery. Entering the twenty-first century the boundaries between surgery and other interventional disciplines blur and become new sites of collaboration and conflict.

Significant parts of the history of surgery as a specialty remain to be explored. While this chapter was able to address a few of the differences in national context between four countries, it is clear that more attention needs to be paid to national and transnational studies in the history of surgery. How surgery developed outside of the metropolises and academic centres that have been the traditional focus of surgical history also calls for more attention. Crowther and Dupree's work can serve as an example of this.⁹⁹

Finally, the development of surgery as a specialty has been influenced by many of the same factors as specialization in medicine more broadly. Both have also reflected larger changes in society in the past 200 years including an economy that can support specialization, the rise of the educated middle classes, and the changing role of the state. A distinct feature of surgery and its specialties, however, is the continued importance of its craft tradition both as a source of identity and as a reflection of the psychomotor skills required for operative success.¹⁰⁰

NOTES

1. On traditional surgery, see chapter 'Pre-Modern Surgery: Wounds, Words, and the Paradox of "Tradition"' by Faith Wallis in this handbook. On status and historiography among surgeons see also chapter 'Surgery and Its Histories: Purposes and Contexts' by Christopher Lawrence.
2. George Weisz, *Divide and Conquer: A Comparative History of Medical Specialization* (Oxford: Oxford University Press, 2006), 6. For an account of the general process, see chapter 'Medicalizing the Surgical Trade, 1650–1820: Workers, Knowledge, Markets and Politics' by Christelle Rabier in this handbook.
3. Andrew Abbott, *The System of Professions: An Essay on the Division of Expert Labor* (Chicago: Chicago University Press, 1988).
4. Rosemary A. Stevens, *Medical Practice in Modern England: The Impact of Specialization and State Medicine* (New Haven CT: Yale University Press, 1966). Rosemary A. Stevens, *American Medicine and the Public Interest: A History of Specialization*, 2nd ed. (Berkeley: University of California Press, 1998). Hans-Heinz Eulner, *Die Entwicklung der medizinischen Spezialfächer an der Universitäten des deutschen Sprachgebietes*, Studien zur Medizingeschichte des neunzehnten Jahrhunderts; Bd. 4 (Stuttgart: Enke, 1970). Weisz, *Divide and Conquer*.
5. George Rosen, *The Specialization of Medicine with Particular Reference to Ophthalmology* (New York: Froben Press, 1944).
6. Roger Cooter, *Surgery and Society in Peace and War: Orthopaedics and the Organization of Modern Medicine, 1880–1948*, (London: Macmillan, 1993). Samuel H. Greenblatt, T. Forcht Dagi, and Mel H. Epstein, *A History of Neurosurgery and Its Scientific and Professional Context* (Park Ridge, IL: American Association of Neurological Surgeons, 1997).
7. On criteria see for example: William J. Goode, 'Encroachment, Charlatanism, and the Emerging Professions: Psychology, Medicine, and Sociology,' *American Sociological Review* 25, no. 6 (1960): 902–914. For reviews of the more recent literature see Thomas Brante, 'The Professional Landscape:

- The Historical Development of Professions in Sweden,' *Professions and Professionalism* 3, no. 2 (2013): 1–18. Keir Waddington, *An Introduction to the Social History of Medicine: Europe since 1500* (New York: Palgrave Macmillan, 2011), 166–187. For an excellent overview of the medical historiography see John C. Burnham, 'How the Concept of Profession Evolved in the Work of Historians of Medicine,' *Bulletin of the History of Medicine* 70, no. 1 (March 1, 1996): 1–24.
8. Notably, Sydney Halpern, *American Pediatrics: The Social Dynamics of Professionalism, 1880–1980* (Berkeley: University of California Press, 1988).
 9. Andrew Abbott, *The System of Professions*. Burnham, 'Concept of Profession' (p. 21), observes that Abbott's work was informed by the work of historians, including medical historians. For examples see Carina Carlhed, 'The Rise of the Professional Field of Medicine in Sweden,' *Professions and Professionalism* 3, no. 2 (2013): 562–577; Peter J. Kernahan, 'Franklin Martin and the Standardization of American Surgery, 1890–1940' (Ph.D. diss., University of Minnesota, 2010); Christelle Rabier, 'Le système des professions, entre sociologie et histoire : Retour sur une recherche,' in *A paraître dans la sociologie d'Andrew Abbott*, ed. D. Demaziere and M. Jouvenet (Ehess, 2013), <halshs-00790494>.
 10. Weisz, *Divide and Conquer*, xiv. I am grateful to Thomas Schlich for suggesting the term.
 11. *Ibid.*, xix.
 12. *Ibid.*, xv–xviii.
 13. Rosemary A. Stevens, 'Medical Specialization as American Health Policy,' in *History and Health Policy: Putting the Past Back In*, ed. Rosemary A. Stevens, Charles E. Rosenberg, Lawton R. Burns (New Brunswick, NJ: Rutgers University Press, 2006), 74.
 14. Rabier, 'Le système des professions,' 4–5.
 15. Toby Gelfand, *Professionalizing Modern Medicine: Paris Surgeons and Medical Science and Institutions in the 18th Century*, Contributions in Medical History; No. 6 (Westport, Conn: Greenwood Press, 1980).
 16. John Flint South, *Memorials of the Craft of Surgery in England* (London: Cassell, 1886). Georg Fischer, *Chirurgie vor 100 Jahren : historische Studie über das 18. Jahrhundert aus dem Jahre 1876* (Berlin: Springer-Verlag, [1876] 1978). For this theme, see also chapter 'Surgery and Its Histories: Purposes and Contexts' by Christopher Lawrence in this handbook.
 17. See Russell Charles Maulitz, *Morbid Appearances: The Anatomy of Pathology in the Early Nineteenth Century*, Cambridge History of Medicine (Cambridge ; New York: Cambridge University Press, 1987); L. S. Jacyna, 'Images of John Hunter in the Nineteenth Century,' *History of Science* 21 (1983): 85–108. M. Jeanne Peterson, *The Medical Profession in Mid-Victorian London* (Berkeley: University of California Press, 1978); Irvine Loudon, 'Medical Practitioners 1750–1850 and the period of medical reform in Britain' in Andrew Wear (ed.), *Medicine in Society: Historical Essays* (Cambridge: Cambridge University Press, 1992), 219–247; Irvine Loudon, *Medical Care and the General Practitioner, 1750–1850* (Oxford: Clarendon Press, 1986).
 18. Among others see Thomas H. Broman, *The Transformation of German Academic Medicine, 1750–1820* (Cambridge: Cambridge University Press, 2002); Thomas N. Bonner, *Becoming a Physician: Medical education in Britain*,

- France, Germany, and the United States, 1750–1945* (Oxford: Oxford University Press, 1995); Claudia Hauerkamp, ‘The Making of the Modern Medical Profession, 1800–1914: Prussian Doctors in the Nineteenth Century,’ in *German Professions, 1800–1950*, ed. Geoffrey Cocks and Konrad H Jarusch (Oxford: Oxford University Press, 1990), 66–84; Charles E. McClelland, *The German Experience of Professionalization: Modern Learned Professions and Their Organizations from the Early Nineteenth Century to the Hitler Era* (Cambridge: Cambridge University Press, 2002); Arnulf Thiede, A. Berglehner, and Gundolf Keil, ‘Prerequisites for the Reintegration of Surgery into Academic Medicine Before 1850,’ in *Philipp Franz von Siebold and His Era: Prerequisites, Developments, Consequences, and Prospects*, ed. Arnulf Thiede, Yoshiki Hiki, and Gundolf Keil (Berlin: Springer, 2000), 5–36.
19. Stevens, *American Medicine and the Public Interest*, 14–33. For a contemporary reference see Chastellux, François Jean, marquis de, *Travels in North America, in the Year 1780, 1781, and 1782; Translated from the French by an English Gentleman* (London, 1787), 65–66.
 20. Peterson, *The Medical Profession in Mid-Victorian London*, 283–287.
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34. On this see also chapter 'The History of Surgical Wound Infection: Revolution or Evolution?' by Michael Worboys in this handbook. M. Anne Crowther and Marguerite Dupree, *Medical Lives in the Age of Surgical Revolution* (Cambridge: Cambridge University Press, 2007), 222. A similar attitude prevailed in France, see Jacques Léonard, *La vie quotidienne du médecin de province au XIXe siècle* (Paris: Hachette, 1977), 82.
35. Anne Digby, *The Evolution of British General Practice: 1850–1948* (Oxford: Oxford University Press, 1999), 294.
36. Stevens, *Medical Practice in Modern England*, 41. Weisz regards this referral system as the key compromise that prevented the widespread specialization that occurred elsewhere. Weisz, *Divide and Conquer*, 186.
37. Honigsbaum, *The Division in British Medicine*. GPs performed an estimated 2.5 million operations a year (*Ibid.*, 306). Figures are from J. Bradford Hill, *J Royal Statistical Society*, 114 (1951):17. Complicating the picture are the many with the MRCS or FRCS working as part-time general practitioners in the interwar and post-war period.
38. Honigsbaum, *The Division in British Medicine*, 141, 305–306.
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40. Digby, *The Evolution of British General Practice*, 293.
41. Stevens, *American Medicine and the Public Interest*, 27.
42. *Ibid.*, 80. See also Kernahan, 'Franklin Martin.'
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44. Christopher Lawrence, 'Democratic, Divine and Heroic: The History and Historiography of Surgery,' in *Medical Theory, Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence, (New York: Routledge, 1992), 29–31.
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49. On the founding of the ACS see Kernahan, 'Franklin Martin' and David L. Nahrwold and Peter J. Kernahan, *A Century of Surgeons and Surgery: The American College of Surgeons 1913–2012* (Chicago: American College of Surgeons, 2012).
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57. Thomas Schlich, 'Farmer to Industrialist: Lister's Antisepsis and the Making of Modern Surgery in Germany,' *Notes Rec. R. Soc.* 67, no. 3 (2013): 247.
58. Marian Döhler, 'Comparing National Patterns of Medical Specialization: A Contribution to the Theory of Professions,' *Social Science Information* 32, no. 2 (June 1, 1993): 185–231.
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60. See also Döhler, 'Comparing National Patterns,' 202.
61. *Ibid.*
62. Obstetrics could be considered a third. See Weisz, *ibid.*, 203–209. Gynaecology would develop as a specialty linked with obstetrics rather than general surgery. See Wangenstein, *Rise of Surgery*, 545–546; Weisz, *Divide and Conquer*, 203–209.
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Between Human and Veterinary Medicine: The History of Animals and Surgery

Abigail Woods

As surgical subjects, animals were affected by, and contributed to many of the developments described in this handbook on the history of surgery. Yet as its chapters illustrate, when medical historians refer to surgery, they generally mean human surgery. Animal surgery is largely neglected. Even historians of animal disease have little to say about the matter.¹ Although occasional glimpses are provided by general veterinary histories and accounts of experimental medicine, there are only a few publications dedicated to its analysis.² This situation can be explained partly by the anthropocentric orientation of historical scholarship in general and medical history in particular. Although perspectives are beginning to shift, the roles of animals as products and shapers of history and society are still insufficiently acknowledged. Another factor is the diffuse and multi-faceted nature of animal surgery, which poses methodological challenges above and beyond those faced by historians of human surgery. Whereas human surgery was generally confined to clinical contexts and performed by dedicated practitioners whose actions were recognised at the time to be ‘surgical’ in nature, animal surgery was a more amorphous practice encompassing multiple species, whose diverse anatomies, physiologies, lifestyles, behaviours, disease tendencies, and relationships with humans generated various rationales for surgery, and posed technical and ethical challenges to it.

This chapter aims to facilitate future scholarship on the subject by describing some of the main features and cross-cutting themes of the history of

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animal surgery. It also suggests ways of approaching its analysis, and future directions for research. It revolves around the two key contexts in which animals occurred in surgery. In clinical settings, they performed the roles of patients. This involved a three-way relationship between the animal, their owner/keeper, and the surgeon. In experimental settings, animals were manipulated surgically for scientific purposes. Here, the scientist-surgeon was also the *de facto* owner, although, as we will see in more detail, certain groups of the public sometimes tried to intervene in their relationships with animals. When investigating the history of animal surgery, it is necessary to consider both contexts, and the historically contingent relationships between them. However, locating animal surgery in the historical sources can be tricky due to the lack of a sharp distinction between this activity and other medical and scientific interventions performed on animals.

The scientists who experimented on animals, and the healers who populated the veterinary marketplace both before and after the late eighteenth-century creation of a veterinary profession, practiced both medicine and surgery. Except where human surgeons were involved, those performing surgery on experimental animals were not referred to as surgeons. Veterinary surgeons did not confine themselves to surgery, and the terms veterinary medicine and veterinary surgery were used non-specifically and interchangeably. Prior to the nineteenth century, surgical interventions on experimental animals can be identified because they were referred to as ‘vivisection’. Subsequently, however, the meaning of this term expanded. Like ‘experiment’ and ‘procedure’, it became a generic label for all kinds of animal manipulations.³ Historians of experimental medicine have not helped matters by referring to all experimental animals as ‘models’. Rarely used before the mid-twentieth century, this term conflates the diverse interventions performed on experimental animals, and their varying objectives.⁴

The blurred boundaries of animal surgery force historians to impose their own definitions on the field. For the purpose of this chapter, ‘animals’ will be defined—as they usually were by historical actors—as non-human vertebrates.⁵ ‘Experimental animals’ were those subjected to manipulations for the purpose of advancing science and medicine. When considering the surgery performed upon them, this chapter adopts a more inclusive approach than Thomas Schlich, Eric Mykhalovskiy, and Melanie Rock pursued, who restricted their analysis to the removal of animal organs for use in humans, and animal-based research into human surgical procedures. They selected these interventions because of their intended surgical benefits to humans.⁶ In shifting the focus from human beneficiaries to animal subjects, this chapter identifies a much wider range of interventions, many of which were not intended to advance surgery, but rather to investigate and demonstrate the physiological functioning of the body.

Schlich’s definition of surgery as ‘the controlled intervention into the structure of a living body in order to repair that structure or to restore a bodily function to a healthy condition’⁷ is only partially applicable here, for while

animal surgery involved controlled interventions into bodily structures, it had diverse objectives. As patients, animals could be subjected to non-therapeutic interventions such as castration. In experimental settings, the goal of animal surgery was not to repair the body (unless it was damaged experimentally for that purpose), but to disrupt it. Experimenters often justified this disruption by reference to future benefits for human and animal patients. Such claims were underpinned by a belief in their shared physicality, which meant that findings could be extrapolated between species.⁸ However they were frequently contested. Consequently, although (as in humans) surgery required greater justification than other therapies owing to its violation of the body, the experimental surgical violation of animal bodies often required very special justification.⁹

The following survey adopts an integrated, largely chronological approach to animals as surgical patients and experimental material. It focuses particularly on the modern era, and concludes with some suggested directions for future research. It draws out two key themes that have emerged in recent dedicated histories of animal surgery.¹⁰ The first theme is the historical co-constitution of animal surgery and human–animal relations. How humans valued and related to particular animals shaped their demands for particular surgical interventions, which in turn shaped the activities and expertise of surgeons in ways that validated human–animal relations. The second theme deals with the historical connections between animal surgery and human surgery as two modes of surgical practice. Animal patients were sometimes subjected to interventions already performed on human patients, and, like human patients, they benefitted from interventions performed on experimental animals. Human surgeons sometimes operated on animals in addition to or even instead of humans while animal healers occasionally moved in the opposite direction. Exploring the nature and extent of these connections reveals perceived similarities and differences in the moral status, physical nature, and cultural valuation of surgical subjects. In highlighting the multi-species dimensions of surgery, this chapter also demonstrates the need to transcend professional and species boundaries when writing its history.

PRE-MODERN ANIMAL SURGERY

Reports of surgery upon experimental animals date back to antiquity. Prominent examples include a Hippocratic text on the heart, and works by the famous Greek doctor, Galen, working in second-century Rome. They reveal that animals were vivisected to discover or demonstrate the functions of certain anatomical structures.¹¹ Evidence of animals as surgical patients is even older. Archaeological findings reveal occasional attempts by humans to heal the fractures of domestic animals,¹² while tomb paintings in pre-Pharonic Egypt depict cows whose horns were surgically manipulated for religious reasons, to form cyclical representations of earth and heaven.¹³ The *Hippiatrica*—a collection of manuscripts that formed the standard Byzantine text

on horse health and healing—borrowed from human medicine in providing instructions for the surgical treatments of wounds and fractures.¹⁴ One author, Pelagonius, discussed the use of cautery, bloodletting, castration and surgical debridement, mainly in horses but also in sheep and cows. He also referred to the various individuals who applied these methods, ranging from shepherds to specialist animal healers.¹⁵

Housni Alkhateeb Shehada's analysis of Arabic manuscripts from the Mamluk period offers rich insights into the surgery that high-status 'veterinarians' performed on valuable horses, hawks, and falcons at the Mamluk courts. Describing the cauterisation, cleaning, and suturing of wounds, the surgical treatment of hooves, bleeding, castration, gynaecological surgery, the removal of skin growths, and care of fractures (including the use of resin to repair hawks' broken talons), he concludes that techniques had advanced beyond those of the classical period, and were superior even to those used in human surgery at the time.¹⁶

Louise Curth offers some insights into animal surgery in Early Modern England. This was usually performed on useful animals like horses and livestock by healers ranging from elite farriers to cow-leeches and laypeople. Practices changed little over the period, and often resembled those of human surgery, as in the management of wounds, bladder stones, skin diseases, limb amputations, fractures, the use of cautery, and bleeding. However, some operations were specific to animals, like castration to improve the performance and manageability of horses and livestock,¹⁷ and—as revealed by archaeological evidence—the tail-docking of female lambs to protect them from maggots.¹⁸

The Renaissance witnessed a resurgence of surgical experiments on animals.¹⁹ Revisionist analysis is beginning to unpack their different practices and epistemic motivations. These ranged from Vesalius's revival of Galen's method of demonstrating human bodily functions on animals, to experiments aimed at discovering new knowledge about the difference between life and death, the heat and fluids of the heart, and the motion of the heart and lungs, as performed by Colombo, Fabricius, Harvey, and many others. Pigs and dogs were the preferred subjects, although Harvey also vivisected many cold-blooded creatures.²⁰ In Early Modern Europe, vivisection formed part of the public culture of anatomy, as illustrated by Alexander Monro primus, professor of anatomy in Edinburgh, 1722–1764, who vivisected dogs to illustrate the functioning of human anatomical structures, and for the moral edification of his students.²¹

The validity of these practices was often subject to debate. Some experimenters were uneasy about the suffering they caused, and queried the Cartesian belief that interventions were morally justified because animals were inferior 'beast-machines' that lacked a rational, immaterial soul. The presumed physical similarity of humans and animals was also questioned: were general conclusions possible from studies of particular animals, and could knowledge drawn from suffering animals shed light on normal humans?²²

These issues arose especially when the subjects studied were the mind, brain, and nerves—as for Swiss physiologist Albrecht von Haller—since the mental faculties of animals were perceived as qualitatively different to those of humans.²³

Concerning animals as surgical patients, in eighteenth-century England, the surgical treatment of elite horse patients was led by medical men, particularly surgeons. Influenced by growing interest in horse racing, selective horse breeding, hunting on horseback, and the performance of cavalry horses, they perceived horses as noble and legitimate subjects of their interventions, and worked to refashion farriery from an empirical practice centred on shoeing, into a polite gentlemanly art that incorporated medicine and surgery. They expanded the elite farriers' tool kit to include surgical needles, cauterisers, and fleams, and echoed developments within human medicine by founding horse infirmaries for the treatment of horses and tuition of farriers. Whereas country farriers typically combined shoeing and drugging with infrequent bleeding and wound dressing, Edward Snape, owner of a London horse hospital, mostly treated surgical conditions of the skin, lower limb, and hoof using bleeding, rowelling (the insertion of a seton under the skin to permit drainage), and firing (whereby tissue on a lame leg was cauterised in the belief that healing made the leg more stable).²⁴

At a time when many medical men engaged in the dissection, collection, and display of animal bodies, it was not unusual for them to perform animal surgery for the purpose of research. The famous Scottish surgeon John Hunter carried out many physiological experiments and tested human surgical techniques on animals. His many pupils followed suit. These men played a major role in founding and running Britain's first veterinary school in London, which they regarded as an important site for advancing these activities. They modelled it along the lines of human hospitals and the horse infirmaries mentioned above, which were run by elite surgically trained farriers.²⁵ The horses admitted to its stables were largely subjected to surgical treatments for lameness. Many of the early pupils were human surgeons. On qualifying, some were commissioned into the army as 'veterinary surgeons', a title that was created to distinguish them from human surgeons.²⁶

Movements also occurred in the other direction. In 1780s France, the refashioning of the Alfort veterinary school resulted in a new curriculum that included courses in human fracture care and midwifery. However, the goal of producing rural veterinarians capable of caring for human as well as animal patients was not fulfilled, as the graduates of this kind of training were resented by surgeons and rejected by the public. In 1788, political changes caused the school to return to its original task of producing horse-oriented practitioners.²⁷ The French veterinary schools were also important sites for experimental animal surgery. From the 1760s, students used large numbers of worn-out horses to practice their clinical techniques, often several times on the same horse and without using anaesthetics.²⁸ In addition, experiments were performed frequently on horses to investigate bodily function.

Paul Elliott concludes that veterinary schools were therefore important sites for the emergence of experimental physiology in France.²⁹ For John Lesch, the Paris school of medicine was more important. During the revolution, its reorganised clinical training regime produced a group of men, including the physiologists François Magendie and Claude Bernard, who went on to apply their surgical skills to experimental animals.³⁰ These developments contributed to a new surgical view of the body as a collection of organs and tissues with specific functions.³¹

MODERN ANIMAL SURGERY

During the nineteenth century, the surgery of animal patients continued to be dominated by bleeding, castration, the management of wounds and lameness, and assistance with births. Horses remained the main patient base. Despite the coming of steam power and the railways, their numbers expanded throughout the century. In rural districts, cows were also important, and there is some evidence for surgical interventions on dogs.³² As in earlier centuries, many animals were treated by their owners and carers. Shepherds usually castrated their own lambs, and reportedly trephined the skulls of sheep to remove tapeworm cysts that pressed on the brain and caused neurological symptoms.³³ In zoos, the keepers took care of minor surgical problems like wounds and abscesses,³⁴ while grooms and trainers managed the wounds and leg injuries of horses.³⁵

The establishment of the veterinary profession added a new group of healers to the marketplace. Although vets were quick to portray their less-educated competitors as cruel and ignorant, evidence suggests considerable overlap between their practices.³⁶ The market was also served by human healers, particularly during the first half of the century. Bonesetters and general practitioners sometimes cared for animals as well as humans. Surgeons carried out various interventions on their own animals and at the request of animal owners—who included their human patients. They treated wounds and fractures in horses, removed tumours from dogs, cataracts from bears, and amputated animal limbs.³⁷

Except where pet dogs were concerned, surgical interventions were performed largely for economic reasons, with the goal of quickly restoring animals to function.³⁸ Zoo animals had to appear before fee-paying members of the public,³⁹ livestock were expected to grow and reproduce themselves, and horses were required for draft power, sporting purposes, and as cavalry mounts. If return to function seemed unlikely, or if the cost of care threatened to outweigh the animal's value, then slaughter was a viable option and allowed losses to be recouped through sale of meat and hides.⁴⁰ Alternatively, successful racehorses could be retained for breeding. This productivist ethos constrained the development and application of intricate surgical procedures. For example, the operation developed to treat the horse respiratory problem known as 'roaring' found few applications in racehorses because of the

lengthy recovery period. Instead, some ‘roarers’ raced with the aid of tracheotomy tubes.⁴¹

The economics of surgical care, together with the scientific theory that animals did not feel pain in the same manner as humans, may explain why anaesthesia was not used routinely in animals for decades after its mid-nineteenth century incorporation into human surgery.⁴² The adoption of aseptic surgery followed a similar trajectory.⁴³ This was despite the experiments conducted on animals with a view to improving surgery in humans.⁴⁴ The lack of anaesthesia in animal experiments fuelled protests against this activity, which became particularly vocal in 1870s UK following the establishment of experimental physiology as a discipline.⁴⁵ Protests emerged a little later in the USA, but were less common in France and Germany.⁴⁶ They formed part of a wider concern for animal suffering that developed as human relationships with nature were redrawn within urbanising, industrialising societies. The treatment of dogs and horses attracted particular attention owing to their perceived proximity to humans, and the concurrent growth of pedigree dog breeding and pet-keeping.⁴⁷

Anti-vivisectionist sentiment in Britain was stimulated by the 1873 publication of the *Handbook for the Physiological Laboratory*. Written by medical scientists, it aimed not to extend knowledge, but to enable beginners to develop skills in vivisection. The descriptions were graphic and there were few references to anaesthesia. Public criticisms of its contents were fired by perceived parallels between dogs as experimental subjects, dogs as pets, and—for the many female anti-vivisectionists—their treatment as patients at the hands of male doctors. Key points of debate were the morality of animal experiments, the accountability of the scientists who performed them, the scientific utility and necessity of this practice, and the suffering it caused. The controversy culminated in legal restrictions to experimenters’ activities under the 1876 Cruelty to Animals Act.⁴⁸

These protests focussed particularly on dogs. However, we know from Cheryl Logan’s analysis of German experimental physiology that scientists employed diverse species in their experiments (although she does not distinguish between medical and surgical procedures).⁴⁹ Historians have suggested various reasons for their selection, including convenience (cost and ease of acquisition), practicality (could a particular surgeon perform the desired procedure on a particular species?) and epistemology (could reliable knowledge be produced and generalised to humans and other animals?). The animal’s biology, behaviour, and psychology had the potential to shape scientific research, which in turn shaped their bodies and lived experiences.⁵⁰ Daniel Todes illustrates this point in his account of the dog experiments performed under the aegis of Russian physiologist Ivan Pavlov. Through a process of trial and error, using facilities, instruments, and staff akin to those of human hospitals, Pavlov devised surgical techniques that made dogs’ digestive glands accessible for long-term physiological experiments conducted by his scientific assistants. In these experiments, the dogs—which were given names—often

failed to perform as expected. Scientists attributed this partly to the failure of surgery, and partly to the dogs' personalities. They responded by taking personalities into account when interpreting experimental results. However, as they did not publicise this approach, it proved difficult for western scientists to replicate their findings.⁵¹

The problem of replicability—which is a recognised feature of complex experimental systems—dogged other surgical interventions on experimental animals. For example, Jacques Miller, an Australian working in London during the early 1960s, found it difficult to remove the thymus gland of mice in the manner described by a fellow scientist. He subsequently discovered an undocumented 'trick' to the operation. He spread the word informally via conferences and the scientists he trained, but there was never any formal discussion of the technique, which probably varied between laboratories.⁵² Journal editors' strategies may have contributed to the problem of replicability, because as Lederer demonstrates for the *Journal of Experimental Medicine* c. 1921–1946, they took steps to abbreviate, omit, or reword descriptions of experiments performed on animals to avoid criticisms from anti-vivisectionists.⁵³

At the end of the nineteenth century, the values of replicability and standardisation moved from experimental to clinical contexts. Working at the Johns Hopkins School of Medicine, the famous surgeon William Halsted used dogs to develop and produce evidence in support of new surgical interventions. Adopting a slow, controlled style of operating that aimed to preserve tissues, he sought to perfect techniques in animals for application to humans.⁵⁴ Similar values filtered into elite veterinary surgery, as illustrated by the work of Frederick Hobday, future principal to the Royal Veterinary College, London, who worked to standardise and statistically document operations on dogs and horses, while also emphasising the need for aseptic surgery and good anaesthesia. A strong advocate of comparative medicine, Hobday treated canine surgical patients in the same manner as humans by developing false eyes, teeth, and limbs.⁵⁵

Meanwhile, new surgical interventions were performed to extract biological material from experimental animals for the benefit of humans. In the 1910s, the veterinarian attached to the Russian Society for Goat Breeding removed the thyroid glands of goats on the instructions of doctors who believed that the milk goats produced after thyroidectomy had medicinal qualities for humans suffering from over-active thyroid glands. This was the context in which endocrinology emerged in Russia.⁵⁶ In 1920s France, the surgeon Serge Voronoff transplanted primate testicles into men who lacked virility. The procedure was relatively uncontroversial in France, but concerns about cruelty to animal donors and transmission of simian characteristics in humans generated resistance in Britain.⁵⁷ Xenotransplantation was investigated further in the 1960s as a means of tackling the shortfall in human organs available for transplant surgery. Primates were used initially because of their resemblance to humans, but scientists turned subsequently to pigs, partly in response to resurgent criticisms of animal experiments which were supported by a new philosophy of animal rights.⁵⁸ More recently, techniques

of kidney transplantation in humans were applied to cats, which performed the dual roles of donor and recipient. The inability of cat donors to grant consent for the operation has prompted considerable reflection on its ethics.⁵⁹

In the twentieth century, domestic animals fell increasingly under the care of veterinarians, who won legal recognition as prime experts in animal health. Other parties were gradually excluded from the performance of surgery on animal patients. While surgery on experimental animals continued to be dominated by scientists—who were often medically trained—within the post-World War II field of laboratory animal science, vets developed new roles as experts in animal management and welfare. This involved efforts to maximise the health and minimise the suffering of experimental animals, both for the benefit of animals and to turn them into more reliable experimental material.⁶⁰ Meanwhile, changes to the domestic animal economy forced veterinarians to adapt their roles and identities as animal healers.⁶¹ Early in the century, the rise of the internal combustion engine caused horses to lose their prime role as animal surgical patients. However, a new equine economy emerged, focused on recreational horses. Dr W. J. R. Fowler, the main equine surgical instructor at Ontario Veterinary College, carved out a unique place in this market, particularly through improving the operation for roaring. By continuing to develop hands-on surgical teaching at the college, and maintaining the horse as the primary animal for student dissection, he equipped his students to take up similar lines of work.⁶²

The fashioning of farm animals into veterinary surgical patients was initially impeded by economic depression, which encouraged farmers to view vets as a last resort. It was not until the revival of agricultural fortunes during and after World War II that a viable market for veterinary surgery emerged, prompting research into anaesthesia and surgical techniques.⁶³ Concurrently, farm animals became subject to non-therapeutic surgical interventions like the de-beaking of poultry, de-horning of cows, and the tail-docking and teeth clipping of piglets. These were performed to reduce the injury risk to other animals, which arose particularly within intensive farming systems.⁶⁴ Like so-called ‘cosmetic surgery’ on pets—tail docking, ear cropping, the removal of cats’ vocal cords and (according to some commentators) routine neutering, these methods attracted considerable criticism that resulted in legal restrictions in certain countries.⁶⁵

As the twentieth century progressed, pets became increasingly important veterinary surgical patients. Kept for emotional rather than utilitarian reasons, they were awarded intrinsic value similar to that of family members. This situation gave rise to what Martina Schlünder and Thomas Schlich have termed an ‘economy of love’. Pet owners demanded improved veterinary care and demonstrated increasing willingness to pay for it.⁶⁶ In response, veterinary schools expanded their training in small animal medicine and surgery. By mid-century, the dog had largely replaced the horse as the subject of student dissection. However, while in the context of inter-war depression, some vets began to view pets as legitimate patients and to campaign against their treatment by lay-people, the traditionally masculine culture of veterinary surgery meant that pets

were not popular patients. Women, who were just beginning to join the profession, found themselves channelled into working with them on the grounds that they possessed ‘gentle hands’ and a ‘naturally’ caring demeanour.⁶⁷ After World War II, pets entered the veterinary mainstream. Practices were reoriented to ‘mimic the trends and structures of the increasingly hospital-based and surgically oriented human medicine’.⁶⁸ Vets investigated and adopted methods of balanced anaesthesia, turned to X-ray technologies, erected purpose-built hospitals, trained up a new cadre of veterinary nurses, and rapidly expanded their surgical repertoire. They thereby validated the intrinsic value that owners attached to their animals, while positioning themselves as defenders of animal experiments on account of the ultimate benefit to animal patients.⁶⁹

Mid-twentieth century fracture care, which is one of the few well-studied topics in the history of animal surgery, offers a fascinating illustration of how the shifting valuation of pets generated higher expectations of surgical care, which resulted in new forms of surgical intervention that circulated between human surgery and different forms of animal surgery. This period saw a movement away from so-called ‘conservative treatments’ such as plaster casts, splints and bandages, which were applied to both humans and animals with the aim of restoring function. By the 1930s, vets had begun to discuss and test methods of internal fixation that were used in human patients, while during World War II, the US navy purchased an external fixation apparatus devised for use in pets for testing on service men.⁷⁰ From the 1950s, new methods of fracture care were pioneered by the Swiss ‘AO’ association of surgeons. Their scientists used experimental rabbits and dogs to generate basic knowledge about bone growth and to perform clinical research on fracture repair. Although initially intended for use in humans, AO methods were subsequently applied to animal patients (mostly dogs but also racehorses) with the help of human surgeons.⁷¹ It required further research to make these methods effective owing to the different sizes and biodynamics of human and animal bodies. Scientists initially conducted this research on dogs—who were also the intended patients. Subsequently, they turned to sheep, as despite their dissimilar metabolisms and the difficulties involved fashioning them into surgical subjects, they found it easier to maintain emotional distance from them.⁷² Emotion also found its way into clinical contexts, as vets began to realise that X-ray appearances of orthopaedic conditions did not necessarily correlate to owners’ descriptions of the animal’s clinical state. Despite their preference for ‘objective’ information, later-twentieth-century vets began to pay greater heed to animal suffering, as interpreted by owners through the lens of human illness experiences.⁷³

REFLECTION

In summarising existing understandings of the history of animal surgery, this survey has drawn attention to the intersecting histories of animals as surgical patients and experimental surgical subjects. With reference to the shifting valuation of animals, it illuminates why particular species were subjected

to particular types of surgery at selected points in time. It also highlights the circulation of ideas, practices, and personnel between human and animal surgical domains, and therefore the need for historians of human surgery to incorporate animals within their accounts. Given the generic nature of much existing literature, there is considerable scope for advancing these observations and opening up new perspectives on the history of animal surgery through more focused analyses. These could address neglected arenas of animal surgery, such as its performance in war and non-western contexts,⁷⁴ its comparative and transnational histories, the use of non-therapeutic surgery in animal patients, and the surgery of animals other than dogs and horses. They should also endeavour to push beyond existing descriptions of what types of surgery were performed on what animals, to engage with the more challenging question of *how* surgery was conducted.

One fruitful approach to this problem is to investigate the nature of surgical skill. Schlich argues in reference to human surgery that skill had technical, affective, and ethical components. It was embedded in certain 'rules of performance' which were shaped by the surgeon and the context in which they worked.⁷⁵ The complexity of animal surgery suggests the existence of multiple rules of performance at any one time. Examining the content of these rules, and how they were fashioned by the two distinctive contexts of animal surgery, its multiple settings (home, stable, farm yard, laboratory and veterinary clinic), its varying objectives, and the physical features and cultural valuations of its animal subjects, would offer important insights into how surgery was practiced. It would also illuminate the characteristics of the 'good surgeon': how did they restrain, operate on, and secure the desired outcomes for their animal subjects, and what traits did they require to win the trust and respect of peers, animal owners, and the wider public?

In addition to the surgeon's skill, it is necessary to consider the environment in which they worked, and its human, technological, spatial, and animal components. What assistance was provided by grooms, farm labourers, animal owners, veterinary nurses, and laboratory animal technicians? How did they come to participate in animal surgery, what skills did they bring to bear on it, and how did they relate to its human personnel and animal subjects? Surgical technologies also require investigation, ranging from animal anaesthesia and aseptic practices, to the use of gloves, masks, surgical instruments, and machines that monitored bodily function. What were their trajectories of development and how did they connect with those of human surgery? In addition, it is important to consider the sites of animal surgery: homes, barns, stables, cages, laboratories, consulting rooms in veterinary clinics, and dedicated operating theatres of varying degrees of sophistication. What are their histories? How were they created and selected, and what was their impact on how and by whom surgery was performed? The roles of animals as shapers and products of this surgical system also requires further attention: in what ways did their physical qualities and moral valuations of them influence how surgery was performed, and what were their experiences of it?

As in human surgery, it is not easy to investigate surgical practice because it involved many automated and non-verbal ways of working. Sources such as films, articles, and texts offer only a partial guide, because the practice of surgery developed with experience.⁷⁶ In human surgery, historians have attempted to tackle this difficulty by studying surgical training as a context in which the tacit was made explicit.⁷⁷ Analysing the training of animal surgeons promises to be similarly illuminating. Much useful information can be gleaned from autobiographies and oral histories, in which descriptions of surgical training and ‘war stories’ from practice illuminate otherwise invisible aspects of surgical skill such as its ‘hardness’.⁷⁸

For the historian of experimental animal surgery, materials used by historians to reconstruct anti-vivisectionist controversies, such as the 1873 *Handbook of the Physiological Laboratory*, scientists’ experimental reports, and first-hand descriptions of vivisection published by its opponents, have the potential to yield additional, novel perspectives on how surgery was practiced. Such sources may help to differentiate between two frequently conflated aspects of experimental surgery: the trial and error development of techniques to turn animal bodies into ‘particular kinds of ‘machines’ designed ... to generate particular kinds of facts’,⁷⁹ and the application of those techniques in order to gather the desired facts. How techniques were standardised within laboratories and experimental communities is another important question, for while historians have much to say about the standardisation of laboratory animals, they rarely consider the standardisation of the procedures performed upon them.⁸⁰

As non-verbal subjects, animals left no authentic records. Consequently the ‘patient’s experience’ of surgical practice can only be captured through records created by humans.⁸¹ However in this respect, animals are little different from other patient groups studied by medical historians such as poor women and the mentally ill, and may be studied in the same way, through the analysis of surviving clinical records.⁸² Coupled with the analysis of veterinary surgical texts and discussions, this would do more than illuminate the history of surgery and human–animal relations: by centring the analysis on the animal surgical subject, it would also contribute to the burgeoning field of animal history by revealing the ways in which animals both shaped and were shaped by surgical practices.

To summarise: The development of dedicated histories of animal surgery is both necessary and important. It promises to add a new dimension to accounts of veterinary and experimental medicine, to enrich histories of animals and of human surgery, and to develop new connections between these domains. Tracing the circulation of ideas, practices, humans, and animals between different surgical contexts would illuminate the circumstances under which surgery transcended the barriers of species and profession to reflect and reshape ideas of what it meant to be human or animal. Identifying the times and places in which these barriers held firm would prove equally revealing—of hierarchies between species and the ambiguities of human–animal

relationships. Implicit in the investigation of such issues is the reconceptualisation of surgery as a more-than-human phenomenon, and the long overdue correction of outdated anthropocentric approaches to surgical history.

NOTES

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Women in Surgery: Patients and Practitioners

Claire Brock

Women's place in the history of medicine, both as patients and as practitioners, has been well established since the 1970s.¹ Surgery has been a very different matter. If considered at all in relation to historical surgical practices, women have been adjuncts, peripheral or in opposition to the main event, operated upon rather than conducting the operations. A similar situation exists in the early twenty-first-century surgical profession. While a woman has recently been appointed to the Presidency of the Royal College of Surgeons, only 8% of surgical consultants in Britain are women and statistics indicate that there is a 20% pay gap between male and female surgeons.² International patterns across Scandinavia, North America, Australia and New Zealand reveal that women are 'less likely to be in most forms of surgery than in the profession overall'.³ Women and surgery are evidently still divided, repelling each other for a variety of reasons, including factors such as life-work balance, relationships in the workplace, or the lack of suitable role models.⁴ If this handbook as a whole intends to return surgery firmly to the historiography of medicine then this chapter has a double aim. First, it reconsiders the ways in which women surgeons operated from the middle of the nineteenth century and why there might be an ongoing disconnection between women and surgery. Second, it looks at the female patient in surgery, a topic that has been the subject of historical analysis much more frequently, but which is equally deserving of further re-examination, especially when both surgeon and patient were the same sex.

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SURGEONS

There had been practising female surgeons in Europe even before women began formally to enter the medical profession from the mid-nineteenth century onwards. Whether with a licence or without, like their male counterparts, these women treated and healed the sick both in their own households and in the wider community (Fig. 1). As historian A. L. Wyman has illustrated, between 1400 and 1800, such 'surgeonesses' set bones, stitched wounds, treated burns and were not frowned upon if, as gentlewomen, they graciously treated the poor and needy.⁵ More recently, Celeste Chamberland has explored women's involvement in the running of metropolitan surgical households in the late sixteenth and early seventeenth centuries. Chamberland indicates that because Early Modern surgical care was located in a blurred space between the domestic and the occupational, women were on site to prepare remedies, assist with treatments, train apprentices and keep financial records.⁶ There are three key points to take from the early history of women's participation in surgery. First, in the treatment, through minor surgery, of everyday injuries suffered by the poor and by the young, women's domestic responsibilities within a regulated sphere of influence were emphasised. Second, the fluidity and uncertain status of the surgical occupation in the Early Modern period allowed manipulation of the boundaries of practice. Finally, financial profit was a contentious issue and objections to female practitioners typically diminished in severity if women confined their ambitions to a particular class of patients deemed suitable for them and did not aim to make a living from their surgery. Female amateurs were acceptable in some circumstances, but payment for services indicated a skilled confidence unbecoming of and unfitting for females. These three issues continued to haunt women surgeons into the twentieth century. They were also, however, concerns that drove those women interested in more professional surgical activities into certain areas of practice, where their presence could be defended as necessary and suitable.

That women had for centuries unofficially practised medicine, including surgery, was not lost on the generation of female practitioners keen to join the newly regulated profession in the mid-nineteenth century.⁷ When Victorian women sought an outlet for their energies that would satisfy their intellectual as well as financial desires, it was not surprising that they chose medicine to assail first. The pioneers took a dual stance in order to justify their ambitions. First, they noted that women had participated in various fields of medical practice since the earliest times, so there was no novelty in them desiring official recognition of what had always been the case. Second, and simply, they were able to explain that women wanted to be treated by their own sex. Indeed, so serious was the lack of understanding, on both sides, that there was a gaping chasm between male practitioner and female patient, who did not breathe the same atmosphere, as Elizabeth and Emily Blackwell phrased it, and so could hardly be expected to bridge



Fig. 1 Cornelis Dusart, A female surgeon applying the method of cupping to a patient (1695), Wellcome Library, London

their differences.⁸ Disastrous tales of women too shy or modest to speak of ultimately fatal gynaecological ailments in front of their male practitioners peppered early claims for the necessity of admitting women to the surgical profession in order to encourage frank discussion for the purpose of combating disease.⁹ The first woman to qualify as a doctor, British-born American Elizabeth Blackwell, had even entered the profession with the aim of becoming ‘the first lady surgeon in the world’. During her training at *La Maternité* in Paris, however, Blackwell lost her sight in one eye when she was infected with purulent ophthalmia. This incident ended her surgical hopes.¹⁰ There were, however, others who were willing to take her place, despite the fact that it was the practise of surgery that most divided supporters and detractors of women’s demands to enter the medical profession. However, from the pioneers’ point of view, without mastery of this last bastion of expertise, there was no way in which women could claim they were capable of carrying out all professional expectations.

On the other hand, many who denied women access to medical practice used surgery to prove their point. It was ‘lamentably ridiculous’, scoffed the *British Medical Journal* in April 1859, that a ‘British lady’ could perform ‘all things that are done in the ordinary course of hospital duties’, especially surgical procedures.¹¹ Even for those who approved of women entering the profession, surgery was the one aspect of medical life which they found unpalatable and impossible to equate with femininity. When Elizabeth Blackwell visited London in 1859, the *Englishwoman’s Domestic Magazine* reported on talks she gave to the Marylebone Institute about the need for female practitioners. Although Maria Susan Rye, the article’s author, wrote supportively about ‘Dr Elizabeth’s’ attempts to open up new outlets for female employment and the inevitability of women’s entry into the medical profession, she struggled to reconcile Blackwell’s gender with the performance of surgery. Rye expressed surprise at Blackwell’s physical ‘womanliness’, given her choice of career, but stumbled when considering how someone ‘whose hands not unfrequently reek with gore, [...] can possibly, by any stretch of the imagination or charity (though both qualities are remarkably elastic) be possessed of the same nature or feelings as the generality of women’.¹² For Rye, Elizabeth Blackwell was an exception to the rule, but her uniqueness was incompatible with her femininity. The possibility of her operating, indeed, made Rye, and many others like her, shudder with gothic horror.

This dismissive view has affected the ways in which historians of medicine have written about surgical practice and, by extension, the possibility of women operating. Ludmilla Jordanova—from a feminist perspective—has claimed that ‘Clearly, surgery is a male act’: a violent attack upon the body.¹³ If we extrapolate from this, when women wield the knife, therefore, they are making a political statement about their willingness to invade and ‘mutilate’ their own sex. Ann Dally has, correspondingly, defended the nineteenth-century woman doctor by explaining her decision largely to confine herself to ‘gentler’ fields of practice, to support non-invasive procedures and

preventive medicine.¹⁴ More recently, Ilana Löwy and Ornella Moscucci have explored women surgeons' turn towards non-surgical means of treating cancer in the early twentieth century.¹⁵ This move in favour of radiotherapy, away from radical surgery, is seen as symptomatic of female practitioners' ongoing doubts about the wisdom of resorting to surgical procedures. In many ways, the history of medicine has kept apart women and surgery in a similar fashion to those who aimed to do the same in the past. It is a viewpoint that can also be found in historical sources; for example, an article from the *Lady's Pictorial* of August 1910 stated succinctly: 'A woman doctor once told me that she thought in the future women would succeed in almost abolishing surgery, save in cases of accident. All their methods tend to prevention. To this end they are attaining meanwhile by becoming magnificent surgeons'.¹⁶ If women operated at all, it was reluctantly, though professionally. The female surgeon's fundamental aim was surgery's abolition. Both in contemporary objections and in the history of medicine, women and surgery remain polarised.

However, if we look at the historical evidence, women who became surgeons did so precisely because they believed surgery was the best option, for themselves and for their patients. Elizabeth Garrett Anderson, who had sat and listened to Elizabeth Blackwell in her 1859 lectures, felt inspired to become the first woman to qualify as a doctor in Britain six years later.¹⁷ Although Garrett Anderson claimed in a letter of 1870 that surgery was 'not my line', she devoted her career, for good or ill, to ensuring that women did not shirk surgical responsibilities.¹⁸ It was, after all, a key part of every single student's training and would, in the form of minor procedures, make up some of a general practitioner's duties. For Garrett Anderson, women were not to be mere adjuncts to surgery; they needed to be in the operating theatre, showing they could operate in ways their detractors assumed they could not. In so doing, they needed also to retain their femininity and prove that women would not 'unsex' themselves by taking up a scalpel. Garrett Anderson's letters to her friends and family in the early days of her cobbled-together training stressed the importance of appearing womanly and attractive, in order both to confuse those expecting otherwise and simultaneously to charm them into disregarding the 'gory' hands. She chose as a working dress in 1863 a 'delightful gown of pre-Raffaelite [sic] brown' which, in spite of nine weeks of 'hard and constant wear', had not lost 'its colour or freshness of look'. Such a look, she noted with pleasure, would 'satisfy' even the most 'sour critical eyes'.¹⁹ Similarly, when she obtained her qualification in 1865 at Apothecaries' Hall, Garrett Anderson commented on her ability to be 'dreadfully crafty' in her dress. She sat through her *viva voce* rather amused than otherwise at the pity directed towards her. 'I went to the Hall', she remarked, 'daintily dressed in pale feminine colours and wore my meekest manner': 'The two had their effect for all the notices have protested with astonishment that I am really not masculine!'.²⁰ From the first operation she experienced in 1860, Elizabeth Garrett Anderson wanted to link the

excitement and the ‘quickening [...] vitality’ she felt when observing surgical procedures with the assistance provided by ‘being as much as a lady as lies in one’s power’.²¹ A combination of the two could encourage belief in the compatibility of women with surgery.

If medical women could look suitably feminine while passing examinations, then the next step was to convince others that they could also hold and direct a scalpel. Beyond moral qualms, the presumption that women could not be surgeons focused on two interconnected reasons: mental and physical weakness. Before the advent of anaesthesia in the mid-nineteenth century, surgery was carried out with brute force, but it required, simultaneously, thought and consideration. With a struggling patient, the surgeon had to be quick and forceful, while making instantaneous judgments about the risks both to themselves and to the patient on the operating table.²² Christopher Lawrence has remarked that the reason why the history of surgery has been sparsely studied comes down to ‘the practical nature of surgical intervention’.²³ It was, indeed, precisely this practical aspect, coupled with those intellectual considerations always stressed by surgeons in the face of jibes at the manual character of their profession, which prevented contemporary opponents from considering women as potential operators. Put simply, women did not have the courage to pick up a scalpel and cut open human flesh. They needed support, argued one detractor in 1907, and were unable to take the initiative necessary to plunge into surgical practice. Female ‘temperament’ was unsuited to surgery because women did not possess the nerve to proceed. Even if they did, they were unable to bear responsibility for their actions:

In the case of a surgical operation the man is satisfied with doing his level best, and if the patient died he would think it could not have been helped. But a woman would worry herself over it while operating, and even afterwards, and the consequence is that the next patient suffers also.²⁴

In 1903, the suicide of a Royal Free Hospital (RFH) locum, Sophia Frances Hickman, who had expressed her terror at the magnitude of surgical responsibilities, added weight to the comments of detractors.²⁵ Weak-wristed, weak-willed and plagued by doubt, female surgeons were impossible, for the good of the profession, but also for the benefit of any future patient.

Alongside strong mental and physical powers, however, nineteenth-century surgeons focused upon the delicacy of surgical procedures. The gradual acceptance of anaesthesia, antisepsis and asepsis, along with new instruments and operating techniques in the second half of the century, made surgery both slower and more intricate.²⁶ Instead of having to complete an operation as quickly as possible before the patient bled to death, new haemostatic tools,²⁷ unconsciousness and practical measures adopted to prevent infection meant that the number of possible operations multiplied and abdominal procedures became a more precise and successful reality. As Thomas Schlich has noted, the best surgery moved from, in the early nineteenth century,

the 'heroic, daring, fast and energetic', lion-like qualities, to the less leonine ideals of 'fastidiousness, gentleness, conscientiousness and slowness'.²⁸ The required lightness of touch allowed women to make links, half-serious, half in jest, between their physique and the deftness needed for more complex surgery.²⁹ As Dr. Jane Walker made clear in an obituary of her former surgical colleague Mary Scharlieb in 1930, 'beautiful' operative skills, such as those possessed by Scharlieb, were based upon 'delicacy of touch', small hands, and the knowledge and practice of needlework. However, the 'smallness' of these attributes contrasted spatially with the 'big' surgical procedures which she carried out in her career. This discrepancy, rather than widening the gap between women and surgery, in fact brought them together as an easy and natural pairing.³⁰ A new style of performance called 'physiological surgery', as Schlich has argued, was slower than the speedy brilliance of the past, but it was also exact, precise and disciplined.³¹ That women entered the profession when changes were beginning to happen in surgery was fortuitous, because it allowed them to argue that they were ideally suited to more complicated ways of operating.

Specialised employment raised, however, another obstacle for women who wanted to devote themselves to surgery.³² Once the early battles had died down with the opening of the London School of Medicine for Women and its award of University of London degrees in the 1870s, female medical students could receive an uninterrupted education. Postgraduate training and hospital positions still eluded those keen to pursue surgical careers. But, as Mary Ann Elston has shown, in the face of opposition, women established their own institutions when they were turned away from existing ones through prejudice or suspicion.³³ The New Hospital for Women (NHW), set up initially by Elizabeth Garrett Anderson as a dispensary in 1866, began strategically to develop its surgical expertise and publicised its dedication to carrying out life-saving surgery. Patients attending St Mary's Dispensary did, indeed, require 'almost purely surgical treatment'; by converting itself into a hospital, the dispensary followed its patients' requirements and needs, while simultaneously supporting the cause of the woman surgeon and her quest for surgical experience.³⁴ In so doing, argued Garrett Anderson's sister, the suffragist Millicent Garrett Fawcett in 1910, the NHW had 'proved the fallaciousness of the old-fashioned idea that women could not possibly do the work of surgeons, and were suited only to "smoothing the pillow" of their patients'.³⁵

What publicity about the hospital kept quiet was that, to begin with, not all operations were carried out by the female staff. Indeed, they leaned heavily on the men listed as consultants to the institution, while women surgeons-in-waiting watched or assisted.³⁶ The extra training afforded in this way, behind the closed doors of the operating theatre, was vital to the growth of female surgical experience, but it also led both to an over-confidence in abilities and increasing divisions between medical women themselves. Despite the fact that, according to her daughter, Garrett Anderson 'never enjoyed operating', she pushed the hospital into undertaking new and controversial procedures,

which, however, were not always successful.³⁷ Ovariectomies, nephrectomies and a splenectomy revealed that women were as capable as men of attempting risky and dangerous operations.³⁸ While procedures such as these characterised the experimental nature of surgery in the last quarter of the nineteenth century, as Sally Wilde has shown, they had an added effect for the woman surgeon, who was herself perceived as risky and dangerous.³⁹ Considerations about risk, as Schlich has put it, are vital to 'whether a medical novelty gets accepted or not'.⁴⁰ The doubly-novel woman surgeon courted additional infamy over what some perceived as the 'mutilation' of her own sex. Rather than shy away from risk-taking, Garrett Anderson made it part of the mission to promote surgery by women for women.

For some, this was fundamentally unacceptable. Elizabeth Blackwell berated her younger colleagues for aping the confident swagger of masculine behaviour by vivisectioning their own sex solely for professional advancement.⁴¹ This was, of course, precisely the image Garrett Anderson had been trying to avoid. A ruthless scalpel-wielding female surely had no right to imply that she had the best interests of her patients at heart. While Blackwell did believe women could and should operate, the way in which they did so was worth consideration. If they removed organs, especially the generative system, without thinking about the consequences for the female patient of their actions, then women surgeons were no better than their male counterparts, keen to cure hysteria or other 'feminine' disorders. This warning from the *grand dame* of medical women was not ignored, and led, in the event, to the toning down of public statements from Garrett Anderson and her effective gagging by the Managing Committee of the NHW.⁴² Importantly, though, it did not stop women from attempting to cure through surgical procedures, nor would it prevent them from experimenting with new methods or processes and then adopting them. In this respect they were no different to their male contemporaries and this should be acknowledged. When Garrett Anderson retired from the New, Mary Scharlieb took over and was designated Senior Surgeon in 1893. The women who attended the New suffered from more than just gynaecological complaints and the 1890s witnessed the growth of operations on the bladder, stomach, kidney, liver and rectum.⁴³ Scharlieb's skills gained her the first position held by a woman in a general hospital which was not run by women when she was appointed to run the Gynaecological Department at the Royal Free Hospital (RFH) in 1902. The RFH was linked with women's medical education since it had become, in 1876, the place where the London School of Medicine for Women students carried out their clinical studies.⁴⁴ By appointing Scharlieb and her assistant Ethel Vaughan-Sawyer, the RFH signalled its commitment to advancing women's surgical cause in the early twentieth century.

The New Hospital saw the development of a wider range of operative procedures under Scharlieb and later under Louisa Aldrich-Blake, who, among other things, pioneered her own method of rectal surgery for cancer.⁴⁵ Correspondingly, Ethel Vaughan-Sawyer at the RFH adopted the controversial

Wertheim's operation for carcinoma of the cervix. This was considered a 'heroic operation' by some contemporary sceptics, alarmed at its radical nature.⁴⁶ In this procedure the womb was taken out by the abdominal rather than vaginal route, the cancerous cervix was encapsulated by a clamp which bore Wertheim's name, and cellular tissue and lymphatic glands were also removed in case they too were infiltrated with malignancy.⁴⁷ Löwy has remarked that women did carry out this procedure, but both she and Moscucci conclude that female surgeons turned towards less invasive, non-surgical methods by the 1910s.⁴⁸ At the RFH, however, Wertheim operations were prevalent in the 1910s and, indeed, reached their peak at this period. This pattern was also found at the New and the recently established South London Hospital for Women and Children, founded by two of the New's former surgeons, Maud Chadburn and Eleanor Davies-Colley.⁴⁹ Thus, where cancer was concerned, women surgeons held tightly onto the scalpel in the first two decades of the twentieth century.⁵⁰ Radiotherapy or X-ray treatment was prescribed only as a palliative measure for absolutely hopeless cases and the dying. Indeed, early use of radiotherapy troubled many practitioners, as Caroline Murphy has noted, and before World War I it appeared 'on the fringes of quackery and orthodoxy'.⁵¹ It might be argued, therefore, that women surgeons were, once again, mirroring the actions of their male colleagues, in order to avoid accusations of substandard or malpractice. Yet, this would deny that radical surgical procedures were seen, by those who carried them out, as the best possible means for the recovery of the patient. As the extensive case notes at the Royal Free indicate, Mary Scharlieb, Ethel Vaughan-Sawyer and Lady Florence Barrett would rather try to cure their patients through surgical means than simply send them out without a hope.

The confidence gained through experience and the turn to radical procedures in the 1900s and 1910s allowed women surgeons to embrace the opportunities offered to them when World War I broke out in 1914.⁵² Initially, they were few, as suspicion still lingered about the efficacy of a woman in an operating theatre, especially when that arena was on or near the battlefield. Historians have acknowledged the contribution of women surgeons to World War I and research has been particularly strong in this area.⁵³ It would be hard to ignore their endeavours, indeed, as contemporary newspapers were full of the achievements of those at home and abroad who were actually operating on the opposite sex for the first time (Fig. 2). The deeds of the Scottish Women's Hospitals across Europe, from France to Russia, and the Women's Hospital Corps, at first in France, and then at home in Endell Street Military Hospital, were eagerly watched as much by supporters of women surgeons as those who hoped that the experience would prove too much for women to cope with and reveal their weakness. Unfortunately for the latter, the successes outweighed the failures. It was recognised by most who were involved that wartime conditions were exceptional and temporary, but that women had ably managed in extremis. Indeed, female surgeons had in many instances

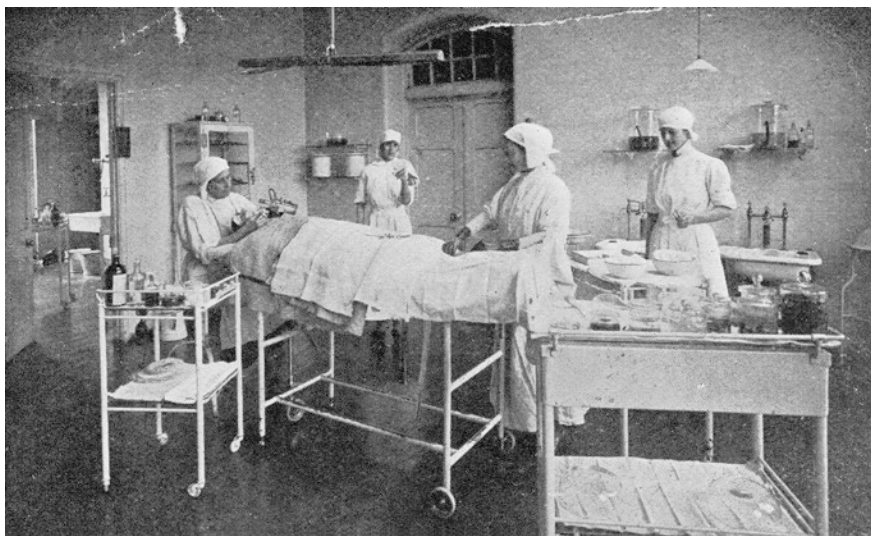


Fig. 2 Operating Theatre, Endell Street Hospital Calendar (1919), Wellcome Library, London

carried out more abdominal surgery before the conflict than some of their male counterparts. Although this was admittedly on their own sex, they approached the challenges of modern warfare, which even the most hardened military surgeon had not experienced before, with enthusiasm. As budding surgeon Lydia Henry remarked in her post-war *Reminiscences* (1920), she ‘felt equally competent to deal with war injuries, given an opportunity’.⁵⁴ When that chance arose, women surgeons were only too aware they needed to take it, to prove both to themselves and to their detractors just what they were capable of achieving.

Correspondingly, it is vital to note, and this is an aspect of women’s service in World War I which has not received as much attention, that women were also taking on surgical positions available usually only to men at home. Additionally, the number of female medical students increased rapidly during the war years, although many did not ultimately finish their course.⁵⁵ As A. H. Bennett reported for the suffragist periodical *Common Cause* in April 1915, debates about medical women’s promise were taking place even in railway carriages, where the upshot was, simply, “‘We want more of them’”.⁵⁶ Shortages meant that medical schools which had never previously considered admitting women students began, reluctantly, to welcome their fees, with the proviso that this was a short-term measure due to the exceptional circumstances of wartime.⁵⁷ Women entrants to the profession achieved near parity with their male counterparts across the undergraduate years by May 1918. Those who had begun their course when there was a widespread panic in the press about the shortage of practitioners in 1915 formed nearly half of

all third-year medical students in 1918.⁵⁸ It was remarkable that no more than 10% of medical students were female before World War I and there were 1000 on the Medical Register,⁵⁹ yet in 1918, there were 665 first-year students alone.⁶⁰ With the absence of male doctors, serving at the front in various capacities, hospital posts were opened up rapidly to women. These included all levels, and provided women with the wealth of surgical experience that they had wanted for decades.

Louisa Aldrich-Blake, for example, took on male, as well as female cases at the RFH. Many were quotidian and uneventful, but the variety of different diseases and injuries seen between 1917 and 1920, which are detailed in the extant patient records from this period, must have been exciting.⁶¹ Aldrich-Blake carried out orthopaedic surgery on her male patients, treating injuries which had resulted, for example, from Zeppelin raids. Industrial accidents to men and to women, especially in munition work, also formed a number of her cases. Some were military men, who were suffering from the effects of their initial injuries, with the shrapnel still trapped in their bodies affecting their return to civilian life.⁶² As can be seen from a brief glance at the case-load of Aldrich-Blake, just one of a whole number of female surgeons, World War I provided women with new experiences, both near the battlefields and on the home front. This widening of surgical opportunities was a temporary phenomenon, as those who took advantage of it were well aware.

What came next requires further consideration by historians of medicine, but it is important to recognise that barely 60 years before, female surgeons were considered an impossibility. From the mid-nineteenth century, debates about women's right to practise were often focused on concerns over their surgical capabilities. By 1918, they had more than proved that doubts were unnecessary. That they had become increasingly visible was to be seen every day in the press coverage of the conflict. It remains for that visibility to be translated more generally into the history of surgery to return women surgeons to the operating theatre. What went on while they were inside is another story waiting to be told by historians.

PATIENTS

Roy Porter's 1985 claim that the history of medicine is 'about doctors, what they know, what they do' to the detriment of the sufferers' narrative rings doubly true when that patient is a woman.⁶³ If women surgeons have been peripheral to the history of surgery, female patients have been prominent. However, they have mostly been considered only as victims of brutalised men, who tore out organs of generation, against the will of their patients, to keep them quiet. A year after Porter's exhortation to action on behalf of narrative from below, Mary Poovey described the ways in which the male practitioner 'silenced' his female patient. The subtitle of her article 'The Medical "Treatment" of Victorian Women'—with quotation marks pointing to the passive character of these females—signals the general stance of her

investigation right away.⁶⁴ This perspective has interesting parallels with Victorian ideas, since analyses such as Poovey's mirror the horror felt by nineteenth-century anti-vivisectionists at experimentation and surgical procedures that violated the passive, unresisting body, whether that be of animals or women. Gynaecological surgeons have been the especial focus of attacks both by campaigners in the late nineteenth century and feminist historians of more recent years. In 1976, G. J. Barker-Benfield wrote in *The Horrors of the Half-Known Life* of American male 'anxieties' surrounding female sexuality, which resulted in castrating surgery, such as ovariectomy, hysterectomy and clitoridectomy, intended to impose order and submission on unruly female bodies.⁶⁵ This so-called operative 'itch' was recognised at the time, as Elizabeth Blackwell remarked in her *Daily Chronicle* critique of reckless late nineteenth-century surgery. Indeed, the Beatty versus Cullingworth case was only one prominent example of wanton surgical disregard for patient requests. Despite strict instructions to her surgeon not to remove both her ovaries, Alice Beatty woke up without them; Charles Cullingworth having gone against Beatty's demands for, as he claimed successfully in court, her own benefit.⁶⁶ There are plenty of examples, indeed, to back up accusations that patients found themselves at the mercy of unthinking, uncaring surgeons.

However, the view of the passive, victimised female patient only covers one side of the story. To deny patients any agency in decision-making or to assume their passive acceptance of radical surgery ignores the ways in which women patients actively resisted or, in fact, sought out a specific treatment. As Porter argued over thirty years ago, to assume such a one-sided relationship between patient and practitioner, would be a 'major historical distortion'.⁶⁷ Regina Morantz-Sanchez has criticised Mary Poovey's stance, for example, by asking how and by whom medical men were employed, positing that it was likely to have been the supposedly passive female patient who had requested their attendance in the first place.⁶⁸ More recently, Sally Wilde has focused on widening surgical encounters beyond the doctor-patient duality. Patients were not always influenced by their practitioners and brought many other pressures to bear upon their decision to undergo or refuse surgical procedures. Surgeons, especially during the age of experimentation in the late nineteenth and early twentieth centuries, were unsure about outcomes and needed to establish a bond of trust with patients because of this.⁶⁹ Detailed studies of case notes, meanwhile, such as Lynsey Cullen's of the Royal Free Hospital or Ortrun Riha's of Göttingen University Hospital, have explored the ways in which patients approached and negotiated with institutions.⁷⁰ Although time-consuming archival work is required for such study, and case notes have their own peculiar problems, the potential reward of such work for the historian of medicine is greater insight into the complex, day-to-day relationship between patients and practitioners, which could in practice be far from hierarchical.⁷¹ It only takes a brief glance into Alice Beatty's lengthy correspondence with the West London Hospital, to realise that patients did not simply give up quietly when they felt aggrieved, however heartbreakingly impotent their protests.⁷²

Case notes offer fascinating ways in which medical women's rhetoric can be put to the test. While supporters of women's right to enter the profession stressed the importance of women treating their own sex, patient records indicated that the relationship between female surgeons and their patients was far more tense than has previously been acknowledged. My own study of female patients treated by women surgeons at the RFH in London has brought up a number of issues.⁷³ An especially noteworthy finding was that not many of the patients had even seen a woman doctor before their experience of being treated by one at the RFH. Fear of examination, of a stay in hospital away from employment, husband, or young children, recourse to self-treatment and shame all prevented female patients from seeking advice—even from their own sex. Indeed, some ignored or dealt with symptoms themselves for decades before eventually visiting a practitioner. When in hospital, women resisted examination, held themselves rigid, and sometimes refused to be prodded and poked with or without anaesthetic. They also discharged themselves if dissatisfied or if they were unwilling to undergo an operation. In some instances, however, female patients, when presented with the likely outcome by their surgeons, actually insisted upon even the most strenuous surgery. This was especially noticeable in cases of malignant disease, where the majority of patients took little persuading to undergo extensive surgical treatment for their conditions. There were exceptions, of course, and not everyone listened to the advice given; some would return, their minds having been changed by ongoing pain, but others were never seen at the hospital again. The latter did not necessarily give up; many patients attended several different hospitals, choosing where best, for whatever reasons, to visit. Some were influenced in seeking cures by others, whether family, friends or strangers, and some were put off from undergoing procedures by similar connections. What is most important to establish is that there was not just one type of female patient, in the same way that the woman surgeon did not, in fact, correspond to the collection of fantasy and reality her detractors had her be. Patients and surgeons alike negotiated their way through the complex world of the late nineteenth- and early twentieth-century medical marketplace. They did not always see eye to eye with each other or with male professionals, but they were actively engaged in advancing their own cause.

CONCLUSION

When women are placed back into the history of surgery as active participants, new avenues open up for research into the ways in which surgeons and patients operated. Even with criticism from their own sex, female surgeons took up the knife and participated in the changes and controversies which drove surgical theory and practice in the second half of the nineteenth century and beyond. It is vital to consider women's contribution as members of a developing profession, especially in the key field of abdominal surgery, where they took the greatest risks. Also fundamental was their relationship with

patients. Although, until World War I, and indeed after, their caseloads were limited to women and children, this should by no means preclude studies of the interaction between surgeons and patients, as well as the wider social networks surrounding both. While the history of medicine has sought to reclaim the patient voice over the past thirty years, there needs to be more research into reasons for compliance with or resistance to surgical practice. If surgery had become safer and more precise by the early twentieth century, why did complaints about practise and refusals to be operated upon still occur, even when a practitioner was the same sex? Can the reasons why there is still antagonism between women's lives and surgical practice be traced back to the history of their controversial entrance into the medical profession? Whether women's reappearance in the history of surgery, alongside research carried out by, for example, Schlich on surgical styles and techniques, will encourage a rethinking of the discipline's pervasive 'macho culture' remains to be seen. The chapters in this volume reveal the wealth of current study in the history of surgery. By placing women back into the operating theatre, it is possible to explore historical circumstances where not every surgeon was male, not every patient female and surgery was not necessarily a male act of violation.

CODA

In an interview of February 2015, Clare Marx, first female President of the Royal College of Surgeons, remarked that she has removed the pictures of dead men from her presidential office and replaced them with those of living women surgeons. Notably, however, she works primarily in the little room next door, effectively apart from her contemporaries. She explained, 'cautiously', the perceived lack of fit between women and surgery: 'Part of this [...] is that they don't see enough women, dare I say it, at the top of their profession that are normal rather than superwomen'.⁷⁴ A history of women in surgery could provide a trajectory for aspiring female surgeons to work through the reasons why those 'normal' women are imperceptible. As Jane Walker concluded in 1930, Mary Scharlieb's surgical skills were such that a woman operating became 'the most ordinary thing in the world'.⁷⁵ The presidential office could do with an additional set of pictures to make visible and value those in the late nineteenth and early twentieth centuries, who first aimed to close the perceived disjunction between women and surgery.

NOTES

1. See Hilary Marland's wide-ranging survey of 'Women, Health, and Medicine' in *The Oxford Handbook of the History of Medicine*, ed. Mark Jackson (Oxford: Oxford University Press, 2011), 484–502.
2. 'First Female President Elected to the Royal College of Surgeons', accessed 31 May 2016, <https://www.rcseng.ac.uk/news/first-female-president-elected-at-the-royal-college-of-surgeons>; Sally Davies, *What organisations can do*

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Nursing and Surgery: Professionalisation, Education and Innovation

Rosemary Wall and Christine E. Hallett

Focusing on the 100-year period from 1853 to 1953, this chapter examines both the roles nurses played within major developments in surgery in the Anglo-American world and the influence of surgical developments on the nurses' role in healthcare. Three thematic strands run through this chapter: professionalisation, education and innovation. The structure is broadly chronological, examining the multiple functions of nurses in the development and implementation of surgical techniques. Nursing practices, including pre- and post-operative care were essential to the survival of patients, especially for those undergoing newly introduced operative techniques. Nurses' provision of antiseptic and aseptic equipment and supplies enabled surgeons to develop increasingly complex surgical procedures that required more and different nursing support. War features prominently within the chapter as innovations were often stimulated by conflicts, with nurses providing practical and emotional support for patients.¹

The significance of the history of nursing for the history of surgery is often underestimated. Surgical nurses have not been completely absent from historical accounts, but usually the topic is discussed only in brief segments on nursing education, on infection and anaesthetics, or in the form of general references to Florence Nightingale.² Even Graham Ayliffe and Mary English's

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account of the history of hospital infection does not explore the essential part that nurses and matrons played in providing germ-free operating and post-operative care environments.³ Peter Stanley's history of surgery from 1790 to 1950 mentions tasks performed by nurses, and histories of particular aspects of surgery such as Stephanie Snow's history of anaesthesia and Emily Mayhew's history of plastic surgery in World War II have briefly highlighted the often hidden role of the nurse.⁴ The role of nurses in surgery has also appeared within a variety of studies of the history of nursing.⁵ But the full complexity of surgical nursing work has rarely been addressed. The most detailed account has been Christine Hallett's *Containing Trauma*, which explores the emerging tensions encountered by military nurses during World War I.⁶ Weaving in original research on education and practice, this chapter synthesises the historiography on nursing and surgery in the UK and North America from the mid-nineteenth to the mid-twentieth centuries, exploring innovations, continuity and the influence of gendered perceptions of surgical roles.

SURGICAL NURSING, GENDER AND AGENCY

As with the history of nursing in general, the history of surgical nursing has an important gender dimension. Tasks relating to surgery that were carried out by professionally trained nurses included cleanliness, hygiene and caregiving, responsibilities that have been linked to women's domestic role in the household. Vanessa Heggie has discussed the metaphor of the family within the hospital: the male doctor as the father, the matron as the mother, and nurses as servants—a gendered hierarchy that was difficult for the other women in the operating rooms, the female doctors, to overthrow.⁷ Following Nightingale's reforms, professional nursing in the UK and North America was a female profession, and nurses' gender affected their authority. In the USA the profession remained largely female until the 1930s when the number of men recruited started to increase during the economic depression, as room, board and a stipend were provided during training, but only 1% of US nurses were men between 1958 and 1960. In the UK, men were not even included in the General Register until 1947. Although men could be asylum nurses, only seven British nurse training schools accepted men for general training; this had increased to 24, and five further affiliated schools by 1945. Ex-servicemen were encouraged into nursing in the 1940s.⁸ Yet division of roles by gender was not completely straightforward. From the perspective of gender history, Alison Bashford has argued that women did not merely provide a service for doctors who were increasingly recognising the value of a clean hospital environment; they were driving change as part of 'middle-class women's philanthropic culture' and could wield power in the hospital.⁹ When the Nightingale Nursing School opened at St Thomas' Hospital, London, in the 1860s, surgeon John Flint South commented that 'lady' nurses wanted

to exert 'executive' authority over hospitals as they had in military hospitals, including overseeing the organisation of nursing.¹⁰ At Guy's Hospital, London, doctors' authority within the hospital was challenged by the Matron and nurses; in order to resolve the dispute, nurses theoretically became subordinate to the medical staff in 1881, but this was not straightforward in practice with the Treasurer, Superintendent and Matron arguably retaining some responsibility for nurses.¹¹

Female physicians and surgeons disrupted the idea of a straightforward gendered hierarchy within the hospital even more.¹² In turn, in the mid-nineteenth century, the reality of nursing practices complicated the arguments against female doctors touching male bodies. Elizabeth Blackwell, a pioneer female surgeon, commented on the double standard that nurses could have close bodily contact with men, for example when inserting enemas, whereas it was controversial for female doctors to do the same.¹³

During the last three decades of the nineteenth century, nurses, once merely the drudges of the hospital, were emerging as the highly trained and disciplined guardians of order, hygiene and sanitation. By the turn of the century, Patricia D'Antonio suggests, their image was one of 'competence, coolness, courage—and control'.¹⁴ The maintenance of order was a key element in surgical nursing practice. Before the introduction of anaesthesia in the 1840s, the surgical operating room had been viewed as a place unfit for women of any class.¹⁵ The need to operate rapidly upon a conscious patient produced a macho environment in which skills in cutting and sawing were given precedence over what were seen as the more feminine attributes of care and sympathy.¹⁶ The invention of anaesthesia transformed both the culture and practice of surgery. Where, previously, the emphasis had been on the strength and speed of the surgeon, the focus now was on his dexterity and finesse—a change that made it possible for women to take on an auxiliary, though active, role in surgery. Female nurses were thus becoming an integral element of the emerging surgical team for many decades to come. Roger Kneebone and Abigail Woods have highlighted the importance of all members of the surgical team and demonstrated that the scrub nurse has indeed a certain degree of agency through a re-enactment of a 1980s' operation, where the nurse suggested instruments and anticipated what the surgeon would require. Yet even within this re-enactment there was continuity with the nineteenth century in that, as Kneebone and Woods note, the surgeon's role in the operating theatre is like that of the 'lead actor in a play'.¹⁷ Indeed, in her work on US gender studies, Margarete Sandelowski has discussed the risk of nurses being seen as subordinate by being allied to 'technologies' serving the doctor. Despite nurses' influence on the design of new devices, their standing in the operating theatre could be devalued by being seen as a tool, with a surgeon referring to a nurse as an 'instrument' in the late nineteenth century, and with the roles of nurses 'bound' to machines and equipment by the 1930s.¹⁸

NURSING AND SURGERY BEFORE ANTISEPSIS: CIVILIAN AND MILITARY HOSPITALS

Even before Nightingale's reforms during the Crimean War in the 1850s, and continued at St Thomas' Hospital, London, in the 1860s, female nurses had worked with surgeons. In the early nineteenth century, St Thomas' records reveal nurses helping surgeons by taking away used bandages and providing clean ones.¹⁹ At St Bartholomew's Hospital in London Sister Rahere (of Rahere Ward) taught the house surgeon how to 'compress a posterior tibial artery' and a nurse at St George's was recorded as understanding how to care for aneurisms.²⁰ Therefore, when Florence Nightingale assumed her position as the Superintendent of the Establishment for Gentlewomen during Illness at Upper Harley Street, London in 1853, her interest in surgery was unusual but not unique. She 'was on hand' at operations, 'closely observing and ready to administer the new anaesthetic, chloroform, or tie up an artery.'²¹ Not all of her encounters with surgical patients were positive, with a woman losing her sight when an operation to remove a cataract went wrong during her time as Superintendent. Her experiences of surgery at Upper Harley Street built on her training at the Institute of Deaconesses at Kaiserswerth on the Rhine, where during her second visit in 1851 she attended surgical operations. This institute for Protestant deaconesses included a school, an orphanage, a penitentiary and asylum for the transition of released female prisoners into society, and a hospital, where deaconesses could be trained in nursing, which included weekly lectures from the founder, Pastor Theodore Fliedner.²² Nightingale's first encounter with an amputation at Kaiserswerth must have taught her about the risks of mid-nineteenth-century surgery. Her account in her journal began with a description of a 'beautiful operation'. The procedure was performed under chloroform, and, as she wrote, the '[t]aking up of the arteries [was] beautiful' and the '[s]awing of the bone momentary'. Yet later that evening complications had occurred with 'disease' affecting the skin so that there was not enough skin to fold over the wound. Just over a week later, after contracting typhus, the patient died.²³

Nightingale's interest in surgery continued when she arrived at Scutari in 1854, as Superintendent of the Female Nurses in the Hospitals in the East during the Crimean War. She wrote letters home, describing the wounds she encountered. When Marianne Estcourt visited her brother Major-General James Estcourt, she reported in her diary in January 1855 that 'Capn. Jordan tells us that Miss Nightingale loves an operation to such a degree that she is always told what are going to be performed'.²⁴ Lieutenant-General Sir John Burgoyne perceived her interest in observing surgery as inappropriate for a woman, and wrote that 'Miss Nightingale ... seems to delight in witnessing surgical operations with arms folded'.²⁵ Assistant-Surgeon Alexander Struthers claimed that a man had been kept waiting on the operating table for 15 minutes until she was found, as Nightingale had insisted on attending every operation, a claim which led to a discussion within the Government

which her friend, the Secretary at War Sidney Herbert, had to 'counter'.²⁶ Yet, Nightingale was attuned to the connections between surgery and patients' emotions; she screened off the beds of patients when amputations took place as if a man 'saw his comrade today die under the knife it ... diminishes his chance'.²⁷ These operations were often performed without effective anaesthesia because Sir John Hall, the Inspector General of Hospitals and Chief of the Medical Staff in the Crimea, initially advised against the use of chloroform, influenced by the idea that the pain of surgery was a stimulant when patients were in shock.²⁸ However, chloroform was commonly used later in the war, in over 60% of operations in December 1855.²⁹

With the introduction of anaesthesia in 1846, operations were in the process of changing, and, as a result of the acknowledgement of the significance of diet and cleanliness, the importance of hospital nurses in general was increasing. As a result of these changes, the need for trained nurses had already been apparent before Nightingale left for Scutari, an argument which has been clearly made by Carol Helmstadter and Judith Godden.³⁰ As the number of London medical schools grew to 12 in the first half of the nineteenth century, doctors increasingly admitted acutely ill patients for teaching purposes. This was against the hospitals' policies, as, except for accident victims, House Committees were supposed to admit patients based on Governors' recommendations.³¹ Therefore the types and numbers of operations grew from the 1830s, even before effective anaesthesia, with some surgeons arguing for the significance of post-operative nursing care as being more important than 'surgical skill'.³² This influx of patients came with higher demands on the nurses' workload.

The activities relating to cleanliness which increased this workload were already underway before the Crimean War, and also prior to Louis Pasteur's work on microbes in the late 1850s, and Joseph Lister's innovations in antiseptics in the 1860s.³³ Following the Napoleonic Wars, efforts were made to combat cross-infection from gangrene. These efforts included the use of boiling water to purify bandages, ventilation and removal of excrement from the wards, as well as washing patients. In 1842, Robert Druitt argued that 'utmost care' must be taken to prevent infection spreading from patients with gangrene via 'sponges or dressings, or even by the fingers or instruments of the surgeon'.³⁴ Some surgeons felt that using the same sponges for different patients' wounds was risky, and Nightingale was already aware of this in Scutari.³⁵ Ayliffe and English provide several examples of disinfectants which were used with dressings from the early nineteenth century.³⁶ So, although Ignaz Semmelweis' demonstration that handwashing could reduce the number of maternal deaths following childbirth was not widely disseminated in the 1840s, other efforts to keep wounds clean were tried out and some of them were becoming routine procedures. A report published in 1864 by physician John Bristowe at St Thomas' Hospital, London, and surgeon Timothy Holmes at St George's Hospital, London, stated that a 'clean technique' was increasingly the standard practice for treating local wounds, and

that dressings were being discarded after one use, or that sponges were used for individual patients before being either thrown away or ‘chemically purified’. Jobs like cleaning sponges, making dressings, helping surgeons by taking away used dressings and providing clean ones, and cleaning wards fell to nurses, and were more time-consuming than the older procedures of just washing the dressings and sponges.³⁷

SURGICAL INNOVATION AND THE PROFESSIONALISATION OF NURSING IN THE LATE NINETEENTH CENTURY

Mid-nineteenth-century surgical innovations such as general anaesthesia and Listerian antiseptics were followed rapidly by the formation of the earliest hospital-based nurse training schools on both sides of the Atlantic. This was no coincidence. Although nurse-leaders were anxious to create an autonomous and distinct role for their profession, the mid-nineteenth century struggles experienced by nursing sisterhoods and reforming matrons had demonstrated that nurses could only advance their profession with the powerful support of doctors.³⁸ Their role was, therefore, moulded by medical need and, because surgery was emerging as a particularly influential arm of medicine, was increasingly driven by surgeons’ need for expert assistance. The recognition of the necessity of surgical cleanliness, which had begun with the work of obstetrical practitioners such as Semmelweiss and Oliver Wendell Holmes, had led, through Lister’s work in the 1860s to the imposition of control on the spaces in which surgical work took place.³⁹ Nurses and surgeons’ assistants (such as dressers and medical students) were made responsible for ensuring the safety and cleanliness of the operating theatre and surgical wards; the disciplined training and the new, purified image of the surgical nurse meant that she was rapidly gaining pre-eminence in this work. A rare account of such early nursing work, written from the perspective of a patient, depicts the hospital nurses of the 1860s as both fiercely assertive in their management of patients and ‘experienced and clever’.⁴⁰

The special role of the nurse in surgery was also reflected in the textbooks of the time. In 1884, Eva Lückes, Matron of The London Hospital, published her lectures to probationers at the hospital’s training school for nurses. *Lectures on General Nursing* became an influential nurse-training manual, and was, in 1898, extended and developed into a textbook under the title *General Nursing*. This was the first of a number of late-nineteenth-century textbooks that provide valuable sources of information on surgical nursing. In its many editions, the text offers an intriguing insight into the changing nature of surgical practice. Lückes advised for example, in her lectures, that the sponges used in surgical operations must be ‘thoroughly cleansed and wrung out of cold or iced water and as dry as possible,’ but she added that

if the operation is done under the carbolic spray, the sponges, after being washed, must be wrung out in 1/39 carbolic lotion, and the nurse must

remember that, in addition to the mackintosh that covers the table, two mackintoshes in very good condition will be required to protect the patient from the moisture of the spray.⁴¹

Surgical nursing practice must, according to Lückes, always defer to the surgeon's 'orders'. The nurse is obliged, for example, to comply with his decision relating to whether a procedure is done using strictly antiseptic, or merely hygienically clean techniques. While such deference was presented as being of paramount importance, it was also viewed as essential that the nurse should understand the reasons behind her actions. Lückes also emphasised the distinct role of the nurse in aftercare, which required an understanding of medical principles as well.⁴² Therefore, although the emphasis in publications such as Lückes' is on action rather than knowledge, the need for intelligent obedience was stressed too.

The involvement of nurses in administering anaesthetics differed depending on national trends. Along with enabling lengthier and more invasive operations, new problems were emerging with anaesthesia. Ether and chloroform were potentially lethal substances and surgical patients required both careful preparation and watchful aftercare. In the northern USA, ether was more commonly used than chloroform, but for both chemicals, the task was delegated to students or nurses. The medical specialism of anaesthesiology gradually developed alongside the practice of nurse anaesthetists from 1897, and from World War II onwards a certain degree of professional competition for anaesthesia emerged. In Scotland and most other European countries, administration of anaesthetics was also undertaken by nurses or students. England was an exception in that deaths from anaesthetics had to be reported to the Registrar General. Therefore, surgeons perceived that delegating anaesthesia to nurses and students was too risky, as the doctors would still be ultimately responsible for any mistakes, and so the medical specialism of anaesthesiology developed by 1900.⁴³

Nurses were also seen to contribute to modern surgery in a special way through their care, conscientiousness and compassion. The presence of the female nurse in the masculine space of the operating theatre is vividly evoked by Thomas Eakins' nineteenth century painting, *The Agnew Clinic* (1889) (Fig. 1), in which famous Philadelphia surgeon, David Hayes Agnew supervises a mastectomy performed by medical staff and observed by a large group of medical students. On the right-hand side of the image stands the composed figure of Pennsylvania Hospital nurse Mary Clymer, a lone female (apart from the anaesthetised patient) in a strikingly male environment. The figures in Eakins' painting are believed to be accurate portraits. The men sprawl on the tiered benches of the amphitheatre-style operating room—intent upon the surgical procedure that is taking place. The medical staff focus fixedly on the incision. Clymer is one of the few figures in the room—perhaps the only one apart from the anaesthetist—who is clearly looking directly at the patient's face, rather than at the scalpel wound on her breast. Clymer's own face is impassive and neutral, and her stance is upright and carefully controlled.



Fig. 1 Thomas Eakins, 'The Agnew Clinic', commissioned by the Medical School Class of 1889, University of Pennsylvania, Courtesy of the University of Pennsylvania Art Collection, Accession No. 1889.0001.

Eakins' painting has been viewed as both an important celebration of pioneering surgical work in the late nineteenth century and a representation of patriarchal medical dominance.⁴⁴ Its significance as a record of the emergence of specialist surgical nursing is less well-recognised. It shows that the surgery of the late nineteenth century was heavily dependent upon nurses such as Mary Clymer who prepared patients, assisted in operations and then supported their patients' recovery.⁴⁵

The work of preparing a patient for surgery was complex, and could only be performed by a scrupulous and conscientious worker. The patient had to be fasted to avoid the danger of vomiting. Ether and chloroform were powerful emetics, and semi-conscious patients were in danger of choking as they emerged from its effects. Ward nurses were responsible for ensuring that the patient was adequately nourished to improve his or her chances of surviving the surgery, but then strictly fasted for at least six hours prior to the actual procedure. Following the patients' return from theatre, they were required to watch them closely, monitor their condition by the frequent measurement of pulse, respiration, blood pressure and temperature; and to introduce fluids and food judiciously over a period of time in a way that would promote recovery, while avoiding vomiting.⁴⁶

Following the widespread acceptance of Robert Koch's bacteriology in surgery, practices evolved further in the 1880s. Koch's theories and techniques provided surgeons and their nursing allies with clear evidence for the role of pathogenic microorganisms in the so-called 'putrefaction' of wounds, which was now seen as 'infection'.⁴⁷ Surgery—and surgical nursing—had entered an era of 'antiseptic' thinking. It was also one into which ideas of 'asepsis'—the complete eradication of microbes from the space in which surgery took place—was beginning to take hold. In 1899, Isla Stewart, Matron of St Bartholomew's Hospital in London, published, in cooperation with a doctor, Herbert E. Cuff, her influential textbook, *Nursing Practice*. Stewart's perspective on the nature of the nursing profession was somewhat different from that of Lückes. As a member of an emerging group of professional leaders in nursing who were openly campaigning for a professional register and a recognised three-year training curriculum, Stewart was keen to emphasise that, in showing obedience, the nurse must ensure that this is not 'the dull mechanical obedience of the ignorant or uninterested. To be effective, it must be whole-minded, intelligent and loyal'.⁴⁸ She also asserted:

Curiously enough the medical profession seems to hold over-training to be the greater evil, as tending to the production of a lower order of practitioner; whereas, it is those who have been insufficiently trained and disciplined who fail to recognise the grave responsibility of disobedience, and who take upon themselves to criticise the doctor's treatment, or even to suggest what form it should take. Such an entire misconception of the duties of a nurse does not spring from an excess of knowledge but from the reverse.⁴⁹

Bacteriology transformed the practice of nursing with regard to the nurses' expertise and training. The nursing profession had already identified its core work in terms of order and sanitation. Now nurses also became the well-trained guardians of antiseptics and asepsis. Where Lückes' 1884 lectures had only mentioned antiseptics in passing as part of an explanation of the need for precision in surgical assistance, her 1898 *General Nursing* devoted 38 pages to the preparation and after care of the surgical patient in accordance with the rules of antiseptics and asepsis.⁵⁰ Published, one year later, Isla Stewart's 1899 textbook offered two chapters on the topic: Chapter XV was composed entirely of an explanation of the nature of 'contagion' and the techniques for 'disinfection'; while Chapter XVI was devoted to the 'production of surgical cleanliness'. In this chapter, Stewart argued that:

The success of the surgical nurse of the present day depends entirely on her ability to understand and appreciate the theory of 'asepsis', or surgical cleanliness, which underlies the practice of modern surgery, and her capacity for intelligent attention to the minutest details.⁵¹

She followed this with an extended description of the nature of microorganisms, including a celebratory history of their discovery, a description of

Lister's work, an extended list of the most commonly used antiseptics, and a detailed explanation of 'the production of asepsis'. Stewart devotes two pages to the sterilisation of surgical sponges, contrasting with Lückes' brief injunction in her 1884 lectures to 'wring out' sponges in carbolic solution.

By the end of the nineteenth century, surgical nursing was already a recognised specialism in the emerging profession of nursing. A vocal and influential group of nurse leaders had been campaigning for two decades for a professional register for nurses. Nurses' moral courage, skilled competence and scientific knowledge-base were, increasingly, being used as arguments in favour of professional recognition.⁵²

FROM ASEPSIS TO HIGH DEPENDENCY UNITS: 1890–1950s

Increasing the tasks performed by nurses, more and more efforts were aimed at preventing infection.⁵³ Bandages, instruments and the operating theatre itself had to be sterilised with autoclaves (containers which sterilise using steam) being developed in this period. Handwashing and scrubbing with alcohol were introduced as knowledge of bacteriology became widespread. At Johns Hopkins Hospital, William Halsted used sterile rubber gloves in 1889 in order to protect his 'scrub nurse' (whom he later married) from the corrosive sublimate hand rinse (and several years later these were also used by the operating surgeons). In the German-speaking world, Johannes von Mikulicz used sterilised cotton gloves from 1896, and they were routine in his operations from 1897. In the same year, Werner von Manteuffel published an article on the use of rubber gloves to protect the patient rather than the surgeon. In the UK, Lynn Thomas is recorded as using them in Cardiff in 1905.⁵⁴ Caps and gowns were worn from the beginning of the twentieth century and masks were suggested from the 1890s, but were rarely used until the 1930s.⁵⁵ In 1917, Russell Howard, Lecturer in Surgical Nursing and Surgeon at the London Hospital, noted the importance of nurses for these new elements in surgical procedures. He argued that the increase in surgical work meant that 'whilst the direction of the treatment remains in his hands, [the surgeon] leaves the details in the hands of the nurse', and that in an emergency, she may be required to use her knowledge of surgery to 'carry out treatment' independently until the surgeon arrives.⁵⁶ Referring to the numerous tasks involved in surgical nursing, in 1937, Henry Brookes, an instructor in Clinical Surgery at Washington University School of Medicine, and Assistant Surgeon to Barnes Hospital, implored a nurse to

write a candid picture of the surgeon, which will help him to make allowances for her shortcomings, and to realize that she also is only a human being, not a machine. It is probable that few surgeons realize what goes on behind the scenes to permit the smooth functioning in the operating room and the efficient care in the wards or rooms.⁵⁷

Brookes explained the variety of surgical nursing roles within and without the operating theatre. The operating room supervisor (a senior nurse) was responsible for correct preparation of the room, equipment and the patient. She may also have acted as the circulating nurse, who was involved in preparing the room and the patient and in getting additional supplies, as well as helping the operating team to put on and take off their gowns. The supervisor might alternatively have scrubbed up and directly assisted. The scrub nurse 'had her own table with various supplies' including getting the sutures ready. Nurses could also be involved in assisting with anaesthetics and more nurses were behind the scenes making supplies, and cleaning and sterilising equipment and the operating room.⁵⁸

From the mid-1950s, the equipment and spaces used by nurses in surgery changed again. In the USA, postoperative recovery rooms, open within weekday daytime hours, developed into critical care and high dependency units from 1953. These units enabled surgeons to develop increasingly complex surgical procedures through higher nurse to patient ratios in a concentrated space.⁵⁹ Just after the end of the period which this chapter examines, Central Sterile Supply Departments and disposable packaging for equipment were developed in the UK. This was inspired by the US military's initiative to transport packs of sterile equipment during the Suez campaign in 1956, and by a Nuffield Provincial Hospitals Trust study in the UK which found that most autoclaves were not fully sterilising equipment.⁶⁰

However, not all was subject to change. It is interesting to note that despite the innovations that occurred in hospital settings, nurses still learnt about preparing an operating theatre within the home or in hotels until the 1930s.⁶¹ The 1930 edition of London Hospital surgeon Russell Howard's *Surgical Nursing* textbook includes a chapter entitled 'The Operation', which is not about a hospital setting at all, but focuses entirely on the patient's home. Howard states in his 'Preface' that he has updated his textbook and removed unnecessary details from its original version published in 1905. So he obviously thought there was still a necessity for this chapter on home surgery in 1930.⁶² The operation used as an example is a laparotomy, as it is performed, for example, for the removal of an ovarian tumour. This was not an emergency procedure. In order to prepare for the operation, the nurse should arrive two days in advance to remove furniture, ornaments and even carpet. Further instructions included removing blinds and curtains if the room was not overlooked by 'neighbours', cleaning walls and furniture with carbolic solution, and obtaining an operating table, or using the kitchen table if necessary, or even a chest of drawers for an operation on a child, with these items of furniture to be covered by two layers of blankets and a mackintosh. Four other tables needed to be prepared for the anaesthetist, surgeon's 'instruments, lotions and swabs', sponges and pads, and dressings.⁶³ The necessity of learning these procedures is demonstrated by an optional question on the Final State Examination for the General Part of the Register from the General

Nursing Council, completed by all nurses who qualified in England and Wales in spring 1938: 'How would you prepare a room in a private house for an immediate operation?'⁶⁴

WARTIME INNOVATIONS: 1899–1953

Although there were substantial changes within civilian hospitals, with the professional nurse as a recognised figure in this environment by the turn of the century, her presence was still rare within military hospitals. Nevertheless, wartime surgical practices have been of particular interest within histories of surgical nursing.⁶⁵ Thus, historians have claimed that the South African War (1899–1902) completed the transformation of the nurse's image from one of disreputable camp-follower to one of highly-trained 'lady-nurse'. For example, the effectiveness of Princess Christian's Army Nursing Reserve nurses, combined with a recognition of the shortage of adequate nursing care for a large proportion of the wounded and sick, provided persuasive arguments for those advocating the formation of a regular army nursing service. In 1902, just before the end of the war, the Queen Alexandra's Imperial Military Nursing Service (QAIMNS) was formed.⁶⁶

By the Summer of 1914 the QAIMNS still consisted of only 297 nurses, but, when Britain declared war on Germany in the August of that year, a Reserve numbering approximately 8000 and a Territorial Force Nursing Service of approximately 2000 were rapidly mobilised. By the end of the war, approximately 17,000 fully-trained British nurses had been mobilised for active service, along with well over 70,000 volunteer-nurses.⁶⁷ During World War I, even the most highly trained and experienced of these were confronted with a range of new challenges, which tested their existing skills and understanding of surgical work. In casualty clearing stations, stationary hospitals and base hospitals, as well as on transports such as ambulance trains, barges and hospital ships, they encountered so-called 'rushes' of patients: overwhelming influxes of casualties that followed large-scale assaults, particularly on the Western Front.⁶⁸ Nurses responded in two ways: first, by perfecting their existing practices; second by innovating.⁶⁹ One of the most detailed insights into the nature of military surgical work during World War I is Violetta Thurstan's *A Text Book of War Nursing*.⁷⁰ Precise and direct in its language and tone, it contains separate chapters for 'Probationers' (which is probably intended to be of use mainly to semi-trained volunteer-nurses) and 'Sisters' (meaning fully-trained professionals). Probationers are advised on 'the preparation of the patient before operation'. This section includes information on bathing patients; giving aperients and enemas to relieve constipation or empty the bowels; preparing the surgical site by painting with iodine; and providing emotional reassurance. Post-surgery, probationers are advised on how to observe the patient for complications ranging from relatively simple problems such as vomiting and dyspnoea, through to complex challenges

such as violent behaviour and complete physiological collapse. Thurstan acknowledges that, although this is not their usual role, probationers might, at times, assist the surgeon in theatre, and so she includes an injunction on what it means to be 'surgically clean': 'it is like being in a white dress in a room newly painted black, the slightest contact with the paint and there is a stain, the slightest contact of your hands with anything not sterile and you are surgically unclean'.⁷¹ In her chapter for trained 'Sisters', Thurstan addresses more complex issues, such as the different ways in which surgical instruments might be sterilised (including judgements on which approaches are the most effective), the preparation and sterilisation of sutures, ligatures and dressings of various kinds, ranging from simple gauze squares to complex absorbent pads containing 'gamgee tissue', a dressing invented by surgeon Joseph Sampson Gamgee, and sphagnum moss, which has absorbent and antiseptic properties⁷²; and the need to work well and sensitively in partnership with the surgeon.⁷³

Upon the foundations of these essential routines, nurses working in military hospitals built a complex array of innovative skills and practice. They learned, for example, to provide 'shock therapy' to bring patients with extensive wounds and heavy blood-loss to a state in which they could survive surgery.⁷⁴ This included, from 1917 onwards, proficiency in the care of patients undergoing blood transfusion.⁷⁵ They learned techniques for the antiseptic treatment of wounds contaminated with anaerobic bacteria on the muddy, manured fields of France and Flanders.⁷⁶ And, perhaps most relevant, they began to break the hitherto-rigid boundaries of their role, moving into what had previously been the domain of the surgeon. As members of 'surgical teams' (each of which consisted of a surgeon, a nursing sister, an anaesthetist and an orderly) they performed minor surgery on patients with multiple wounds; as surgeons cleaned and debrided the more extensive and complex wounds, nurses removed bullets, shrapnel and debris from smaller wound-beds. One highly experienced nurse with the QAIMNS described how the CCS to which she had been posted coped with overwhelming 'rushes' of patients: 'We cleared the wounded from the Arras Sector in April [1917]. In the operating theatre we now had 6 tables going at one time, and our theatre staff was augmented by the arrival, the day before, of theatre "teams" for the extra tables'.⁷⁷

From 1917 onwards, UK, Australian, South African and New Zealand nurses trained as 'lady-anaesthetists'. US base hospitals, arriving in Europe that year, already had their own nurse-anaesthetists, this role having been well-established before the war.⁷⁸ British and dominion nursing services, perhaps influenced by the US example, began to put their nurses through specialist training programmes in base hospitals and casualty clearing stations. However, due to the reluctance of Commanding Officer Neville Howse to deploy nurses close to the front lines, Australian nurses were prevented from practising as anaesthetists.⁷⁹

During the Spanish Civil War the work of small field hospitals continued to develop; 'autochairs' were quite literally 'mobile' units. Their operating theatres were fitted into large motor-vehicles, permitting surgical teams to travel to where they were most needed.⁸⁰ A few years later, the challenges of clinical practice in the hostile environments of World War II (1939–1945) resulted in a recognition of the need to both develop specialist surgical techniques such as wound care, and also to improvise. One interesting development was a recognition that wounds that had been infested with maggots seemed to be cleared of slough and dead tissue more quickly, and to heal more rapidly. This gave rise to an interest in the development of larval therapy in civilian practice, following the war.⁸¹

In some war-time innovations, nurses played a special role. A surgical procedure from World War I, which became much more widely-used during World War II, was the use of pedicles in plastic surgery. This technique was explained in an interwar surgical nursing textbook for civilian use, for example, in accidents. A pedicle is a skin graft which comprises the whole thickness of the skin, with the graft transferred from one area of the body to another whilst still 'attached to the original site for nourishment', or transferred step-by-step via another part of the body, once circulation has been established within the pedicle.⁸² The procedure was used for Royal Air Force airmen who suffered from horrific burn injuries in World War II. Nurses played an essential role in caring for wounds and the pedicles, and in emotionally supporting the airmen. At East Grinstead Hospital, Sussex, in southern England, orderly and nursing care included saline baths, feeding and oral hygiene, particularly for patients with facial injuries. The nurses' training even included getting used to the 'appearance' of their patients.⁸³ An illustrated post-war textbook graphically shows just how challenging the care of these patients' pedicles must have been, with nurses carefully applying protective dressings, while not compromising the graft's blood supply. Nurses had to monitor the colour and feel of the skin, without being overzealous, since '[u]ndue anxiety on the nurse's part will distort judgement'.⁸⁴ Emily Mayhew explains that younger nurses at East Grinstead could be given opportunities which they might not have had in other specialisms as they needed to be 'gifted' and 'capable' and withstand the 'heavy emotional load entailed by their unique charges and duties'.⁸⁵ The BBC documentary 'The Guinea Pig Club' (2004), based on Mayhew's research, illustrates the nurses' emotional support of the patients, enabling the disfigured men to feel comfortable with women; several of the airmen subsequently married nurses.

Innovations in the division of labour between nurses and doctors continued during the Korean War (1950–1953), with the rapid evacuation of patients from the frontlines in helicopters to mobile army surgical hospitals (MASHs), which were increasingly sophisticated, and then onwards via air transports to base hospitals in Japan.⁸⁶ This transport system also enabled the emergence of new roles, such as that of 'flight nurse', a highly specialised role

enabling trained nurses to take responsibility for the care of patients during journeys from MASHs to base hospitals in Japan.⁸⁷

CONCLUSION

The fragile and shifting boundary of the nurses' role is, potentially, a significant theme in the history of surgical nursing, though, to date, very few histories have actually addressed it. Existing evidence suggests that, typically, nurses have been permitted to take on some of the work of the surgeon at times of emergency, such as in wartime and during periods of economic stringency. Nurses in casualty clearing stations and base hospitals were both undertaking fundamental care work, while at the same time expanding the boundaries of their role into the realms of minor surgery. More generally, there was also an increasing tension between the desire to protect the essentially holistic caring role of the nurse in surgical nursing, on the one hand, and the need to perform more specialist and technical work on the other.⁸⁸ This theme has come up in more recent discussions about the significant change that occurred from the 1960s onwards in the USA, where the nursing profession vigorously promoted specialisation and expertise as well as the more holistic role of nurses in healthcare, for example the function of a nurse practitioner, a role situated between the traditional nurse and the doctor.⁸⁹ This development influenced nursing roles in other parts of the world, although projects for deliberate 'role transformation' rarely proceeded smoothly. In the UK and Australia debates emerged in the 1990s about the boundaries of nursing work. While few argued against the value of specialist nursing roles, some warned that the movement of expert nurses across the boundaries of their hitherto-recognised practice, into a more 'medical' or 'surgical' role might mean that fundamental care skills were in danger of becoming devalued.⁹⁰ Along similar lines, Sandelowski argues that by the 1960s the specialism of scrub nurse was at risk in the US as a result of a shortage of nurses and the technical rather than caring work in the operating room. This led to the training of health care workers who were not nurses as technicians in order to replace scrub nurses. However, some operating room nurses still managed to combine before- and after-care with their extended role in operative surgery.⁹¹

As this chapter has demonstrated, nursing has played an important role in the development of surgery. Elements of both continuity and change, starting even before Nightingale's nursing reforms, played out differently in a variety of settings ranging from hospitals, theatres of war, and patients' homes. As we have shown, the study of surgical nursing can inform our understanding of the history of surgery more generally. Focusing on the history of nurses in surgical settings has the special benefit of a better understanding of the everyday practice of surgery and the patient experience, for example in terms of developing and following routines, as well as the provision of clinical and

emotional support in aftercare—aspects that are often neglected in a historiography that is focused on technical innovation and heroic operations. Despite its specific interest for both the history of surgery and the history of nursing, surgical nursing has not been pursued deeply enough, by either historians of medicine and surgery or by specialists in women's history, for whom the gender dimensions of this topic are potentially of special interest. There is significant recent research on the history of female surgeons,⁹² yet there has been a failure to recognise that, for all their tendency to move across the boundary between their own work and that of the surgeon, specialist nurses also had their own domain of practice, which (as they asserted in their own textbooks and journal articles) was a realm of expertise that went beyond the scope of the surgeon. It is worth looking at the history of surgical nursing in its own right and the existing lack of a significant historiography in this field highlights the need for further work on the subject, to which this chapter provides a foundation.

NOTES

1. On the topic of war and surgery, see also chapter 'Surgery and War: The Discussions About the Usefulness of War for Medical Progress' by Leo van Bergen, in this handbook.
2. For example, Roger Cooter, *Surgery and Society in Peace and War: Orthopaedics and the Organization of Modern Medicine, 1880–1948* (Basingstoke: Macmillan, 1993), 206 and 347 n50; Harold Ellis, *The Cambridge Illustrated History of Surgery* (Cambridge: Cambridge University Press, 2009), 133–134; Christopher Lawrence and Richard Dixey, 'Practising on Principle: Joseph Lister and the Germ Theories of Disease', in Christopher Lawrence (ed), *Medical Theory, Surgical Practice: Studies in the History of Surgery* (London and New York: Routledge, 1992), 153–215, see 185; Ira M. Rutkow, *Surgery: An Illustrated History* (St Louis, Missouri: Mosby—Year Book, Inc, 1993), 353 and 356; Owen H. Wangensteen and Sarah D. Wangensteen, *The Rise of Surgery: From Empiric Craft to Scientific Discipline* (Folkestone: Dawson & Sons, 1978), 285–286, 344 and 350.
3. Graham A.J. Ayliffe and Mary P. English, *Hospital Infection: From Miasmas to MRSA* (Cambridge: Cambridge University Press, 2003).
4. Peter Stanley, *For Fear of Pain: British Surgery, 1790–1850* (Amsterdam and New York: Rodopi, 2003), 145–146; Stephanie Snow, *Operations Without Pain: The Science and Practice of Anaesthesia in Victorian Britain* (Basingstoke: Palgrave, 2006), 143–155, 186 and 197; Emily Mayhew, *The Reconstruction of Warriors: Archibald McIndoe, the Royal Air Force, and the Guinea Pig Club* (London: Greenhill, 2004), 63–64, 70–71.
5. For example, Margarete Sandelowski, *Devices and Desires: Gender, Technology and American Nursing* (Chapel Hill: The University of North Carolina Press, 2000), 115–120; Jane Brooks and Christine E. Hallett (eds), *One Hundred Years of Wartime Nursing Practices: 1854–1953* (Manchester: Manchester University Press, 2015).

6. Christine E. Hallett, *Containing Trauma: Nursing Work in the First World War* (Manchester: Manchester University Press, 2009).
7. Vanessa Heggie, 'Women Doctors and Lady Nurses: Class, Education and the Professional Victorian Women', *Bulletin of the History of Medicine* 89.2 (2015): 267–292, see 281.
8. Joan Evans, 'Men Nurses: a Historical and Feminist Perspective', *Journal of Advanced Nursing* 47.3 (2004): 321–328, see 323–325.
9. Alison Bashford, *Purity and Pollution: Gender, Embodiment and Victorian Medicine* (New York: St. Martin's Press, 1998), 24.
10. Keir Waddington, 'The Nursing Dispute at Guy's Hospital, 1879–1880', *Social History of Medicine* 8.2 (1995): 211–230, see 216.
11. Bashford, *Purity and Pollution*, 24; Waddington, 'The Nursing Dispute', 228.
12. The challenges which they faced are explored by Claire Brock in the chapter 'Women in Surgery: Patients and Practitioners', on women and surgery, within this handbook.
13. Bashford, *Purity and Pollution*, 93.
14. Patricia D'Antonio, *American Nursing: A History of Knowledge, Authority, and the Meaning of Work* (Baltimore: The Johns Hopkins University Press, 2010), 28. See also: Thomas Schlich, 'Surgery, Science and Modernity: Operating Rooms and Laboratories as Spaces of Control', *History of Science* 45 (2007): 231–256. On the emergence of professional nursing in the USA, see also: Susan Reverby, *Ordered to Care: The Dilemma of American Nursing, 1850–1945* (Cambridge: Cambridge University Press, 1975); Barbara Melosh, *The Physician's Hand: Work, Culture and Conflict in American Nursing* (Philadelphia: Temple University Press, 1982); Philip A. Kalisch and Beatrice J. Kalisch, *The Advance of American Nursing*, 3rd Edition (Philadelphia: J.B. Lippincott, 1995).
15. Regina Morantz-Sanchez, *Conduct Unbecoming a Woman. Medicine on Trial in Turn-of-the-Century Brooklyn* (New York, Oxford: Oxford University Press, 1999), 207–214. On the history of anaesthesia see also chapter 'Surgery and Anaesthesia: Revolutions in Practice' by Stephanie Snow in this handbook.
16. Thomas Schlich, "'The Days of Brilliancy Are Past": Skill, Styles and the Changing Rules of Surgical Performance ca 1820–1920', *Medical History* 59 (2015): 379–403.
17. Roger Kneebone and Abigail Woods, 'Recapturing the History of Surgical Practice Through Simulation-based Re-enactment', *Medical History* 58 (2014): 106–121, see 118.
18. Sandelowski, *Devices and Desires*, 2–3.
19. St Thomas' Hospital, LMA/HO1/ST/A25, London Metropolitan Archives, cited in Carol Helmstadter and Judith Godden, *Nursing Before Nightingale, 1815–1899* (Farnham: Ashgate, 2011), 9.
20. Geoffrey Yeo, *Nursing at Bart's: A History of Nursing Service and Nurse Education at St Bartholomew's Hospital, London* (London: St Bartholomew's and Princess Alexandra and Newham College of Nursing, 1995), 20, and *Lancet*, 1831–32, II, 265, both cited in Stanley, *For Fear of Pain*, 146.
21. Mark Bostridge, *Florence Nightingale: The Woman and Her Legend* (London: Viking, 2008), 188–194, quotation from 194.
22. *Ibid.*, 97, 197, 127 and 157.

23. Florence Nightingale, Diary, 31 July 1851, 9025/9076 and 77; 8 August 1851, 9025/9078, Wellcome Library, London, cited in Bostridge, *Florence Nightingale*, 157.
24. Marianne Estcourt, MS Diary, D1571, F555-8, 29 January 1855, Gloucestershire Record Office, cited in Bostridge, *Florence Nightingale*, 227–228 and 585.
25. Bostridge, *Florence Nightingale*, 228, who cites Lieutenant-General Sir John Burgoyne to Lord Raglan, 27 March 1855, NAM 1968-07-293-9, National Army Museum, London.
26. Bostridge, *Florence Nightingale*, 228.
27. Florence Nightingale to William Bowman, 14 November 1854, Goldie Private Collection, cited in Bostridge, *Florence Nightingale*, 227.
28. Mark Bostridge, 227; quotation from Snow, *Operations Without Pain*, 143.
29. Helmstadter and Godden, *Nursing Before Nightingale*, 7; Snow, *Operations Without Pain*, 143–144; Bostridge, *Florence Nightingale*, 227.
30. Bostridge, *Florence Nightingale*, 94; Helmstadter and Godden, *Nursing Before Nightingale*.
31. Helmstadter and Godden, *Nursing Before Nightingale*, 3 and 5.
32. *Ibid.*, 7.
33. See also chapter ‘[The History of Surgical Wound Infection: Revolution or Evolution?](#)’ by Michael Worboys, in this handbook.
34. Stanley, *For Fear of Pain*, 149, including quotation from Robert Druitt, *The Principles and Practice of Modern Surgery* (Philadelphia: Lea and Blanchard, 1842), 100–102. See Ayliffe and English, *Hospital Infection*, 112.
35. Helmstadter and Godden, *Nursing Before Nightingale*, 6.
36. Ayliffe and English, *Hospital Infection*, 104.
37. Helmstadter and Godden, *Nursing Before Nightingale*, 6, citing Parliamentary Paper, 28 (1864), 483–485; and Birmingham General Hospital Minute Book, 5 December 1862. See also Stanley, *For Fear of Pain*, 150, for the increasingly routine use of disposal dressings from the mid nineteenth century.
38. On the conflicts between nursing sisterhoods and the doctors and administrators of the hospitals that employed them, see: Judith Moore, *A Zeal for Responsibility: The Struggle for Professional Nursing in Victorian England, 1863–1883* (Athens: University of Georgia Press, 1988). On the development of systems for nursing practice in the nineteenth century, see Helmstadter and Godden, *Nursing Before Nightingale*.
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Opening the Abdomen: The Expansion of Surgery

Sally Frampton

The rapid development of abdominal surgery in the late nineteenth century has often been viewed as a high-point in the story of surgery—the moment when surgeons marked out a major part of the body as prime territory on to which their skill could be put to work, and when the abdominal cavity, with its mysteries and dangers, was conquered by the profession, now emboldened by anaesthesia and antiseptic technique. Indeed, the history of abdominal surgery has been bound together closely with that of the antiseptic practices introduced by Joseph Lister in order to avoid wound infection.¹ Listerian antiseptics undoubtedly had an impact on the treatment of the abdomen and nineteenth-century surgeons themselves carefully crafted a pivotal place for Joseph Lister within the histories they created.

But abdominal surgery also has its own discrete and complex history. In this chapter I chart the changing identity and practice of modern abdominal surgery as well as its diverse historical interpretations. Expansion is a useful way of thinking about abdominal surgery, and particularly so in relation to the critical period in the late nineteenth century when its status rose rapidly. During this time the expansion of abdominal surgery was anatomical, as it spread across the abdominal cavity; it was also professional, as its practitioners wrangled over disciplinary territory; and it was geographical, since abdominal surgery invited international competition. Expansion also points to one of the key characteristics of abdominal surgery, the large surgical incision, which was however, increasingly contested in the latter part of the twentieth century.

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Focusing in particular on the Anglo-American experience, this chapter goes on to show how the growing success of a number of abdominal operations became central to surgeons' self-perception and symbolic of the striking progress many claimed surgery had made during the second half of the nineteenth century. This success was coupled with confidence, reflected in the historical accounts that Victorian surgeons forged of their craft that used progressivist narratives couched in the language of victory. Practitioners of abdominal surgery consolidated their elite role in the early twentieth century as numerous procedures were introduced that predicated abdominal surgery as a preventive for incipient disease and even a panacea for the ills of modern life. However, narratives of progress surrounding abdominal surgery were increasingly challenged in the late twentieth century. As the history of medicine became more closely attuned to matters of gender and a social historical perspective began to predominate in the field, historians reconceptualised abdominal surgery—and particularly its rise in the nineteenth century—as emblematic of medicine's role in subjugating women, due to the preponderance of experimental abdominal procedures upon the female reproductive organs. Finally, this chapter points to the implications of minimally invasive surgery, the introduction of which invites questions about the status of open abdominal surgery in contemporary practice, as well as highlighting the need for continued historical examination of the field.

CONSTRUCTING THE SURGICAL ABDOMEN

Ovarian disease has long occupied a central place in the negotiation of surgical space within the abdomen. Historians have often marked the starting point of abdominal surgery as Christmas Day, 1809, when forty-six-year-old Jane Todd Crawford underwent an operation in Danville, Kentucky to remove an ovarian tumour. Crawford had completed a sixty-mile journey on horseback over rough terrain in order to reach the surgeon Ephraim McDowell, who had agreed to remove the large and painful growth which she had been afflicted with for several months. As was not uncommon with sufferers of ovarian disease, Crawford had believed for some time that she was pregnant rather than ill, the rapidly growing tumour mimicking the external signs of a growing child. By the time McDowell first attended Crawford, her tumour had grown so large that local doctors believed childbirth to be imminent. It was only with Crawford's second consultation with McDowell that an ovarian tumour was diagnosed. 'Having never seen so large a substance extracted, nor heard of an attempt, or success attending any operation, such as this required, I gave to the unhappy woman information of her dangerous situation' McDowell later reported, 'she appeared willing to undergo an experiment, which I promised to perform if she would come to Danville'. Despite McDowell's graphic description of the operation—at one point 'the intestines rushed out upon the table'—the operation was, to the surprise of

many, a success, with McDowell removing Crawford's fifteen-pound tumour in its entirety.² Crawford recovered from the operation quickly and went on to live for another thirty-two years.³ The operation appeared to be an unprecedented act in the history of surgery; so much so that when McDowell published details of the case in 1817, along with those of two more successful procedures he had performed, some of his contemporaries cast doubt upon their authenticity.⁴

The history of abdominal surgery has long been focused on this story of Ephraim McDowell, a man who has had a sustained grip on the title of 'father of abdominal surgery'. For early historians of the field McDowell fitted the mould of the surgeon-pioneer, using ingenuity and self-reliance to create a new operation, while Crawford's courage equally lent itself to a narrative of fortitude and bravery. This was reinforced by two early biographies of McDowell, authored respectively by Mary Young Ridenbaugh, in 1890, and August Schachner in 1921. Both authors had a personal connection to the surgeon; Ridenbaugh was McDowell's granddaughter and Schachner a fellow Kentucky surgeon who would later lead the campaign to have Ephraim McDowell's house restored and converted into a museum. The biographies shared a similar objective in highlighting McDowell's unique role in the operation's development and were responding to an apparent reluctance among British surgeons to acknowledge the significance of his contribution.⁵ They emphasised the importance of McDowell's rural location, on the 'edge of civilisation' as Schachner put it, and painted a picture of McDowell as the embodiment of the pioneering American spirit.⁶

Ovariectomy, as the removal of diseased ovaries would come to be known, plays a crucial role in both the history and historiography of abdominal surgery. But the origin myth embedded in the McDowell story belies a more variegated history of abdominal surgery prior to the mid-nineteenth century. It is true that the majority of surgery before this time dealt with bodily ills that could be treated externally, such as amputation and the removal of skin growths and tumours; the very identity of the surgeon was bound up with the external body, traditionally seen as the province of the surgeon, in opposition to physicians' authority over internal disease.⁷ But it is also true that surgical procedures that involved making incisions into the abdominal cavity have existed since antiquity. The operation of paracentesis (known colloquially as 'tapping'), for example, in which a small incision is made into the abdomen to drain fluid from internal swellings, was detailed by Celsus,⁸ while instructions for abdominal procedures are recorded in the texts of Galen, who advised readers on how to treat severe intestinal dilations by enlarging the peritoneal wound and pushing back the intestines, before carefully stitching the abdominal lining back together.⁹ Surgical texts of the eighteenth century recommended abdominal procedures for severe injuries and operations for hernia were also described.¹⁰ Reports of caesarean section are scattered throughout the annals of history too, mostly bloody and sorrowful episodes of babies being extracted from dead or dying mothers. In 1738 the first

caesarean in Britain in which the mother was saved was performed by Mary Donally, a midwife. Donally delivered Alice O'Neal, a farmer's wife from Armagh, of a dead child after twelve days of obstructed labour, cutting open O'Neal's abdomen and uterus with a razor, removing the child and dressing the wound with egg white;¹¹ by doing so Donally had attained greater success with the operation than any British surgeon thus far, despite her 'inferior' professional status as a midwife.

Attempts at abdominal surgery were then, not infrequent, and Peter Stanley, in his work on British surgery between 1790 and 1850, has argued that 'surgeons were prepared to open the abdomen more often than has been supposed'.¹² His work is one of the few to highlight the rich diversity of operations that were performed prior to the mid-nineteenth century, of which abdominal operations constituted an important aspect, a diversity that has been subsumed by narratives that project an image of surgery transitioning to the internal organs only with the aid of anaesthesia and antisepsis. Most of these abdominal operations were focused on traumatic wounds, immediate life-threatening disease and palliative measures. Ephraim McDowell's ovarian operation represented something new because Jane Todd Crawford's disease was, arguably, chronic rather than acute. In the early nineteenth century, ovarian disease was understood as a form of dropsy, a term used to describe accumulations of fluid within the body. Ovarian dropsy was considered both a common affliction and a debilitating one. The slow growth of the tumour and its confusion with pregnancy, as characterised by Crawford's experience, usually meant it was diagnosed at a late stage. It was also notoriously difficult to treat, with medicines considered useless in dealing with the condition. Most cases were treated by paracentesis but this was a palliative measure, temporarily shrinking the tumour but not removing it, and often leaving patients in a desperate condition as the tumour re-grew.¹³ The Crawford case came after decades of debate among French and British practitioners about how to deal with this distressing condition and the possibility of opening the abdomen to do so. In 1753 British obstetrician William Hunter and French surgeon Sauveur-François Morand both published pieces speculating on the possibility of extirpating the diseased ovary entirely. Morand evoked examples from the ancient world to bolster his case, citing cases of female 'castration' (the removal of both ovaries), described by the Greek author Hesychius, in the fifth century. Morand also referred to examples where ovaries had been removed in error following wounds to the belly.¹⁴

While the complexity and frequency of ovarian pathology made it a focus for debates, its context was wider discussions about whether the abdominal cavity could be safely opened and the more general effect that removing organs might have on bodily health.¹⁵ In the early nineteenth century these questions were investigated by the obstetrician James Blundell. Blundell would later become well-known for performing the first human-to-human blood transfusion but he was also deeply interested in the prospect

of abdominal surgery. In 1828 Blundell conducted a large number of experiments using twenty-nine rabbits, variously removing their ovaries, uteri, spleens, kidneys and portions of the bladder, as a way of establishing how far the peritoneum—the membrane in which the abdominal organs were enfolded—could tolerate injury. Eight of the rabbits survived. Believing the anatomy of the human and rabbit abdomen to be similar enough that the results could be used to give an indication of how patients might respond,¹⁶ he argued that his experiments had proved in principle ‘moderate openings into the human peritoneum will not necessarily, or even generally, prove fatal from inflammation’. Blundell also concluded from his experiments that the ovaries, the uterus, the spleen and parts of the bladder could all be removed without the body failing.¹⁷

Despite Blundell’s assertion, practical surgical experimentation on humans remained primarily confined to the ovaries, and further successful cases in America, Germany and Britain were recorded in the 1820s and 1830s. In 1842 Charles Clay of Manchester put the operation on firmer ground in Britain when he began a long and unbroken series of operations, coining the term ‘ovariotomy’.¹⁸ Invigorated by the introduction of anaesthesia, over the next forty years the operation became a source of controversy and excitement as an increasing number of practitioners undertook it, positioning it as breaking new ground in the cure of a chronic abdominal condition. Advocates extolled the operation as a means of saving thousands of women from the ravages of terrible disease. Opponents depicted it as a barbarous act, which might kill the patient when she could in fact live with her condition for months or even years. The latter played on the physical nature of the operation to condemn those who performed it as ‘belly-rippers’, evoking an image of bloodthirsty butchers, who could not tell apart surgery and dissection. However, by the 1860s, with mortality rates beginning to drop to around thirty per cent, and with operators beginning to publish long and highly detailed series of their ovariotomy cases, the tide began to turn in favour of the operation, particularly in Britain, where medical practitioners took a lead in performing the procedure.¹⁹

THE PECULIARITIES OF THE PERITONEUM

‘The time seems to have come when it is proper to gather together and describe in systematic manner the surgical operations usually spoken of as abdominal’, wrote the Bristol based surgeon James Greig Smith in the preface to his textbook *Abdominal Surgery* published in 1887.²⁰ Smith’s book was testament to the rapid expansion that major, planned, abdominal surgery had undergone over the last decade. Until then the field had to all intents and purposes *been* ovariotomy. Reflecting back in 1903 the abdominal surgeon Arthur Mayo Robson described the operation as ‘the battlefield of abdominal work’.²¹ His description was apt in that the operation had borne

the brunt of most of the medical, technical and ethical arguments that had been put forward against abdominal surgery in the 1840s and 1850s, with some ovariatomists suffering professional setbacks as a consequence. But with confidence rising in the operation, aided by improved technologies, such as the introduction of artery forceps to arrest haemorrhage, new opportunities were being afforded for further exploration of the abdomen.²² Important developments were happening in continental Europe; German-speaking countries were becoming the centre for the new ‘radical spirit’ taking hold in surgery, and were the location of a number of new, daring operations.²³ In 1881 the *Lancet* reported how the Viennese surgeon Theodor Billroth had begun performing resections of the stomach in order to treat malignancies and had successfully excised a cancerous pylorus from a female patient, promising new hope for the treatment of cancer—a condition generally left alone by surgeons operating on the abdomen.²⁴ In Germany in 1882 the surgeon Carl Lagenbuch successfully performed the first cholecystectomy (removal of the gallbladder).²⁵ Meanwhile in Britain ovariatomists like John Knowsley Thornton were expanding into kidney surgery.²⁶ Describing a vast range of operations from hysterectomy (removal of the uterus), and gastrotomy (incision into the stomach) to procedures on the liver and spleen, *Abdominal Surgery* was the first of its kind in any language, a textbook which brought together the gamut of abdominal operations now in practice and unified them into a discrete surgical category. Well-established operations like ovariotomy sat side-by-side with procedures such as the excision of pancreatic tumours, which remained resolutely at the experimental stage, having been performed rarely and with little success.²⁷

The appearance of the monograph was welcomed by the *British Medical Journal* but with a perceptible note of caution:

Of late there have been too many compilations by young men of limited experience, and were it not that this book is one of the better class among these productions, and is, moreover, admirably put together, it would be the impartial reviewer’s duty to animadvert strongly on the conduct of any individual assuming the position of a teacher in so vast a subject on the slender personal experience of about fifty cases.²⁸

The *Journal* was no doubt alluding to the youth of the author—Smith was in his early thirties when *Abdominal Surgery* was published and he himself had relatively little experience in the field. But Smith’s youth was paralleled by that of abdominal surgery as a distinct form of practice and the review hinted at concerns about how the fledgling field might best be cultivated. The 1880s had seen a move towards medical specialism in Britain, but the turn towards specialisation had been slower than on the continent and anxieties remained about whether categories of specialist practice were becoming too narrow.²⁹ However Smith’s monograph also signalled expansion, as it and the surgical textbooks that followed over the next decade, showcased the spread

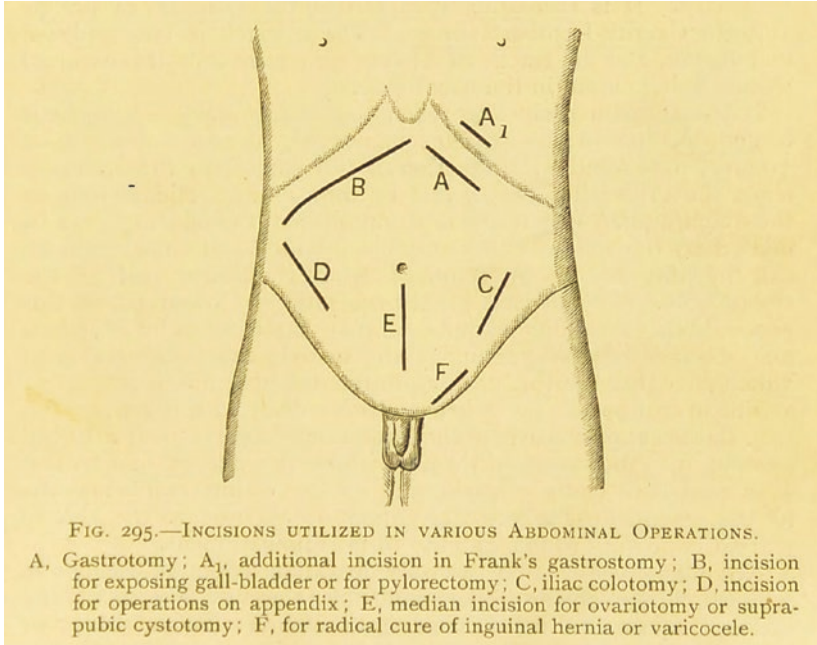


Fig. 1 Image depicting incisions for abdominal operations, from *A Manual of Surgery for Students and Practitioners* (1899) authored by William Rose and Albert Carless. The manual was one of the most popular surgical textbooks in the English language and shows the proliferation of abdominal operations in use by the end of the century. A male body is used to demonstrate among others, the incision for ovariotomy, showing the incorporation of gynaecological procedures into the broader category of abdominal surgery. *Credit* Wellcome Library, London

of abdominal surgery to beyond the female pelvis, blurring the boundaries between specialist surgery of the female reproductive organs and abdominal surgery that was not sex-specific (see Fig. 1).

The increasing success of abdominal surgery had ramifications for professional politics, which in turn collided with questions regarding the impact of Listerian antiseptics. From the perspective of most surgeon-authored histories constructed towards the end of the nineteenth century, the introduction of the antiseptic system in 1867 had liberated surgery from many of its ills; Arthur Mayo Robson claimed it had saved ‘more lives each year than Napoleon destroyed in all his wars’.³⁰ And while the language surrounding antiseptics may have become less histrionic, a narrative persisted well into the twentieth century that posited antiseptics as the catalyst for a revolution in abdominal surgery.

As the history of ovariotomy makes clear however, the project to surgically manage the internal body was well under way before antiseptic practices were

rolled out and more recently historians have critically re-examined Lister's legacy.³¹ It is a point worth reiterating that in the 1880s a number of abdominal surgeons questioned the impact of Listerian antisepsis—always a fluid concept anyway—on their work. The crux of the debate centred on the way the peritoneum should be managed. Peritonitis (inflammation of the peritoneum) had long been the dread disease of surgeons who ventured into the abdomen. The delicate peritoneal sac frequently became inflamed following surgical interference and was very often the cause of death in the days following an operation. Nurses attending patients during the aftercare period were especially trained to undertake careful vigilance of abdominal patients and were instructed to be alert for any signs of peritonitis.³² For many abdominal surgeons the period after the operation could be tenser than the operation itself, as patient and practitioner anxiously awaited to see if peritonitis or another post-operative complication would occur.

In 1881 in Britain the Birmingham-based surgeon Robert Lawson Tait began to publicly question the usefulness of antiseptics in managing the peritoneum. A bombastic and provocative figure who took pleasure in antagonising the London surgical establishment, but who nonetheless had a reputation as an exceptional abdominal surgeon, Tait had little time for carbolic acid and was sceptical about the germ theory on which Lister's system of surgery was based. In his many letters to the medical press on the subject Tait pointed to the rapid decrease in the mortality of ovariectomy which had occurred before Lister's antiseptic system had even been established; having tried antiseptic measures in his own practice he claimed it had done nothing to improve his mortality rates. 'I cannot reconcile the statements of my friends, who tell me such marvellous things about their experience of Listerism in general surgery, with my own experience in abdominal surgery', wrote Tait to the *Lancet* in 1881, 'and as my practice is entirely limited to this special field, and as I have no grounds for doubting the statements of my friends, I can only feel that an explanation will be found in the peculiarities of the peritoneum'.³³ Moreover, Tait believed carbolic acid could actively irritate and injure the peritoneum, increasing the risk to the patient. While Tait was not the only surgeon to question the impact of antisepsis on abdominal surgery, he was the most vocal.³⁴ A consequence of his resistance was that in the early twentieth century he was often historicized, including by his biographer John Shepherd, as having 'backed the wrong horse'.³⁵ Anna Greenwood has critiqued the idea that Tait was in any way unscientific in his claim. The meaning of science is adaptable depending on time and context, and Tait himself felt his denial of the germ theory of putrefaction and antiseptic practices to be wholly justified by an empirical, scientific approach based on observations from his own practice of surgery.³⁶

Historians have been attentive to the professional dimension to this issue. Ornella Moscucci has detailed how in the late 1870s specialists in the diseases of women and general surgeons—both of whom had been involved in

the development of the operation—wrangled with one another as to who was best placed to perform ovariectomy. This was sparked by the growing prestige and decreasing mortality of the operation, as well as its increasing practice in general hospitals (as opposed to institutions which specialised in diseases of the female pelvis).³⁷ General surgeons claimed that antiseptics had democratised the abdomen, making it safer to operate upon, and hence that abdominal surgery no longer needed to stay in the province of those with specialist skill in handling the peritoneum. This was further amplified by the expansion into ‘aseptic’ techniques in the 1880s, which prioritised the preventive cleanliness of the surgeon and operating space over methods designed to combat already present agents of sepsis. Increasingly general surgeons tightened their grip on the operation. Specialists in the diseases of women resisted this territorial challenge, emphasising Tait’s contention of the ‘peculiarity’ of the peritoneum of which they claimed only they were sufficiently familiar with.³⁸ However this division was complicated by the development of abdominal procedures beyond the female pelvis; those who had started out as ovariectomists like Tait, were beginning to identify more closely as specialists in abdominal disease rather than diseases of women. This functioned both as a way to mark their expansion into other areas of surgery, and as means of reasserting their specialist status. Such strategies were only partially successful. By the early twentieth century a growing—although by no means categorical—division between operations on the female pelvis and other forms of abdominal surgery was apparent.³⁹ While the former remained a mainstay of specialist gynaecologists, the rest of abdominal surgery became more closely incorporated into general surgery, a division which is still apparent in most countries today, and where ‘general surgeon’ is often synonymous with expertise in abdominal procedures.

GENDERING THE ABDOMEN

In the nineteenth century, constructing abdominal surgery as a specialist form of practice gave impetus to constructing its historical narrative.⁴⁰ Reflections on one’s personal history of working in medicine, intertwined with more general observations about the state of the profession, were a common feature in the late nineteenth-century medical press, often contained within addresses delivered by surgeons to medical societies.⁴¹ Abdominal surgeons were no different in this respect, however the nature of their work, the opening of a once feared internal cavity, did afford them additional rhetorical opportunities; their speeches were often replete with militaristic analogies and masculine bravado, where the abdomen was imagined as virgin territory penetrated and conquered by surgical hands.⁴² A few even posited 1880 as year zero for abdominal surgery, re-casting the 1870s as the dark ages, a time during which, Mayo Robson lamented, the state of treatment for abdominal disease was so poor that the physician ‘waited until his hypotheses were

proved or disproved in the dead house'.⁴³ These narratives were primarily triumphalist in style. But they also revealed concerns that abdominal surgery constituted a kind of climactic endpoint to the technical advance of surgery. Famously in 1886 the surgeon John Erichsen declared that 'that the final limits of surgery have been reached in the direction of all that is manipulative and mechanical there can be little doubt',⁴⁴ while James Greig Smith, writing in 1888, cited surgeons' achievement in lowering the mortality of ovariectomy to two per cent as the pinnacle of surgical achievement; 'surely this is the *ne plus ultra*, not only of abdominal surgery but of all surgery' Smith wrote.⁴⁵

At the same time that these narratives were being constructed fears were growing that excessive amounts of surgery, particularly ovariectomy, were now being performed. A trend for oöphorectomy (removal of both ovaries to treat diseases in other parts of the body) had led to claims that a mania for operating had taken hold of surgeons—across Europe but especially in America. Increasingly there was concern regarding the long-term consequences there might be for women who had both ovaries removed, as well as the societal consequences of an operation that potentially took away a woman's reproductive abilities. This trend was tempered somewhat in the final years of the century as 'conservative' treatments for ovarian disease began to be experimentally introduced and which saw tumours carefully divided and removed from the ovary, so that the non-diseased parts of the organ could be retained. Surgeons including Christopher Martin in Birmingham (formerly Lawson Tait's assistant), Samuel Pozzi in Paris and William Mecklenberg Polk in New York were among the leaders of the movement. Conservative surgery—as it was called by contemporary surgeons and later historians—was, however, by no means a perfect solution.⁴⁶ Techniques for resection were more complex than complete ablation of an organ, requiring minute and detailed technical work to ensure that all the diseased tissue was removed. Moreover, radical operations on the female pelvis continued, with a notable increase in hysterectomies. The latter operation had undergone a remarkable reduction in its mortality during the first decade of the century, giving rise to speculation that early-stage uterine cancer could be cured.⁴⁷

The gendered character of ovariectomy as an operation exclusively performed upon women was both celebrated and lamented within professional circles in the nineteenth century. Many doctors hailed the life-saving and life-improving qualities of the operation, positioning it as a salvation for woman-kind. This view drew on Victorian notions of women as vulnerable creatures, towards whom the paternalistic medical profession could act as protector. But others were more critical of the use of invasive procedures. With accusations of over-operating on women abounding by the late 1880s, commentators from both inside and outside the profession questioned the necessity of operations for small tumours and minor conditions and renewed pressure was put on surgeons to re-examine their motives for operating. Some claimed double standards, questioning whether male patients would ever be subject to such invasive procedures on their reproductive organs to which women had

been subjected.⁴⁸ Both male and female bodies were subject to major surgery of an experimental nature in the eighteenth and nineteenth centuries, through myriad novel operations from aneurysm ligation to amputation at the hip.⁴⁹ But the complications of childbirth, the internal positioning of the female reproductive organs, and the growing interest in the impact diseases of those organs could have on the more general health of women, all contributed towards the profession's intent on finding surgical solutions for 'female' disease.

In the late twentieth century, the centrality of the female pelvis to the project of opening the abdomen began to be examined more closely by historians. Women's history drew on the political agenda of second-wave feminism to draw out essentialist notions of the female body which many medical interventions seemed to be premised upon. Meanwhile the move towards a social history of medicine paved the way for a more attentive exploration of patients' experiences. Both found ample ground in abdominal surgery. Barbara Ehrenreich and Deirdre English's *For Her Own Good: 150 Years of the Expert's Advice to Women* (1979) dissected the surgical legacy of the nineteenth-century medical profession, scrutinising the subset of ovarian operations that were performed (primarily in America) to treat psychological disturbances in women, including hysteria and nymphomania. Their analysis critically examined the expansion of abdominal surgery seemingly into a realm of social control, that saw female patients being 'brought in by their husbands, who complained of their unruly behaviour'.⁵⁰ Ehrenreich and English set the scene for histories that viewed the operation as primarily configured upon surgical mismanagement—or at the very least over-management—of the female body. Literature including Thomas Laqueur's *Making Sex* (1990), Ornella Moscucci's *The Science of Woman* (1990) and Ann Dally's *Women Under the Knife* (1991) all, to a greater or lesser degree, predicated the existence of ovariectomy upon cultural notions of femininity.⁵¹ More recently Ilana Löwy has argued that the idea that female organs are particularly amenable to surgery has continued. This, she argues, is evident in the management of 'precancer', a field where by far the most common and well-known procedures are prophylactic mastectomy and oöphorectomy (the term is used today to describe all operations where one or both ovaries are removed) for those with the faulty BRCA gene. It is a trend Löwy has linked to 'the tradition of surgical management of gynaecological problems'.⁵² The gender politics of abdominal surgery have been further nuanced by the work of Regina Morantz-Sanchez and Claire Brock, both of whom have, crucially, drawn attention to the role female surgeons played in promoting its practice on both sides of the Atlantic. Brock has also highlighted the active role of female patients in pursuing abdominal surgery, showing that the position of female actors in the development of the discipline was complex and not simply a story of passive patients and domineering doctors.⁵³

Birth of a Slave: Motherhood and Medicine in the Antebellum South (2006) by Marie Jenkins Schwartz has similarly drawn attention to the use of caesarean sections, Schwartz focusing on those undertaken upon enslaved women in the American South. Schwartz argues that the use of the operation was likely connected to the lack of consent required from slaves about the medical care they received which meant they often became experimental cases for young doctors to practice upon, a prospect which a free woman may have balked at.⁵⁴ The use of caesarean section in the nineteenth century was also linked to broader health inequalities: the operation was usually resorted to when a woman had pelvic deformities which made labour impossible and these deformities were often caused by diseases of poverty like rickets. In general, however, caesarean section is an aspect of surgery which has received relatively little attention from historians, and where it has, predominantly in its twentieth-century context. Angela Davis, for example, has identified the increased use of caesarean section and other interventional techniques as leading to a critical moment in the 1970s when obstetricians came under increased scrutiny from nurses, politicians and from the general public for their role in medicalising childbirth.⁵⁵

This historiographical thread speaks to the enduring relationship between gender and abdominal surgery. But the controversies surrounding some surgical procedures by the end of the nineteenth century must also be read within a broader history of abdominal disease and its therapeutics. Doing so reveals how the degree to which abdominal surgery is gendered has fluctuated, and also contextualizes ovarian, uterine and obstetrical procedures within a broader framework of surgical experimentation and innovation.⁵⁶

ABDOMINAL SURGERY IN THE TWENTIETH CENTURY

In the first decade of the twentieth century practitioners of abdominal surgery successfully consolidated its status as an elite—perhaps the most elite—category of surgery, through impressing upon both the medical profession and the public the ability of abdominal surgery to provide the most effective cure for diseases that would have been otherwise medically managed. In this respect, Ian Miller has described the duodenal ulcer as the ‘flagship disease of early twentieth-century surgery’, in that it showcased not only surgical skills in both diagnostics and cure, but positioned the abdomen as a site of scientific research. Miller highlights particularly the work of the Leeds-based surgeon Berkeley Moynihan, who in 1910 published his findings on duodenal ulcer disease. Moynihan believed duodenal ulcers to be much more frequent than had been previously thought, and often labouring under a misdiagnosis of gastric disease.⁵⁷ Moynihan based his view on years of practice and urged his contemporaries to view abdominal surgery as ‘the pathology of the living’: an opportunity to build up a storehouse of knowledge on abdominal pathology, through connecting symptomatology with operative experience.

By keenly observing such patterns, surgeons could soon build up an accurate clinical picture of a disease using case histories alone, leading to earlier diagnosis and intervention.⁵⁸

Moynihan's work represented an encroachment of surgery upon what was traditionally the physicians' territory of the digestive system. By claiming that organic lesions in the duodenum occurred frequently, Moynihan was able to argue the superiority of surgical management over treatment by medicine and diet.⁵⁹ Moynihan's annexing of the duodenum was not the only case in which abdominal disease was being re-constructed upon the premise of surgical management. Perhaps the most audacious episode of surgical expansionism was to be found in the practice of British surgeon William Arbuthnot Lane. In the early 1900s Lane introduced his research into a condition he later termed chronic intestinal stasis, which identified the dangers of the overloaded, constipated colon, a condition that Lane claimed poisoned the rest of the body, destroying the patient's health.⁶⁰ Lane advocated the removal of the large bowel in its entirety to fix the problem.⁶¹ His theories reflected a medical and cultural preoccupation with the human gut as a source of ill health in the early twentieth century, as the dietary fashions of modern life, particularly refined foods, were increasingly connected with a range of diseases. Under Lane's treatment plan surgery was employed to remodel the abdominal cavity to suit modernity.

Dale C. Smith and Keith Wailoo have also probed transitions from medical to surgical management in their respective case studies on early twentieth-century medicine. Smith has shown how at the turn of the century appendicitis was re-defined by surgeons as a disease that was an ever present danger, the threat of which was only eradicated when the organ itself was removed.⁶² Wailoo has taken this point further, arguing that new disease categories—in his case splenic anaemia, for which US surgeons called for the removal of the spleen—were constructed *because*, as Wailoo puts it, of a 'culture willing to support surgical experiment and adventure' rather than as a result of any obvious pathology.⁶³ However such endeavours to re-imagine abdominal disease as surgical were not without their limitations; Lane's operative treatment of chronic intestinal stasis was largely rejected by the 1910s, while splenic anaemia had virtually disappeared as disease category by the 1930s.

Both Smith and Wailoo's case studies point also to the lead America was taking in surgical innovation by the turn of the century, fleshing out a trend identified by Christopher Lawrence, who has written of the surgeon as the 'democratic hero', and who was thought to be encapsulated particularly in the pioneering spirit of the American surgeon.⁶⁴ Contemporary commentators proclaimed the practical genius of surgeons in the States as well as their thriving reciprocal relationship with the German surgical community, who by then dominated the field of pathological science.⁶⁵ Leading the advance upon the abdomen was important; American surgeons had long lamented the

apparent failure of their mid-century predecessors to build on the work of Ephraim McDowell and which had resulted in advances in ovariectomy being led by the Britain. By the twentieth century McDowell could be reclaimed into a celebratory narrative culminating in American surgeons expanding their surgical territory and wielding global influence.

The re-modelling of the abdomen as a site of surgery was not confined to chronic conditions. When in 1939 British surgeon and medical historian Zachary Cope published his historical account *Pioneers in Acute Abdominal Surgery* (1939) it reflected the growing treatment options that had emerged in the last fifty years for acute abdominal diseases too, from bowel obstruction to ruptured ectopic pregnancies.⁶⁶ Ana Carden-Coyne's exploration of military medicine in the first World War gives further context to this shift, relaying a critical moment in acute abdominal surgery as military surgeons began to advocate early laparotomies for gunshot wounds to the abdomen in place of a non-invasive programme of pain relief and rest. Surgical intervention was held up as the most ethical choice for treatment because it afforded patients a chance of survival, despite a high mortality rate following surgery and the fear that the prospect of surgery engendered in patients.⁶⁷ This positioning of surgery as a riskier, but ultimately morally superior alternative to medical management echoed defences of abdominal surgery made in the nineteenth century when ovariectomists denigrated the financial and emotional drain that medical management of ovarian disease put on a patient, which they compared against the potential quick-fix and curability of ovariectomy.⁶⁸

Given the extensive developments that had occurred in the field over the previous seventy years, by the middle of the twentieth century abdominal surgery appeared to have entered a comparatively static period. Operations like cholecystectomy, which had become one of the staple procedures in the general surgeon's repertoire, had by then remained virtually unchanged in technique for decades.⁶⁹ At the same time, other areas of surgery, perhaps most notably cardiac surgery, became more obvious focal points of surgical drama and innovation.⁷⁰ But major changes were afoot. In the 1980s surgeons began to incorporate minimally invasive—known colloquially as 'key-hole' techniques—into their practice.⁷¹ Large incisions were replaced with tiny 'laparoscopic' ones and camera chips were inserted into surgical instruments, allowing operations to be viewed on video screens. This technique, alongside new procedures involving interventional radiology, promised to decrease recovery time from procedures and improve the patient experience. But the introduction of minimally invasive techniques was controversial. The benefits of the new approach were not self-evident to many surgeons, who feared that small incisions and the lack of direct vision available during the procedure would compromise the safety and efficacy of the operation. Pioneered principally by urologists and gynaecologists, occupational sociologist James Zetka has shown that general surgeons were particularly resistant to minimally invasive practice at first, fiercely defending their terrain against

it. But by the early 1990s, in the face of keyhole surgery's successful establishment in other fields, general surgeons moved towards the laparoscopic method. Those who opposed it were left with little choice but to adapt.⁷² It was not long before general surgeons were proclaiming a revolution in their field of practice. In particular the introduction of laparoscopic cholecystectomy was viewed as symbolic; representing the expansion of minimally invasive technique into general surgery via one of the most common operations in the abdominal surgeon's repertoire.⁷³

CONCLUSION

The first of the major bodily cavities to be explored by surgical hands, the abdomen held a distinctive place in the surgical imagination in the nineteenth century, a site of drama, in which the wonders of surgical progress were thought to be fully realised. In the twentieth century abdominal surgery played a major role in establishing the predominance of surgery as a means of managing the internal structures of the body. But by situating abdominal surgery in the long view, its history stretching back beyond the nineteenth century and continuing to be constructed today, one can draw out aspects of a more complex narrative that caution against more celebratory histories; abdominal surgery is characterized by its instability as a category when considered in professional terms, its intricate relationship with gender, and its changing definition and status as medicine moves into the twenty-first century.

Indeed, the last thirty years have seen the decline of a surgical era that saw the opening of the abdomen as a key trait of modern surgery, and the beginning of a new one, where large incisions of the abdomen have become increasingly incongruous with current surgical trends. For the trainee surgeon of today the landscape of abdominal surgery is dramatically different from what it was just a few decades ago. The majority of operations performed will be done laparoscopically and only occasionally will cholecystectomy or appendectomy call for an open incision to be made. Open abdominal surgery still has a place, especially in emergency surgery, where laparotomies need to be employed for serious wounds and to investigate acute abdominal pain of unknown cause, but it is becoming more uncommon in today's operating theatres.

Raising questions as it does about the nature of skill in surgery, models of surgical training and the interrelationship between emergency and elective surgery, the continuing changes in abdominal surgery spell out the importance of keeping an eye trained on the field as it continues to transition: historians are only beginning to explore the impact of minimally invasive practice, not just in surgery but upon medicine as a whole. At the same time, the continued controversies over the right of women to choose elective caesarean sections draws attention to the continued relevance—and cultural significance—of open surgery of the abdomen. Indeed, caesarean section in

particular, warrants far greater examination by historians than it has received thus far, given its pivotal role in both the history of surgery and obstetrics. As surgeons, patients and the public continue to negotiate the place of abdominal surgery in society; its history remains germane, affording a window onto long-held controversies and concerns, the presence of which can still be felt today.

NOTES

1. See also chapter ‘The History of Surgical Wound Infection: Revolution or Evolution?’ by Michael Worboys in this handbook.
2. Ephraim McDowell, ‘Three Cases of Extirpation of Diseased Ovaria’, *Eclectic Repertory and Analytical Review* 7 (1817): 242–243.
3. Mary Young Ridenbaugh, *The Biography of Ephraim McDowell M.D, the Father of Ovariectomy* (New York: Charles L Webster, 1890), 73.
4. Ezra Michener, ‘Case of Diseased Ovarium’, *Eclectic Repertory and Analytical Review* 8 (1818): 111–115, see 114–115.
5. Ridenbaugh, *The Biography of Ephraim McDowell*; August Schachner, *Ephraim McDowell: ‘Father of Ovariectomy’ and Founder of Abdominal Surgery*. (Philadelphia and London: J.B Lippincott Company, 1921).
6. Schachner, *Ephraim McDowell*, xvi; Ridenbaugh, *The Biography of Ephraim McDowell*, 4.
7. Andrew Wear, *Knowledge and Practice in English Medicine, 1550–1680* (Cambridge: Cambridge, 2000), 219.
8. Aulus Cornelius Celsus, *De Medicina* (On Medicine) transl. W. G Spencer (Cambridge, MA: Harvard University Press, Loeb Classical Library edition, 1938), 385 (<http://penelope.uchicago.edu/Thayer/E/Roman/Texts/Celsus/7.html> accessed 22 July 2016).
9. Luis H. Toledo-Pereyra, ‘Galen’s Contribution to Surgery’, *Journal of the History of Medicine and Allied Sciences* 28 (1973): 357–375, see 363–364.
10. Lorenz Heister, *A General System of Surgery, in Three Parts* (London, J. Clarke et al., 1763), 63–70; 85–87.
11. Lisa Forman Cody, *Birthing the Nation: Sex, Science and the Conception of Eighteenth-Century Britons* (Oxford: Oxford University Press, 2005), 40.
12. Peter Stanley, *For Fear of Pain: British Surgery, 1890–1850* (Amsterdam and New York: Rodopi, 2003), 78.
13. Sally Frampton, ‘The Debris of Life: Diseased Ovaries in Eighteenth-Century Medicine’, in *The Secrets of Generation: Reproduction in the Long Eighteenth Century*, eds Raymond Stephanson and Darren N. Wagner, 344–363 (Toronto: University of Toronto Press, 2015), 348.
14. William Hunter, ‘The History of Emphysema’, *Medical Observations and Inquiries* 2 (1758): 17–70, see 44–45; Sauveur-François Morand, ‘Remarques sur le observations précédentes, avec un précis de quelques autres, sur le meme sujet’, *Memoires de l’Academie Royale de Chirurgie* 2 (1753): 455–460, see 460.
15. Sally Frampton, ‘“The Most Startling Innovation”: Ovarian Surgery in Britain, c.1740–1939’ (PhD dissertation, University College London, 2014).

16. See also chapter ‘[Between Human and Veterinary Medicine: The History of Animals and Surgery](#)’ by Abigail Woods on animals and surgery in this handbook.
17. James Blundell, ‘On the Surgery of the Abdomen’, *The Lancet* 12 (1829): 353–356, see 355.
18. Charles Clay, ‘Ovariectomy’, *Medical Times* 9 (1843): 4–5.
19. Professional opinion about ovariectomy had changed so rapidly that in 1865 the leading British ovariectomist Thomas Spencer Wells commented that ‘it is difficult, as the new year opens, to remember without some doubt as to the correctness of memory, what was the position of ovariectomy in the opinion of the profession only seven years ago’. Thomas Spencer Wells, *Diseases of the Ovaries: Their Diagnosis and Treatment* (Churchill. London, 1865), ix. Wells calculated the mortality rate in his own practice as around one-third, xiii.
20. James Greig Smith, *Abdominal Surgery* (London, Churchill, 1887), viii.
21. Arthur Mayo Robson, ‘Address in Surgery: Observations on the Evolution of Abdominal Surgery from Personal Reminiscences Extending over a Third of a Century and the Performance of 2000 Operations’, *Lancet* 162 (1903): 292–297, see 293.
22. Frederick Treves, ‘Address in Surgery: The Surgeon of the Nineteenth Century’, *Lancet* 156 (1900): 284–289, see 287–288.
23. Peter C. English, *Shock, Physiological Surgery, and George Washington Crile: Medical Innovation in the Progressive Era* (Westport and London: Greenwood Press, 1980) 31.
24. ‘Annotations’, *Lancet*, 118 (1881): 1148.
25. R.P Rowlands, ‘Bradshaw Lecture on the Surgery of the Gall-Bladder and Bile-Ducts’, *Lancet* 214 (1929): 1075–1081, see 1075.
26. John Knowsley Thornton, ‘On Three Successful Cases of Nephrotomy with Remarks on this Operation’, *Lancet* 121 (1883): 899–901.
27. Smith, *Abdominal Surgery*, 569–570.
28. ‘Reviews and Notices: Abdominal Surgery’, *British Medical Journal* 2 (1887): 512–513, see 512.
29. George Weisz, ‘The Emergence of Medical Specialization in the Nineteenth Century’, *Bulletin of the History of Medicine* 77 (2003): 536–575, see 572.
30. Mayo Robson ‘Address in Surgery’, 292.
31. Most notably Christopher Lawrence and Richard Dixey. See: Christopher Lawrence and Richard Dixey, ‘Practising on Principle: Joseph Lister and the Germ Theories of Disease’, in *Medical Theory, Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence, 153–215 (London and New York: Routledge, 1992) 153–154. See also chapter ‘[The History of Surgical Wound Infection: Revolution or Evolution?](#)’ by Michael Worboys in this handbook.
32. London Hospital matron Eva Lückes warned nurses of the careful and exacting care that would be expected from those looking after ovariectomies, which was ‘one of the most important operations of which you can ever have charge’. Eva Lückes, *Lectures on General Nursing* (Trench, Kegan Paul, 1884), 133. See also chapter ‘[Nursing and Surgery: Professionalisation, Education and Innovation](#)’ on nursing by Rosemary Wall and Christine Hallett in this handbook.
33. Robert Lawson Tait, ‘“Listerian” Ovariectomy’, *Lancet* 117 (1881): 35.
34. Another high-profile figure who questioned the role of antiseptics in abdominal surgery was Edinburgh ovariectomist Thomas Keith. Keith was initially a

- supporter of Listerian antiseptics but later grew to believe that external chemicals like carbolic acid were probably unnecessary and perhaps even injurious. Thomas Keith, 'Results of Ovariectomy Before and After Antiseptics', *British Medical Journal* 2 (1878): 590–593.
35. John A. Shepherd, *Lawson Tait: The Rebellious Surgeon* (Kansas City: Coronado Press, 1980). 202. As quoted in Anna Greenwood, 'Lawson Tait and Opposition to Germ Theory: Defining Science in Surgical Practice', *Journal of the History of Medicine and Allied Sciences* 53 (1998), 99–131, see 108.
 36. Greenwood, 'Lawson Tait and Opposition to Germ Theory', 99–131.
 37. Ornella Moscucci, *The Science of Woman: Gynaecology and Gender in England 1800–1929* (Cambridge: Cambridge University Press, 1990): 165–184.
 38. 'Reports of Societies', *British Medical Journal* 1 (1890), 958.
 39. When leading abdominal surgeon Berkeley Moynihan first published his popular textbook *Abdominal Operations*, it is notable that he included only operations that could be performed on both sexes—neither ovariectomy nor hysterectomy were included. Berkeley Moynihan, *Abdominal Operations* (Philadelphia and London: W.B Saunders and Company, 1905).
 40. On constructing historical narratives more generally, see also chapter 'Surgery and Its Histories: Purposes and Contexts' by Christopher Lawrence in this handbook.
 41. Michael Worboys, 'British medicine and its past at Queen Victoria's Jubilees and the 1900 Centennial', *Medical History* 45 (2001): 461–482.
 42. 'In the abdomen there is no single viscus or part which is free from the attacks of the surgeon'. John H. Morgan, 'Presidential Address on the Romance of Surgery', *Lancet* 156 (1900): 1061–1064, see 1062. For more on the use of militaristic language by surgeons see English, *Shock, Physiological Surgery*, 32–33.
 43. Mayo Robson, 'Address in Surgery', 293.
 44. John Erichsen, 'An Address Delivered at the Opening of the Section of Surgery', *British Medical Journal* 2, no. 1337 (1886): 314–316, see 314.
 45. James Greig Smith, *Abdominal Surgery* (London and Bristol: J.A Churchill and Arrowsmith, 1888), 120.
 46. For more on the changing meanings of conservative and radical surgery see Gert H. Brieger, 'From Conservative to Radical Surgery in Late 19th-century America', in *Medical Theory, Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence, 153–215 (London and New York: Routledge, 1992): 216–231.
 47. Ilana Löwy, "'Because of Their Praiseworthy Modesty, They Consult Too Late": Regime of Hope and Cancer of the Womb', *Bulletin of the History of Medicine* 85 (2010): 356–383, see 372.
 48. Thomas Spencer Wells, *Modern Abdominal Surgery: The Bradshaw Lecture Delivered at the Royal College of Surgeons of England. With an Appendix on the Castration of Women* (London: J. A Churchill, 1891): 47.
 49. Stanley, *For Fear of Pain*, 76–77, 152–153.
 50. Barbara Ehrenreich and Deirdre English, *For Her Own Good: 150 Years of the Expert's Advice to Women* (London: Pluto Press, 1979), 137.
 51. Thomas Laqueur, *Making Sex: Body and Gender from the Greeks to Freud* (Cambridge, Massachusetts and London, England: Harvard University Press,

- 1990); Moscucci, *The Science of Woman*; Ann Dally, *Women Under the Knife: A History of Surgery* (London: Hutchinson Radius, 1991).
52. Ilana Löwy, *Preventive Strikes: Women, Precancer, and Prophylactic Surgery* (Baltimore: Johns Hopkins University Press, 2010), 237.
 53. Regina Morantz-Sanchez, *Conduct Unbecoming of a Woman: Medicine on Trial in Turn-of-the-Century Brooklyn* (Oxford: Oxford University Press, 1999); Claire Brock, 'Surgical Controversy at the New Hospital for Women, 1872–1892', *Social History of Medicine* 24 (2011): 1–16; Claire Brock, 'Risk, Responsibility and Surgery in the 1890s and Early 1900s', *Medical History* 57 (May 2013): 317–337.
 54. Marie Jenkins Schwartz, *Birthing a Slave: Motherhood and Medicine in the Antebellum South* (Cambridge, Massachusetts and London: Harvard University Press, 2006), 164–166.
 55. Angela Davis, *Modern Motherhood: Women and Family in England, c.1945–2000* (Manchester and New York, Manchester University press, 2012), 85.
 56. See for example Sally Wilde and Geoffrey Hirst, 'Learning from Mistakes: Early Twentieth-century Surgical Practice', *Journal of the History of Medicine and Allied Sciences*, 64 (2009): 38–77.
 57. Ian Miller, *A Modern History of the Stomach: Gastric Illness, Medicine and British Society, 1800–1950* (Abingdon, Routledge, 2015), 97–98.
 58. Berkeley Moynihan, *The Pathology of the Living and other Essays* (Philadelphia and London: W.B Saunders and Company, 1910), 19.
 59. Miller, *A Modern History of the Stomach*, 106; Moynihan, *The Pathology of the Living*, 50.
 60. Ann Dally, *Fantasy Surgery, 1880–1930: with Special Reference to Sir William Arbuthnot Lane* (Amsterdam: Rodopi, 1996) 110–111; W.A Arbuthnot Lane, 'Remarks on the Results of the Operative Treatment of Chronic Constipation', *British Medical Journal*, 1 (1908): 126–130.
 61. Lane, 'Remarks on the Results of the Operative Treatment of Chronic Constipation', 126.
 62. Dale C. Smith, 'Appendicitis, Appendectomy, and the Surgeon', *Bulletin of the History of Medicine*, 70 (1996): 414–441, see 436.
 63. Keith Wailoo, *Drawing Blood: Technology and Disease Identity in Twentieth-Century America* (Baltimore and London: The Johns Hopkins University Press, 1997), 55.
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Surgery and Anaesthesia: Revolutions in Practice

Stephanie J. Snow

INTRODUCTION

The discovery of anaesthesia in 1846 was a defining moment in the history of surgery. It revolutionised the surgical experience for both patient and surgeon; the expectation that surgery will be painless remains at the bedrock of contemporary practice. By transforming human experiences of surgical pain and suffering, anaesthesia created a watershed between modern surgery and earlier practices. And yet its early introduction was hugely controversial and provoked deep debates about pain, death and the nature of life. It drove the recalibration of surgical and social conceptions of the risks and benefits of pain and was used selectively until at least the 1860s. By the end of the nineteenth century, however, anaesthesia was established as an enduring symbol of Victorian civilisation: ‘the greatest discovery of the age’.¹ In the history of surgery it stands as the strongest mark of humanitarianism and the progress of science: ‘What greater blessing has science ever conferred upon the human race?’, marvelled Frederic Dennis (1850–1934), Professor of Surgery at Cornell University in 1905.² Unsurprisingly, celebratory and progressivist narratives of its discovery and introduction characterize much of the literature until the present day.³ Whereas most of the early accounts shared a triumphalist tone, Barbara Duncum’s scholarly study of anaesthetic technology and techniques, published in 1946, the centenary year of ether’s introduction, was the first to identify the richness of anaesthesia’s history by considering

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the controversies around chloroform fatalities, the geographical divergence in anaesthetic use and the broader social and cultural context.⁴ Notably, the history of anaesthesia has been vigorously researched by practitioners themselves, producing what Christopher Lawrence has described as ‘an historical industry’ on the topic.⁵ The UK and the USA have thriving Anaesthesia History societies that stage international conferences; history features in anaesthetic textbooks and specialist journals. Studies produced in this context usually focus on questions of primacy, great men, technology, agents and the physiological process.⁶

It is only recently that historians have begun to explore the controversies that surrounded its introduction and establishment as a routine practice and to tap into its potential for deepening our understandings of nineteenth-century surgery and medicine. Martin Pernick’s, *A Calculus of Suffering*, was a landmark study that used anaesthesia as a lens through which to explore ideas of professionalism and benevolence in nineteenth-century USA.⁷ Since then the introduction and take-up of anaesthesia in Britain, its use in childbirth in the context of the broader critique of the medicalisation of birth, the controversies about chloroform death, and the cost-benefit analysis of the risks of pain-free surgery have been the primary areas for historical investigation.⁸ Scarcely any historians have explored its twentieth-century history. Work such as that by the anaesthetists Keith Sykes and John Bunker reveals the impact of the World Wars on anaesthetic practice, maps the evolution of specialist anaesthesia and recounts how practitioners developed new areas of expertise such as intensive care and chronic pain management but does not contextualise this history in the wider history of medicine.⁹ Jennifer Beinart’s study of the Nuffield Department of Anaesthetics in Oxford between 1937 and 1987 is a rare exception and her discussion of aspects such as anaesthesia’s status within medicine, sub-specialisation, and the role of women reveals how this field can illuminate broader themes in the history of surgery and medicine.¹⁰ What follows will, I hope, demonstrate the richness of the history of anaesthesia and its potential for opening up new ways of understanding how attitudes to human suffering shifted irrevocably over the course of the nineteenth century and redefined concepts of surgical risk.

ANAESTHESIA PRE-HISTORY

Anaesthesia has a distinct pre-history and many writers, though few historians, have questioned why the technique of rendering patients oblivious to pain through inhaling chemicals like ether and nitrous oxide did not emerge earlier than the 1840s. To understand this conundrum, we need to appreciate the significant shifts that occurred in medicine between the 1790s and the 1840s. Since classical times the body was understood as a holistic system in which health was attained through balancing the body’s natural and individual equilibrium. Therapies were conceived of as stimulants or depressants and used to counter imbalances in the body and restore it to equilibrium.

The nervous system was the focus of much study in the eighteenth century and in 1752 Swiss physician Albrecht von Haller (1708–1777) located sensibility (feeling) as an exclusive physical property of the fibres of the nerves and irritability (motor function) as a basic property of the muscles.¹¹ In parallel, death became understood as a process rather than a punctual and absolute event, which gave rise to the possibility of using techniques such as resuscitation to restore an apparently dead body to life.¹² This was the framework within which Humphry Davy (1778–1829) embarked on his explorations of nitrous oxide. Davy was a chemist, recruited by Thomas Beddoes (1760–1808) to assist with Beddoes' researches into newly discovered gases like nitrogen, hydrogen and oxygen as therapies for lung conditions such as tuberculosis at the Pneumatic Institute in Clifton, Bristol in 1799.¹³ Davy used animal experiments to determine whether the gases would stimulate or depress life in the body and found that nitrous oxide had a different mode of action: it caused an initial period of excitement followed by a state of exhaustion which could be reversed by breathing air.¹⁴ He breathed the gas himself finding it utterly intoxicating and also noted its efficacy in numbing a bad toothache. But he was never in any doubt that the initial stimulatory effects on the nervous system would rapidly become depressive and thus lead to death.

In the history of anaesthesia, much has been made of Davy's observation that nitrous oxide dulled toothache and his suggestion that the gas could be useful during surgical operations that did not incur significant blood loss. William Smith concluded that Davy's researches set the stage for anaesthesia 'but the actors went away'¹⁵; Margaret Jacob and Michael Sauter's sensitive historical analysis establishes the reasons for Davy's expectation that nitrous oxide's pain-relieving qualities were diminished with surgical blood loss. Blood was the source of all sensations, painful and pleasurable, thus significant blood loss not only weakened nitrous oxide's pain-relieving powers, but also heightened the risks for the patient.¹⁶ However, the key reasons that Davy's research into nitrous oxide could not have led to the beginning of anaesthesia rest on his understandings of human physiology. First, he did not believe it was possible to disassociate sensibility from the living principles of the body without dangerous consequences. Breathing nitrous oxide was a process of suffocation in which death was the final outcome. Even when life was restored, intense pain would be experienced during the return of sensations to the body. Davy's suggestion that nitrous oxide might be useful in surgery was based on the substance's properties which he conceived to be similar to opiates or alcohol. In small doses these agents would act as stimulants but in larger doses they would depress the body's systems and intensify bleeding.¹⁷ Second, he believed that pain fulfilled a physiological function and associated its presence with the return of vitality to the body after illness. 'By whatever cause the exhaustion of organs is produced', he remarked, 'pain is almost uniformly connected with their returning health'.¹⁸ He certainly supported the use of opiates and alcohol to relieve pain but he also considered pain as an essential component of the healing process.

The animal experiments of the Shropshire surgeon Henry Hill Hickman (1800–1830) in 1823 on ‘suspended animation’ using carbon dioxide have also proved difficult to assimilate within the longer history of anaesthesia. Frederick Cartwright, for example, argues against any connection.¹⁹ Yet Hickman’s ability to conceive of a physical state in which sensibility was temporarily suspended draws on the new configurations of the nervous system established through the work of Charles Bell (1774–1842), Francois Magendie (1783–1855) and Marie Flourens (1794–1867) which supported a separation of functions of the mind from those of the body. During the 1830s the British physiologist’s Marshall Hall’s (1790–1857) work on nerves and reflex actions suggested that the nervous system could be understood at three hierarchical levels: the brain (sensation and volition), spinal cord (reflexes like swallowing), and the vegetative nervous system (circulation, respiration, digestion). Such views made it possible to conceive of in which breathing and circulation could continue independently of sensation and movement.²⁰

The word ‘anaesthesia’ had been in medical usage since the 1750s with the meaning of a cluster of diseases in which the key symptom was the loss of touch. By the 1840s it was regarded as a condition of insensibility—the loss of feeling—which could be caused by things like a very tightly wrapped bandage, or physical states like palsy, often, as Pernick notes, in association with poor healing.²¹ In June 1846, Professor John Elliotson’s oration to the Harveian Society expressed exactly how physiological knowledge in the 1840s could support the concept of anaesthesia: ‘The loss of common feeling—anaesthesia, is but a form of palsy, and in it wounds give no pain. If this condition can be induced temporarily by art, we of necessity enable persons to undergo surgical operations without suffering’.²² Elliotson was part of a new generation for whom old ideas (such as those held by Davy) about the critical function of pain during surgery had begun to wane.

PAIN AND SURGERY

Pain had long been understood to perform an elemental role in surgery by sustaining the body’s vitality whilst its systems were being depressed by the stress of an operation. The idea of pain as a ‘voice of nature’, a protective device which could warn of internal inflammation or disease in advance of visible symptoms was implicit in a large number of treatments.²³ Peter Stanley details the acutely painful nature of many of the therapies used at the site of wounds after injury or operation and how surgeons and patients accepted them nonetheless as offering the best chance for recovery.²⁴ Despite such attitudes from the 1820s onwards the problem of surgical pain became increasingly prominent as surgeons began to extend the range and complexity of procedures through practising what was called conservative surgery. This approach sought to preserve limbs and tissues through excising diseased or injured bone instead of amputating the whole limb, and although it had significant benefits for patients, it increased the length of the operations and thus the patients’ suffering.²⁵

From the 1790s opiates had been widely used to treat chronic, terminal pain and post-operative pain but they were too risky to employ in any great quantity during operations. Alcohol was sometimes given in small amounts to patients to fortify them before an operation or revive them afterwards, but large doses were routinely avoided. Its depressant qualities were believed to compound the risks of surgery and exacerbate blood loss. That large doses of alcohol were routinely used to diminish the pain of operations is one of the most persistent fallacies in the history of anaesthesia. Thus, surgeons had to think of other ways of mitigating surgical pain. James Moore (1762–1860), surgeon at St. George's hospital in London designed a steel contraption in 1784 to diminish sensibility prior to amputation by applying pressure to the limb. However, patients complained about the considerable pain of the compression itself.²⁶ Other techniques such as burning the skin, acupuncture and creating a state of intermittent consciousness by bleeding the patient prior to surgery were tried out, but with little success.²⁷ During the 1820s and 1830s mesmerism, a form of hypnosis, introduced by Anton Mesmer (1734–1815) in the 1790s was trialled. A few practitioners like James Esdaile (1808–1859) working in India reported great success but most viewed it as quackery.²⁸ In the meantime surgeons continued to develop more complex and technically demanding procedures. Between September 1840 and December 1841, the *Lancet* published details of new operations for stammering, squinting, club foot and cataract. This suggests that contrary to much historical interpretation, surgical development was not dependent upon anaesthesia.²⁹ Nevertheless, the high risks of infection, blood loss and mortality combined with patients' reluctance to endure pain caused operations to remain the last resort of surgical practice after all other means of treatment had failed. The view that a successful method of surgical pain-relief could be developed was a 'myth' declared the French surgeon, Alfred Velpeau (1795–1867), in 1840.³⁰

UPTAKE OF ANAESTHESIA

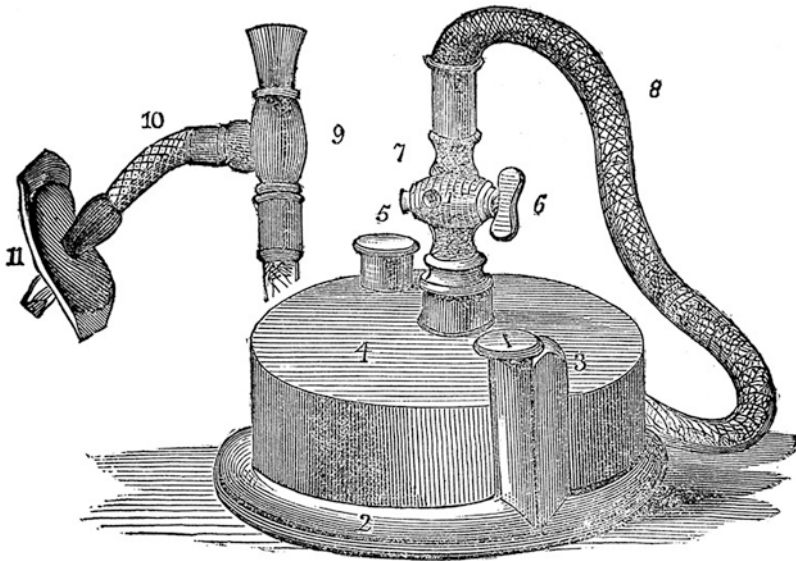
It is worth noting that the discovery that inhaling chemicals like ether and nitrous oxide could temporarily produce insensibility to surgical pain did not originate from the new physiology. Instead it was found by serendipity in the course of experiments that US dentists performed to improve their business by offering pain-relief to patients undergoing tooth extractions. By the 1840s breathing 'laughing gas', as nitrous oxide was known, was a popular recreational pursuit. In 1844 in Hartford, USA, the dentist Horace Wells (1815–1848) observed that a young man under its influence seemed impervious to the pain of an injured leg. Wells used nitrous oxide on his dental patients but in 1845 his demonstration of its pain-reducing effect during a tooth extraction at Massachusetts General Hospital in Boston failed and the method was dismissed as a sham.³¹ Around the same time, Crawford Long (1815–1878), a doctor in the southern state of Georgia, USA, was successful in using ether to prevent pain during operations. But his results were not publicised as he was not convinced as to whether the anaesthetic effects were produced by the

patient's imagination, or the chemical itself.³² The anaesthetic effect of ether was later established by the dentist William Morton (1819–1868) through a successful demonstration at the Massachusetts General Hospital, Boston on 16 October 1846 during the removal of a tumour on the jaw.³³ The use of ether, at the time a known remedy for toothache, had been suggested to Morton by fellow dentist Charles T. Jackson (1805–1880). Subsequently the main protagonists of the introduction of the substance for the suppression of surgical pain got entangled in bitter priority disputes: Morton and Jackson attempted to patent its use while Wells tried to assert his part in establishing the principle of anaesthesia. Wells committed suicide in 1848, but the arguments with Jackson persisted until Morton's death in 1868. Richard Wolfe's scholarly biographies of Morton and Jackson depict Morton as a self-serving crook while painting a sympathetic defence of the contribution made by his rival Jackson.³⁴ Yet it is likely that it was precisely Morton's desire for commercial success in dentistry that had freed him to take risks that doctors at the time would have avoided. Nitrous oxide and ether were already well-established within the medicine of the time. Ether was listed in the contemporary pharmacopoeias and used as a treatment for asthma. However, at the same time medical students were taught that such chemicals were poisonous and although they initially acted as stimulants they would lead to death through oxygen deprivation. Not even the most 'bold and adventurous' surgeon would have had the 'temerity' to experiment with ether as Morton had, commented the New York surgeon, Valentine Mott (1785–1865).³⁵

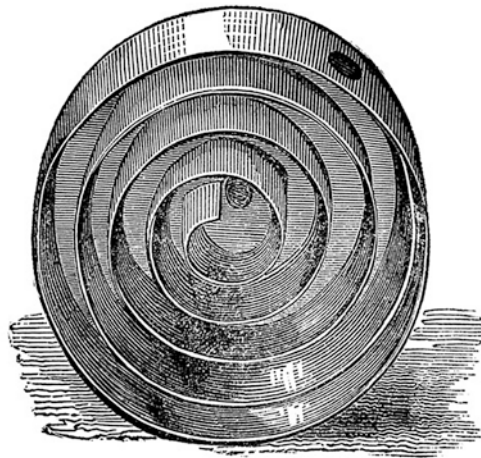
Shortly after the successful demonstration in Boston, news of ether was sent across the Atlantic to the UK and Europe and spread worldwide within six months. In London, the surgeon Robert Liston (1794–1847) used it successfully in a leg amputation on 21 December 1846. Anaesthesia's benefits were indisputable, though many doctors and dentists had difficulties in administering it effectively. Patients who received too small a dose grew excited, struggled, and lost their sense of propriety. 'Now we'll dance the Polka', a respectable solicitor told his dentist.³⁶ Such episodes threatened to undermine the seriousness of surgery. Thus, Charlotte Brontë (1816–1855) noted: '[I] would think twice before I consented to inhale; one would not like to make a fool of oneself'.³⁷ The majority of practitioners approached ether empirically, trying it out on themselves or on patients and did not consider the scientific principles at play. But in London, John Snow (1813–1858), then a general practitioner and later to become famous for his work on cholera, began by researching the physical and chemical properties of ether and proceeded to investigate its effects on animals. Snow's passion for applying science to medical practice coupled with his well-established interest in the physiology of respiration and the principles of gas exchange informed his approach. He discovered that the degree of anaesthesia was determined by the concentration of ether in the blood which in turn depended on temperature. He deduced that ether produced its anaesthetic effects by being absorbed into the blood and acting on the nervous system. Ether initially

affected the higher, more subtle brain functions and as the concentration in the blood increased, sensibility was suspended and the more important functions such as respiration were steadily depressed. Following these principles, he designed an inhaler that used a water bath to control the temperature of the air and thereby the amount of ether given to patients (Fig. 1). He demonstrated the inhaler at the Westminster Medical Society in January 1847 and began to administer ether at St. George's and University College hospitals in London. In *On the Inhalation of Ether*, published in summer 1847, Snow described the process of anaesthesia as five identifiable degrees of narcotism which systematically and predictably suspended bodily functions. The fourth degree in which the effects of ether reached the spinal cord and blocked sensibility and movement and the patient was fully unconscious was, declared Snow, the correct degree for surgical cases. His analyses established the framework of modern anaesthetic practice.³⁸

But many doctors still struggled to administer ether successfully, often inducing a state of excitement rather than insensibility in their patients. These difficulties coupled with concerns about ether's safety caused it to be abandoned by many doctors. Ether could have remained a rare surgical technique but for the discovery of a new anaesthetic—chloroform—in November 1847 by the Edinburgh physician James Young Simpson (1811–1870). Chloroform immediately revived interest in anaesthesia and its efficacy caused it to be rapidly adopted worldwide as the anaesthetic of choice. However, the first death from chloroform occurred within a matter of weeks in Newcastle Upon Tyne in the north of England. In January 1848, 15-year old Hannah Greener was having a toenail removed at her home and died within two minutes of inhaling chloroform. An intense debate broke out on the cause of her death. Had chloroform killed through the respiration, or had an overdose poisoned the heart? Simpson argued that the brandy and water given to Hannah to revive her had caused asphyxia; Snow maintained that death had occurred from overdosage because the chloroform was given on a handkerchief rather than using an inhaler. This set the terms for a dispute between Edinburgh and London which persisted through the nineteenth century and manifested itself through the use of the handkerchief versus the inhaler. Snow was in a minority as he placed the inhalation of ether and chloroform within the framework of the new scientific medicine. He saw anaesthesia as a universal process which produced a predictable sequence of responses in all bodies and was of potential benefit to most patients. Any patient, he claimed, who was fit for an operation was fit for anaesthesia; using an inhaler allowed for the dose to be quantified and administered safely.³⁹ On the other hand, the majority of doctors at the time placed the new technique within the familiar therapeutic paradigms of classical medicine in which each patient had an individual response to the chemicals; administering chloroform on a handkerchief allowed practitioners to tailor the dose individually for each patient. Questions on the mechanism of death by chloroform remained unresolved until 1911. The dispute has been explored by Lawrence's historical analysis as to



- | | |
|--|--|
| <p>1, Cap which unscrews to admit the air to
 2, Metal pipe.
 3, Entrance of ditto into
 4, Spiral chamber.
 5, Star closing aperture for putting in or
 pouring out ether.
 6, Two-way tap.</p> | <p>7, External opening of ditto.
 8, Flexible tube.
 9, Ebony tube, containing ball valves of
 cedar wood.
 10, Portion of flexible tube to admit of
 change of position of
 11, Mouth-piece, with soft cushion, &c.</p> |
|--|--|



Interior of spiral chamber, the bottom being removed.
 N.B.—The spiral tin plate is soldered to the top, and reaches nearly to the bottom.

Fig. 1 Ether apparatus designed by John Snow, published in *The London Medical Gazette* on 19 March 1847. Wellcome Library, London

how the physiologist A. Goodman Levy (1866–1954) provided the missing link by showing that even low doses of the anaesthetic were able to cause death by inducing ventricular fibrillation of the heart.⁴⁰

IMPACT ON SURGERY

Some historians have claimed that the development of surgery was not significantly influenced by anaesthesia until the introduction of antiseptic techniques in the 1870s diminished the problem of infection.⁴¹ Nicholas Greene's analysis of the types of operations performed between 1846 and the 1870s led him to conclude that anaesthesia had 'little immediate effect' on the development of surgery.⁴² Certainly the risks of post-operative wound infection and surgical mortality remained relatively unchanged until the 1870s despite the use of ether and chloroform. Nevertheless, anaesthesia solved the problem of surgical pain. It consequently revolutionised patients' attitudes to operations and caused surgeons to recalibrate the risks and benefits of pain in surgery.

In London practice, the availability of ether reconfigured the type of operation performed from the beginning. Analysis of the accounts of around 70 procedures performed in London during the first three months of 1847 which were published in medical journals shows that ether encouraged the performance of joint excisions (understood to be one of the most painful surgical procedures) and increased the number of minor procedures such as toenail removal, lacerations and circumcision.⁴³ Unlike the reasons for amputation, these conditions were no immediate threat to life. Prior to ether, surgeons had offered such operations to prevent the development of serious infection, but many patients refused on account of the pain. As a result, these conditions often deteriorated to the point when amputation was the only means of saving life. Ether immediately began to reverse these trends as patients consented to surgery provided they would suffer no pain. Thus, the first patients to try ether at King's College were those who had previously refused operations and over 90% of the arm and leg amputations performed at St. George's during the first months of 1847 were due to chronic disease in the ankle or wrist joint.⁴⁴ By April 1847 the *Lancet's* claim that the number of surgical operations in London had 'more than doubled' fuelled arguments that ether had given rise to unnecessary surgery.⁴⁵ But rising operation numbers were much more a reflection of the enthusiastic patient response to anaesthesia rather than surgical bravado. Surgical notes show that in the UK and the USA there was no apparent overuse of surgery consequent to the introduction of anaesthesia: surgeons continued to try non-operative therapies before operations and kept classifying some conditions as inoperable because of either the location or severity of the disease.⁴⁶

The impact of ether on surgical practice in London and Boston seems remarkably similar. Pernick's analysis of practice at the Massachusetts General Hospital showed the rate of surgery increased by 2.5 times during the first

twelve months of ether use and the case-books of William Ferguson (1808–1877), Professor of Surgery at King’s College, London reveal a similar doubling in the rate of surgery.⁴⁷ Notably in both places, the use of ether reflected common views that sensibility to pain was determined by race, gender and age so that the patients most likely to receive ether were those understood to be particularly vulnerable to pain: women, children, the elderly and accident victims.

The introduction of chloroform in November 1847 sustained the growth in operations established by ether. Substantial evidence on the early use of anaesthesia is difficult to find, but we have rich material on its adoption into everyday London practice through Snow’s case-books. These were painstakingly transcribed and published by Richard Ellis, an anaesthetist whose researches from the 1970s established much of the detail of the introduction of ether to London and Snow’s anaesthetic practice.⁴⁸ Spanning from July 1848 to June 1858 the case-books cover almost 4500 surgical and dental anaesthetic administrations, with information on the anaesthetic and techniques, details about the operating surgeon/dentist, the procedure and the location.⁴⁹ Snow’s notes capture the overwhelmingly positive response of patients to pain relief; some patients needed encouragement to breathe chloroform, but only a handful refused it. The interweaving of hospital-based work with private practice and charitable work shows how patients would travel from across Britain and across the world to have medical treatment. Operations were carried out in hotels and lodging houses as well as patients’ homes, often with family and friends in attendance, and the notes afford us a glimpse of the dynamics of economics and etiquette that structured such encounters. Chloroform was overwhelmingly the primary anaesthetic; Snow used ether in only 0.3% of administrations. His records illuminate how the reconfiguration of surgery begun under ether continued with chloroform. The numbers of reconstructive procedures rose rapidly and included operations to repair disfigurements from birth or injury, the reconstructive surgery of nose defects, the removal of small tumours and the repair of fistulae. Snow was under no illusion that the purpose of such plastic operations was to mitigate deformity and directly connected them to the availability of anaesthesia: he argued that without pain relief most patients would not tolerate such procedures.⁵⁰ Between 1849 and 1857, the number of this kind of operations recorded by Snow tripled. Prior to anaesthesia, surgery on children had been very limited due to the difficulty of controlling the little patients. In 1842 Ferguson had declared lithotripsy—the crushing of bladder stones and leaving the fragments to dispel—to be intolerable for children; by 1854 he was performing lithotripsy on 3-year olds under chloroform.⁵¹ Children under the age of 10 accounted for 13% of Snow’s practice and he recorded giving very young babies chloroform during the repair of hare-lips: similar increases in surgery upon children were noted by Pernick.⁵² Historically, female surgical patients were less likely to be offered operations than their male counterparts, partly because of the widespread view that females were more susceptible to pain and partly because males were more likely to suffer trauma. It thus

makes sense that women were significant beneficiaries of anaesthesia: Snow's administrations of chloroform to private female patients for plastic/superficial operations increased fourfold between 1849 and 1857 and London hospital records show that the proportion of female patients undergoing operations had risen dramatically by the 1860s.⁵³ Simultaneously, excisions kept growing to replace amputation as treatment for diseased or injured bones and joints. By 1865 the Scottish surgeon James Syme (1799–1870) declared that 'amputation below knee is seldom required, since all diseases and injuries which were formerly held to demand it may, with few exceptions, be remedied by removing the foot at the ankle.'⁵⁴ Dentistry also responded dramatically to anaesthesia and patients sought to benefit from pain-free tooth extractions and the fitting of artificial sets of teeth. Snow's dental work increased by 17 times between 1849 and 1857 and the majority of his patients were middle-class female patients.⁵⁵ Dental history remains an area which is currently underexplored in the literature.

RECALIBRATING RISK AND PAIN

Making pain-free operations a norm of surgical practice required practitioners to significantly reconfigure their understandings of pain in the surgical context. Joanna Bourke's recent study of the social and literary history of pain reveals the complex ambivalences that shape meanings of pain and its connections with the accessibility of pain relief.⁵⁶ Calculating the risks of intervention against the benefits of alleviating suffering and preserving life had always been an essential dimension of surgical practice. In this context, pain was understood as a core component of surgery, stimulating the body's systems during the stress of an operation. But as we saw earlier, the establishment of pain relief as a medical goal in many areas of medicine through the use of opiates from the 1790s unsettled notions about surgical pain. The prevailing view that surgical pain was purposeful juxtaposed against concerns about the risks of ether and chloroform meant that until around the 1860s most practitioners used anaesthesia selectively. Risk assessment within a cost-benefit analysis, as Ian Burney has shown, provided the framework for anaesthetic practice for the first decades.⁵⁷

Advocates like Snow and Simpson who promoted the universal use of anaesthesia constructed the pain of surgery to be of inherent risk and argued that anaesthesia's benefits were not just humanitarian but could also be quantified clinically:⁵⁸ removing the pain thus constituted the removal of a key surgical risk. Simpson compared mortality rates pre- and post-anaesthesia in British hospitals and concluded that prior to anaesthesia mortality rates for amputations of the thigh, leg and arm came to 29 deaths in every 100 cases. His calculations after the introduction of ether suggested that mortality rates had decreased to 23 deaths in every 100 cases and he argued that saving 6 lives out of every 100 cases was a quantifiable benefit of pain relief. Snow's confidence in the universality of anaesthesia was underpinned by his

knowledge and conviction that anaesthesia was a chemical process that produced predictable physiological effects and that its risks could be managed so long as administrations were undertaken with the scientific framework of safe dosages. He argued that pain itself was a physiological risk and described how the pulse of a patient having his bladder stones crushed without anaesthesia responded dramatically to the pain.

The risks of ether were commonly linked to its chemical classification as a poison and the process of inhalation which appeared so similar to asphyxia. However, mostly concerns were focused on ether's violation of social morality as it caused patients to lose their inhibitions and behave in ways that made surgery more difficult to control. Chloroform posed no such risks, but early fatalities under chloroform anaesthesia created a context in which concern focused on its propensity to cause death without warning during an administration. Surgeons varied widely in their attitudes to anaesthetic risk. Most conceived of anaesthesia as an unpredictable process. They evaluated its risk on the basis of each individual patient and frequently considered pain a lesser risk than anaesthesia. In 1853, a spate of chloroform fatalities across the London teaching hospitals caused surgeons to decrease their use of anaesthesia: the *Lancet* published a condemnation of chloroform on the basis that its risks were too great, even in amputations of the leg. Snow's records show how even though his hospital practice declined during this period, his private practice was maintained.⁵⁹ This speaks to the extremely positive response of patients to anaesthesia. Many patients expressed apprehensions about the anaesthetic process, yet their fear of pain enabled them to surmount such worries. And however selective surgeons might be in their use of chloroform in hospitals, private patients held the upper hand when negotiating their access to pain-relief.

In childbirth, arguments about the physiological purposes of pain versus the benefits of its absence also played out, but it was a very different context from that of surgery. From a religious standpoint, labour pains were explained in Christian philosophies as God's punishment for Eve's disobedience in the Garden of Eden. From the perspective of the doctors, birth was in principle viewed as a natural event, which only required medical intervention in cases of complication as a last resort. Notably the debates on the moral and biological risks of the introduction of pain-relief in childbirth have furnished one of the most popular areas for historical study to date. In these discussions, clinicians such as Donald Caton have argued that practitioners were motivated by humanitarianism and that they shared with mothers the common goal of safe birth.⁶⁰ Historical interpretation, however, has been much more critical. Historians have been citing pain relief in childbirth as an exemplar of the wider attempt of medical practitioners to gain control over the birth process and as an instance of the general medicalisation of birth through technology (forceps) and place (home versus hospital). Mary Poovey showed how in this context representations of gender, which defined women by their reproductive role and placed them in the private sphere of the home

as upholders of morality, were constructed, used and contested, and how the use of anaesthesia played into these processes by controlling female patients and their sexuality.⁶¹ Most recently Jacqueline Wolf has sustained these arguments arguing that although anaesthesia seemed of benefit to labouring women, it promoted medical control over birth and pain-relief especially as many practitioners did not employ it until the last stages of labour.⁶² Nevertheless for mothers like Fanny Appleton Longfellow, wife of the poet Henry Wadsworth Longfellow, who breathed ether during the birth of her third child and declared it to be ‘the greatest blessing of this age’, and indeed, Queen Victoria who was given chloroform during childbirth in 1853 and 1857, pain-relief was an empowering experience that they equated with the wider civilisation of society.⁶³ Thus, the evidence we have from patients of the time in the UK, Queensland, Australia and New Zealand, directly contradicts the idea of a top-down imposition of anaesthesia on childbearing women and leads to a more complex picture.⁶⁴

The decisive reconfiguration of chloroform as a benefit rather than a risk appears to have occurred during the period of the Crimean War (1853–1856). At its commencement, army medical officers were cautioned against using chloroform especially during amputations. Interestingly, the publication of this memorandum in the *Illustrated London News* provoked a public outcry. Over the course of the war the balance of opinion shifted and when the Government review of medical services was published in 1857, it concluded that the majority of surgeons were in favour of using chloroform for both ‘severe and slight wounds’ requiring operations.⁶⁵ Even while chloroform fatalities continued to provoke medical and public concern, most surgeons agreed that anaesthesia offered more benefits than risks. Despite the large historical literature on war and its consequences for medicine and society, there have been few studies of anaesthesia’s place on the battlefield. Henry Connor’s study is a rare example of the value such perspectives can yield.⁶⁶ By the 1860s, the practice of selective anaesthesia had diminished and pain-relief was used for most major operations in hospitals. The focus of debate changed from whether or not anaesthesia should be used, to how it could be administered more safely.

RISK, SPECIALISM AND SURGICAL IDENTITY

Practitioners diverged significantly in their response to the early chloroform fatalities. In the northern US states and some parts of Europe chloroform was abandoned in favour of the greater safety of ether. The UK, most of Europe, and the southern US states continued using chloroform. These choices pivoted on the social and cultural expectations of medicine in each community: in the UK, surgeons were prepared to tolerate the risks of chloroform in exchange for its efficacy, and although anaesthetic safety remained a key issue of medical and public concern until at least the 1900s, no doctor was prosecuted for fatal incidents that occurred in the context of anaesthesia; in the northern US states surgeons returned to ether for fear of patient litigation in

the event of a fatality and American patients did indeed pursue malpractice claims over surgeons' decisions to use chloroform rather than ether.⁶⁷ The safety of ether meant that single-handed surgeons could administer it in advance of an operation, or delegate the process to a student or nurse. In London, specialist practice emerged as the solution for the problem of chloroform's risks and was initially manifested through Snow's work and his argument that safe administration of chloroform depended on scientific knowledge of the anaesthetic process and technical skill in administration. Patrick Black (1813–1879) was appointed as chloroformist to St. Bartholomew's hospital in 1852.⁶⁸ By the 1880s, most London teaching hospitals had appointed specialist administrators including Dudley W. Buxton (1855–1931), Frederic Hewitt (1856–1916) and Frederick Silk (1858–1943) who campaigned to embed the study of anaesthesia in the medical curriculum and established the first professional association of anaesthetists in 1893. By the end of the nineteenth century anaesthesia was a recognised specialism in England and distinguished from surgery whereas the first US appointment of a doctor with special responsibility for anaesthetics was not made until 1897 in New York.⁶⁹ The anaesthetist was 'a man of science' who could render any patient insensible to the pain of surgery, claimed Buxton in his 1897 Oration on the jubilee of the discovery of chloroform.⁷⁰

The key point about specialist anaesthesia was that it enabled the risks of anaesthesia to be separated from the risks of surgery. The person who administered the anaesthetic, rather than the surgeon, would be required to attend inquests in the event of a fatality. This differentiated such surgeons who employed a specialist to anaesthetise patients—as in English practice—from those surgeons who delegated the administration to a junior doctor or nurse—as in Scottish, US and European practice. In the first case, the administrator was accountable for the risks of anaesthesia, in the second the surgeon was held responsible for both anaesthetic and surgical risk. 'The person who undertakes control of the anaesthetic is responsible for the safety of the patient', affirmed the *Lancet* in 1896.⁷¹ Some surgeons viewed this as a dangerous diminishment in surgical status: 'In certain eventualities is the anaesthetist to dictate to the surgeon so that the surgeon becomes a mere operator, a subordinate instead of a chief, who under all circumstances retains his supreme command and the entire responsibility in his own hands? This constitutes in my opinion, the tendency to the degradation of surgery against which all surgeons should guard with all their might', railed Edinburgh-trained surgeon, Edward Lawrie in 1901.⁷² The Scottish-English dissension on chloroform administration reveals the way in which specialism was contingent on the context of English, and particularly London, medicine. Nevertheless, over time, surgeons grew to appreciate the way in which skilled anaesthesia could support and ease their work. Abdominal operations for example, were much easier to perform under deep anaesthesia that stopped all reflex movements; surgeons operating on the nose and throat required the laryngeal reflex to be kept functioning so patients would not choke on blood and mucus.

Through the 1860s and 1870s, anaesthetic practice in London became increasingly sophisticated and technical. Nitrous oxide and ether were reintroduced into practice and specialist practitioners began to combine different anaesthetics to match the patient and the surgical context.⁷³ Nasal intubation was developed to improve the depth of insensibility during operations on the mouth; mouth-props were designed for use in cleft palate operations.⁷⁴ Specialists adopted established surgical techniques for restoring the airway by means of an incision in the neck; new methods were developed to suck out debris and blood in the case of haemorrhage during operations on the mouth or nose; oxygen gas was used to assist in artificial respiration. Pre- and post-operative pain relief moved from being a surgical to an anaesthetic responsibility, and from the 1870s the pre-operative administration of subcutaneous morphia was routine practice in many London hospitals.⁷⁵ The introduction of cocaine in the 1880s led to the use of local anaesthesia.⁷⁶ In spite of such developments, specialist practice remained singular to London and other large metropolitan centres where patient numbers were large enough for anaesthesia specialists to make a living. In Scotland and many parts of Britain, Europe and the USA, chloroform continued to be the sole anaesthetic, administered on a cloth or handkerchief. In communities like Boston where ether was the primary agent, it was poured on to a towel rolled into a cone with a sponge pushed inside. Duncum cites only one US ether inhaler, designed by O. H. Allis in 1874.⁷⁷ Startlingly little historical attention has focused on the dynamics between risk, technology and the emergence of specialist anaesthesia, although specialism in medicine and its connections to professionalisation are a well-ploughed furrow in the history of medicine.⁷⁸

CONCLUSION

By 1900, together with new techniques to control infection, anaesthesia had revolutionised surgery. However, it remained a risky process: the most common figures for chloroform fatalities range from one fatality in every 2000–3000 administrations.⁷⁹ Through the early twentieth century patient experience improved through the introduction of intravenous barbiturates which put patients to sleep rapidly without the unpleasantness of inhalation; in addition, the use of muscle relaxants improved operating conditions for surgeons. Chloroform, ether and nitrous oxide remained the primary agents up until the development of a new generation of anaesthetic agents beginning with halothane in the 1950s. From the 1930s onwards academic anaesthesia emerged in the UK, the USA and other parts of the world and anaesthetists developed research programmes around their specialist knowledge of heart and lung functions. Balanced anaesthesia became established and consisted of combining a range of drugs that fulfilled different functions: pain relief, amnesia, muscle relaxation and sedation. Anaesthetists extended their work into the development of intensive care units, chronic pain relief services and accident and emergency medicine.⁸⁰ Over time the risk of fatalities fell

to around two per 100,000 anaesthetics by the 1980s and now most studies suggest it stands around one per 100,000 anaesthetics. In the twenty-first century anaesthesia continues to raise questions about the nature of pain and consciousness; its mechanism remains elusive; and patients remain fearful, not just of mortality but of complications such as accidental awareness which occurs in approximately one in every 19,000 cases.⁸¹ Yet it is now impossible to imagine a world without it.

In their introduction to a 1987 exhibition on anaesthetic history, *No Laughing Matter*, Christopher and Ghislaine Lawrence described the world of historical anaesthesia as a ‘vast undiscovered country’.⁸² Over the past thirty years or so the country has been mapped and some of its defining features have been revealed. Yet there is so much more to be pursued. Comparative work in different cultural and geographical contexts would balance the historiographical focus on the UK and the USA; better understandings of anaesthesia’s emergence as a specialty and its relationship with surgery would illuminate present-day preoccupations around sub-specialisation and the creation of new clinical roles; and patient experience and agency is ripe for interdisciplinary study. The introduction of anaesthesia was a critical historical moment that shaped the world in which we live. Only through far-reaching investigations of this history can we fully understand how we experience and think about suffering and surgical risk today.

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43. Snow, *Operations Without Pain*, Appendix, Tables A.1, A.2 and A.3.
44. Ibid, 131–132.
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46. Pernick, *A Calculus*, 208–209, Snow, *Operations Without Pain*, 132.
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The History of Surgical Wound Infection: Revolution or Evolution?

Michael Worboys

Surgeons have always feared wound disease in trauma injuries or from surgical operations. This was especially the case before the adoption of antiseptic and aseptic practices from the mid-1860s and the advent of antibiotics from the mid-1930s.¹ At best wound infection delayed healing, at worst it could lead to rapid death, as infection spread locally as gangrene and systemically as septicæmia. The problem had become more prevalent from the late eighteenth century when surgical work was increasingly undertaken in hospitals, where overcrowded and insanitary wards provided the conditions for disease to spread between patients.² The term ‘wound infection’ first came into general use in medicine in the late 1860s, when its adoption signalled a major change in how ‘mischief’, a term previously used for wound disease, was understood by surgeons.³ Previously surgeons had attributed wound disease to internal, spontaneous decomposition of damaged and dead tissues. After the change their focus was on external contamination by chemical compounds or biological germs.⁴ Histories of surgical wound infection have tended to focus on this period and in particular the work of one surgeon, Joseph Lister, whose antiseptic surgery used carbolic acid to kill the germs that Louis Pasteur had claimed were the cause of putrefaction and, by implication, wound disease.⁵ In this view, antiseptic surgery was the second of two innovations that most histories of surgery claim revolutionised practice in the Victorian era.⁶ The first was anaesthesia, introduced in the 1840s, which gave surgeons more time for their operations; then came antiseptic surgery which made their work

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safer. ‘Lister’s revolution in surgery’ is said to have opened up the possibility for more elective, invasive and radical procedures, creating operative surgery as we know it today.⁷ David Wootton has controversially claimed that its impact went beyond surgery and that ‘modern medical science’ began with Lister’s first trials with antiseptic wound treatment in March 1865.⁸

In this chapter I discuss this story taking into account recent histories of wound disease and its management that have revised the previously Lister-dominated historiography. I begin by questioning the conventional assumption that, prior to the adoption of Lister’s antiseptic system, wound disease had been the bane of surgeons’ work. Next, I consider to what extent Lister’s antiseptic system was revolutionary by discussing its reception and the extent and timing of its adoption by his contemporaries. I then discuss aseptic surgery, based on germ-free rather than germ-killing practices, which by the end of the nineteenth century challenged antiseptic surgery as a best strategy to prevent wound infection. Whether asepsis was a variant of Lister’s system or a distinct alternative was debated by surgeons in the late nineteenth century and continues to animate historians today. Finally, I consider the prevention and treatment of wound infection in the twentieth century, focusing particularly on World War I, the impact of antibiotics, and the major procedures in reconstructive surgery developed after mid-century. The primary focus of this chapter is the UK, where Lister’s system was first developed and most vigorously contested, though developments in France, Germany and the USA are also discussed.

WOUNDS BEFORE LISTER

At the beginning of the nineteenth century, surgical work mostly involved treating wounds caused by injuries and trauma, rather than wounds made in surgical operations. Whether treated by consulting general practitioners or the relatively few full-time surgeons, patients were typically treated in the doctor’s ‘surgery’, or in a dispensary. Many were treated in their home, since there, according to contemporary theories, they were less liable to catch ‘mischief’ from others. The recognition that hospitals were places where diseases could be caught and spread was evident in the general restrictions placed on admitting those with such diseases and isolating sufferers in fever wards. Surgical wards were prone to, what the Edinburgh surgeon John Bell termed, ‘epidemic ulcer’, where ‘mischief’ turned to gangrene. In his *The Principles of Surgery*, first published in 1801, he wrote:

There is no hospital, however small, airy or well regulated, where this epidemic ulcer is not to be found at times; and then no operation dare be performed! every cure stands still, every wound becomes a sore, and every sore is apt to run into gangrene: but in great hospitals especially, it prevails at all times and is a real gangrene.⁹

He observed that because such diseases spread in the body to surrounding tissues and into the blood, most of the local remedies applied were useless. Instead he recommended a judicious mix of humoral measures that aimed at rebalancing the body fluids: bleeding, purges and dietary restrictions to lower the system, alongside stimulants aimed at raising its vitality.¹⁰ This approach highlights a continuing issue for surgeons with wound disease, weighing local against general treatments or what combination of the two.

With the growth of hospitals¹¹ in the first half of the nineteenth century, more and different types of patients were admitted, including those with injuries and surgical diseases, for example skin diseases, fractures and bladder stones. Relatedly, hospitals became places for training and research, with opportunities for the comparative study of diseases. Surgeons gained greater knowledge of normal and morbid anatomy, and this was associated with the view that diseases had localised seats rather than being of a systemic nature, as in humoralism. This redirection of the surgeon's gaze, together with the introduction of effective anaesthesia,¹² encouraged the admission into hospitals of more patients with conditions that surgeons felt able to treat by techniques of excision, tension relief and repair. In addition, the numbers of patients in hospitals was increasing due to wider social changes, and this exacerbated overcrowding and poor sanitation, creating the conditions for any 'catching disease' to spread between patients. Surgery was subject to the law of unintended consequences: 'progress' in the form of new places for surgical work, with greater knowledge and better methods had a downside—an increase in the incidence of 'mischief in wounds', 'epidemic ulcers' and 'wound infection'.¹³

Operations apart, surgical practice mostly involved dealing with skin afflictions, ulcers and traumatic injuries. All of these were characterised by inflammation, so that the aim of the treatment was to control this process, most commonly by drawing out the heat and reducing swelling by the use of poultices, leeches or other methods. 'Mischief' in operative wounds was associated with either excess inflammation, or with the presence of objects preventing the adhesion of the tissues. Contemporary theory of wound healing was based around the body's response to a clean, incised wound as planned to occur in elective operations. The ideal was to keep the two sides of the wound minimally inflamed and then to reunite them to facilitate adhesion, a process termed 'healing by first intention'. Some, but not excessive, inflammation was essential to this process and understood to be nature's response to injury; it increased blood flow and vitality to promote the growth of new (granulation) tissue. Surgeons helped adhesion by stopping bleeding and removing coagulated blood to provide clean surfaces. They would also take measures to ameliorate pain and reduce tension, since relaxed tissues healed best. In good clean wounds inflammation would produce some suppuration, the oozing of fluid that was the substrate for new tissue growth and adhesion. This exudate was sometimes called 'laudable pus' and wounds that

healed well were said to be 'sweet'. Plasters or sutures would be used to hold the sides of the wound together and it would be protected by lint dressings, which encouraged drying and scabbing, emulating nature's ways. Although surgeons' focus was primarily local on the wound itself, the improvement of a patient's general health through dietary measures, clean air and rest was another element of their strategy, based on the experience that the prognosis for the ill-nourished and enfeebled was least favourable.

When faced with wounds that were contused or punctured, with the skin broken and already contaminated, surgeons aimed to replicate healing by first intention. Thus, once bleeding had been controlled, the wound would be cleaned and dead tissue excised through debridement. The tissues would then be brought together as far as possible: wounds were known to heal best when the area over which new, granulation tissue had to grow was as small as possible. In cleaning and preparing open wounds for closure, most surgeons applied some antiseptics: oils such as myrrh and camphor, herbs such as aloes, and salts such as borax and alum.¹⁴ Opinion differed on how soon to close an open wound. Too early a closure that was definitely considered dangerous, while if left open too long, tissues might become excessively inflamed by exposure to oxygen, producing excessive pus that would accumulate in the wound, be liable to putrefaction and hence turn the wound septic or 'sour'—the converse of 'sweet' wound. Tissue might lose vitality and die, becoming liable to putrefaction from pressure due to build-up of fluid in the wound, failure to remove all 'extraneous objects', or contamination. Tissues might also die spontaneously if and when a patient became generally enfeebled.

The number of remedial measures taken by surgeons matched the number possible causes, which typically were assumed to be multiple. Where there was excessive suppuration, surgeons would institute drainage and also attempt to cool the tissues. If an open wound turned 'sour' further cleansing and debridement might be necessary. As we have seen, surgeons were only too aware that putrefaction could spread rapidly, taking the form of gangrene, where tissues turned black and patients died quickly. And as Bell acknowledged, surgeons knew that putrefactive poisons could escape from wounds and their dressings, which in hospitals meant they would reach patients in adjacent beds and even across the hospital. This was particularly dangerous as hospital patients were especially vulnerable, since their bodies were weakened and more susceptible to infection to start with. In addition, they were likely to be nursed in ill-ventilated, insanitary conditions.

Surgeons gained new experiences of wounds and their management in the wars of the late eighteenth and early nineteenth centuries, especially in the new technologies used in the American War of Independence and Napoleonic campaigns.¹⁵ The main injuries were from bullets and bayonets that produced puncture wounds and from heavy artillery causing severe trauma, including damage to limbs that required amputation. Puncture wounds were considered to be serious because of injuries to internal organs and the presence,

deep in the body, of ‘extraneous bodies’ and dirt. Again the goal of the treatment was to produce a clean wound, by removing bullets and shrapnel and then, sometimes using hot irons (cautery), to seal and tidy up the wound before closure. Amputations were done quickly and—to avoid gangrene—best made high up on the limb in undamaged tissue, but not too close to the trunk. Surgeons needed sufficient amounts of undamaged skin to make a flap to cover the end of the stump; their goal was to achieve adhesion between the healthily inflamed surface of the cut limb and the underside of the flap.

The Crimean War in the 1850s had a high social and medical profile because of the toll of death and suffering among injured soldiers in British military hospitals. This situation was brought to international attention by Florence Nightingale, who subsequently used her experience in nursing wounded soldiers to become a leading reformer of nursing and hospital design.¹⁶ She reported that soldiers were treated in the most appalling conditions: hospitals were understaffed, under-resourced and insanitary. As in most conflicts at the time, more soldiers died from infections and other diseases than from combat injuries.¹⁷ On her return home, Nightingale carried her critique to domestic institutions, campaigning for the reform of nursing practices and training and the better design and operation of hospitals to prevent the spread of disease. Her suggestions were holistic character: first, better order and hygiene across the hospital; second, better nursing care of patients; and third, improved ventilation to stimulate the patient’s constitution and dilute aerial poisons. The implicit question Nightingale posed to surgeons was why and how had they allowed their wards to be so insanitary? Her critique was certainly political, but it was also, as Charles Rosenberg has emphasised, informed by her holistic and essentially moral stance, which was at odds with surgeons’ narrow focus on the wound and its technical management.¹⁸

Through the 1860s, criticisms of hospital conditions became more widespread, culminating in James Young Simpson’s claim at the end of the decade that British hospitals were in severe crisis, which he characterised by the term ‘hospitalism’, with ‘surgical fevers’ endemic in most institutions.¹⁹ Simpson, who was an eminent surgeon, focused on the ‘hygienic evils’ and called for hospitals to be either relocated, re-built, run along more sanitary lines, or all of these.²⁰ In reaction to such propositions, elite physicians and surgeons closed ranks to defend the hospital as their arena of professional activity. They disputed that surgical mortality was increasing and contested the meaning of the figures he produced. Rather than the sanitary conditions, they blamed other factors such as the admission criteria, the nature and severity of the patient’s illness or injury, their general health and constitution, wider epidemic influences and reporting practices.²¹ Then as now, measuring the impact of different factors in surgical outcomes was fraught with difficulty because of the number of variables and their changing interactions over time. Lister intervened in this debate in papers published in January 1870, entitled ‘On the Effects of the Antiseptic System of Treatment upon the

Salubrity of a Surgical Hospital', claiming he had the solution to the crisis in his specific methods of wound treatment that he had been trialling and promoting since the mid-1860s.²²

LISTER'S ANTISEPTIC SYSTEM

Lister's first publication on his antiseptic methods had appeared in March 1867 in an article entitled 'A new method of Treating Compound Fracture, Abscess, &c. with Observations on the Conditions of Suppuration'.²³ In the paper, he detailed new ways of countering the 'disastrous consequences' of putrefaction in deep wounds and provided reasons for adopting his methods. Adopting Pasteur's view that microorganisms caused putrefaction, Lister turned existing assumptions on their head, claiming that 'mischief in wounds' came from outside the body, not from within. Danger came from the air and 'the minute particles suspended in it, which are the germs of various low forms of life, long since revealed by the microscope, and regarded as merely accidental concomitants of putrescence, but now shown by Pasteur to be its essential cause'.²⁴ Lister's innovation consisted in utilising the well-tried antiseptic properties of carbolic acid—diluted sufficiently to be not too toxic to tissues, but still strong enough to kill germs—in order to prevent microorganisms entering wounds and to destroy those already there. His first publications were highly technical, providing information on materials and procedures, and written to make readers feel they were looking over his shoulder.²⁵

In August 1867 Lister elevated his innovation into what he called 'the Antiseptic Principle' and extended its range to ordinary contused wounds, lacerations and ligatures, concluding on the beneficial effects of his treatment 'upon the general healthiness of a hospital'.²⁶ In his next major publication in July 1868, his innovations had become 'the Antiseptic System'—'the systematic employment of some antiseptic substance, so as entirely to prevent the occurrence of putrefaction in the part concerned, as distinguished from the mere use of such an agent as a dressing'.²⁷ He was now proposing a whole regimen to exclude the possibility of putrefaction and abolish wound infection, which by 1870 had been extended to be the foundation of the overall improvement of 'the Salubrity of a Surgical Hospital'. He had been criticised from the outset. Historians used to argue that this was because his ideas were revolutionary, however, recent work has shown that contemporaries disputed his practices and the outcomes.²⁸ Indeed, many critics thought that he claimed too much from too few cases and on the shaky grounds of Pasteur's, then still contested, theories about germs. Most surgeons in fact ignored his rationale in Pasteurian germ-theory, and if they tried his methods at all, they did so in a piecemeal manner not as a system. It is significant that his work was often reported in the medical press under headings such as 'Surgical Novelties' and 'Hospital Efficiency', topics on which there were always numerous proposals.²⁹

Reports in journals suggest that many surgeons did actually try Lister's methods, but met with difficulties when they tried to translate his words into action, as well as being able to afford the materials and the extra time needed. Surgeons who visited him in Glasgow and learned his techniques first-hand had the greatest success. Interestingly, some surgeons, like his Glasgow colleague Eben Watson, while rejecting germ theories, found carbolic acid useful because it helped tissues coagulate, harden and resist the action of oxygen in the air.³⁰ Historians have recently explored opposition to Lister's methods in more detail. Rather than dismissing them as a sign of conservatism and stubborn resistance to Pasteurian laboratory science, they examined the rationale of their sceptical stance.³¹ One challenge was that some contemporaries raised were that Lister's methods were unoriginal. Antiseptic chemicals were already widely used in surgery and medicine. Moreover, it was known that the French surgeon Jules Lemaire had already pioneered the use of carbolic acid with septic wounds.³² The major practical objection was that Lister's system was complicated, time-consuming, expensive and far from cost-effective. He was also attacked for not waiting longer to publish his results, as it still remained open whether his success was independent of the cycle of hospital epidemics. In terms of 'Hospitalism', Lister was read by some as saying that the hygienic reform of hospitals was in fact unnecessary, because the only thing that mattered was killing germs. Critics were thus able to paint Lister's system as retrograde, perpetuating the surgeon's gaze on the 'local' and 'external', confirming that surgical work was manual rather than mental, and ignoring the wider health of the patient and their circumstances.³³ And why was Lister so exclusive, denying his patients the benefit of other tried and tested methods, including alternative antiseptics and medical treatments that helped the body resist septic poisoning? His experience and that of his supporters was that the antiseptic system 'worked', but his statistics were open to other interpretations, and not all surgeons experienced benefits.³⁴ On the other side, however, Lister had many supporters, who promoted his methods and system with missionary zeal; indeed, they were often referred to as his disciples.

The disputes over Lister's antiseptic system continued through the 1870s. A key reason was that he was seen to have founded a 'party'—the Listerians: a group of disciples who were enthusiastic supporters, who, explicitly and implicitly denigrated non-followers. In the meantime, Lister's antiseptic practices had changed. Supporters said this was progress: critics interpreted these as an admission of earlier deficiencies. The iconic spray, which used a special device to produce a mist of carbolic acid over the wound and surgeon's hands, was added to the system in 1871. By the end of the decade it was less favoured, even by Listerians, who increasingly pointed to germs reaching the body by contact rather than through the air, and of the germ-resisting, vital properties of the healthy tissues as a foundation of their practice.³⁵ To use a metaphor

popular at the time, infection required both ‘seed and soil’—germs and a vulnerable body.³⁶ Enthusiasts for Lister’s system was not only found in Britain; there were similar evangelising groups in Germany, where they soon became the majority, and the USA, where there was great scepticism.³⁷ While putatively only pushing for the adoption of a particular method of wound management, Listerians were in fact seeking a reform of surgery that would see it grounded in new knowledge from the laboratory and the experimental sciences. However, as historians have shown, their critics had their own version of ‘scientific surgery’: prioritising empiricism rather than rationalist theorising; clinical experience rather than laboratory experiment; and open eclecticism rather than dogmatic exclusivity.³⁸

Through the 1870s germ theories became more complicated and this had implications for Listerian practice. First, researchers showed that there were a number of different microorganisms causing wound infection and these had different properties. Next, it became clear that ambient air was a minor source of septic germs, which perhaps explained the success of some surgeons with the open treatment of wounds and the experience of surgeons who, in removing ovaries (ovariotomy) had routinely exposed the abdominal viscera.³⁹ In addition, investigations showed that septic wounds did not throw off many, if any, germs, and those that escaped seemed to do so on objects, clothing and surgeons’ hands. Another problem came from laboratory investigations which found germs within antiseptic dressings themselves. Supporters blamed this on poor technique, as carbolic acid solutions must have been made up wrongly or applied unevenly; critics doubted both the principle and the practice.

Listerians took all challenges in their stride and by the end of the 1870s the antiseptic system was dominant. Historian Lindsay Granshaw has suggested that this dominance was due to a compromise between Listerians and their opponents as they amalgamated their theories and methods.⁴⁰ However, it is more accurate to see this as the result of a takeover, made on the Listerians’ terms. Their masterstroke was to make the antiseptic system a broader church, arguing that ‘every successful method of treating wounds will be found to conform to the antiseptic principle’.⁴¹ This claim was directed principally towards their rival ‘party’, the Cleanliness School, which sought to practice germ-free rather than germ-killing surgery.⁴² Thus, the leading UK surgeon Jonathan Hutchison observed in 1879 that ‘all surgeons were in these days antiseptic’, not in the sense of strict ‘spray and gauze’ men, but rather that all aimed to achieve the end of antiseptis, albeit by different means.⁴³ Such claims led John Erichsen, a doyen of UK surgery to complain that the word antiseptic had ‘simply lost all significance’.⁴⁴ By this time Lister’s own practices had changed too: he used the spray less and less, finally giving it up in 1887. William Watson Cheyne, who is often referred to as ‘Lister’s lieutenant’ for his role in popularising antiseptis, wrote in the mid-1880s that there were in fact now six forms of antiseptic wound management.

First and foremost was Listerian ‘asepsis’, the gold standard of excluding micro-organisms from the body; the other five methods of killing or excluding microorganisms: chemicals, drainage, irrigation, evaporation (as in the open treatment), and scabbing.

ASEPSIS

Watson Cheyne did not mention asepsis directly because, as a good Listerian, he was convinced that germ-free wounds could only be guaranteed by anti-sepsis. Many of the leading figures in the ‘Cleanliness School’, like Lawson Tait, were ovariectomists and they claimed their experience of open abdominal surgery showed that the best results came from keeping everything in the operating environment scrupulously clean. They were sceptical about the presence and powers of germs, and stressed the role of the vital resistance that healthy tissues provided against infection.⁴⁵ Some historians, notably Nicholas Fox, have claimed that the Cleanliness School and its aseptic surgery was not a development of Listerism, ‘but an entirely novel process, based *on a completely different theory*’ (italics in original).⁴⁶ The allegedly ‘different theory’ is said to have been based on the persistence of humoralism, which Fox equates with notions of vital resistance. However, as shown above, vital resistance had become, even if it had not always been, important in the Listerian system. If there was an alternative basis for asepsis, it was developed in Germany and based on the bacteriology of Robert Koch.⁴⁷ Its essence was to make the whole surgical environment germ-free and not to rely at all upon vital resistance. A key marker of this kind of asepsis was that it used heat, either boiling, steam, or the dry heat of autoclaves, rather than chemicals to destroy micro-organisms. The new aseptic practitioners aimed to sterilise surgical instruments, ligatures, dressings, tables, floors and walls of the operating room, which was redesigned for ease of disinfection, and to keep surgeons’ hands and patients’ tissues germ-free too.⁴⁸ Proponents of asepsis argued that these factors were all controllable by the surgeon and his team; vital resistance was not.⁴⁹ In addition, Robert Koch in his pioneering laboratory investigations had shown that the germs causing septic infection were of a specific type—*micrococci*—and were capable of being infective as well as putrefactive, that is, they could produce sepsis in living healthy as well as dead tissue.

Thomas Schlich has shown that German aseptic surgery came principally from the laboratory.⁵⁰ Koch’s school had little time for ‘seed and soil’ notions, and made germs powerful invading agents that had to be tracked down and combated at all costs. His bacteriological methods, particularly the growing of microorganisms on culture plates, depended on sterile conditions. The emulation of such an environment became the goal of certain German surgeons, notably Ernst von Bergmann, whose practice was also informed by Koch’s studies of disinfection, where heat had been shown to be more effective than chemicals. Von Bergmann was also the first surgeon

to recognise the importance of Koch's studies of wound infection in showing that specific micrococci, soon to be named *Streptococcus* and *Staphylococcus*, were to be blamed for wound infection.⁵¹ Schlich demonstrates how developments in German surgery and bacteriology can be understood as a case of co-production of surgical and bacteriological knowledge, with a number of men becoming surgeon-bacteriologists, investigating and monitoring the microflora of their wards and operating theatres. Von Bergmann's assistant Kurt Schimmelbusch was the most important disseminator of the new aseptic practices, introducing standardised methods and materials, with strict protocols and technical norms. Concerning the terminology of the various approaches, Schlich shows that whether German surgeons claimed that the new aseptic surgery was Listerian or not depended on context, and the contingent political value of claiming continuity between antisepsis and asepsis.⁵²

The leading theorist of the new aseptic surgery in the UK was Charles Barrett Lockwood.⁵³ In his own laboratory, he confirmed German results that wounds healed faster and with fewer complications when they were completely free of septic micrococci. He also confirmed the superiority of (dry) heat over (wet) chemicals for disinfection, and recommended the use of bacteriological monitoring of different methods.⁵⁴ Lockwood also argued that vital resistance was 'beyond the control of the surgeon, while asepsis is not'. Lockwood's biographer, Eric Jewesbury, recognised his modernist commitments, observing that 'his conception of the coming doctor was one who would have his dwelling in a small apartment adjoining a huge laboratory, and who would carry with him test-tubes and antitoxins when he set out to visit his patients by aeroplane'.⁵⁵ In 1894, Cheyne, after reasserting a Listerian pedigree for the broadened antiseptic system, wrote that while 'theoretically perfectly correct aseptic practice was unnecessary' as he was confident that the range of anti-germ practices, plus what surgeons now knew about bodily resistance to infection, had made surgery as safe as was practically possible. He predicted, wrongly as it turned out, that aseptic surgery would become a 'surgical curiosity' as it was irksome and gave no better results than existing methods.⁵⁶

By 1900, Listerian antisepsis and von Bergmann's asepsis co-existed as alternatives for different types of wound in different settings.⁵⁷ In the management of trauma injuries and open wounds, antiseptic methods were favoured, since, in this context, tissues were already likely to be contaminated. By contrast, with operative wounds in elective surgery, asepsis was preferred. In the USA, William Halsted brought together techniques and materials to try and achieve absolute asepsis, which for surgeons included wearing special clothing and rubber gloves. Some surgeons also started wearing masks to avoid 'droplet infection' through the exhaled air from the surgeon's mouth and nose.⁵⁸ Many other surgeons thought such methods were unnecessary and, as with Listerian antisepsis before it, the new asepsis became a mixed economy, adapted to surgeons' personal preferences, settings and types of

operation. Schlich has recently reminded us that every aspect of surgical technique, which became ever more elaborate and dependent on teams, played a part in avoiding or managing wound infection.⁵⁹

Overall, rates of wound infection and surgical mortality fell in the second half of the nineteenth century. How much of this was due to Lister's antiseptic system and asepsis will never be known precisely. The way infection rates were calculated changed, as did ways of reporting. In addition, numbers were complicated by the fact that infections were influenced by so many variables and changing conditions, apart from developments in infection control. The following list of factors involved is in no particular order and is not exhaustive: new surgical techniques; fewer last ditch operations; different types and numbers of operations, including more elective and minor procedures; better run and cleaner hospitals, not least due to the reform of nursing; better fed and cleaner patients, different patterns of injury and disease; and perhaps changes in the virulence of pathogenic micro-organisms.⁶⁰ Perhaps the greatest achievement of the Listerians was to claim, and in time to be given almost sole credit for, the changed prospects with the prevention and treatment of wound infection. Indeed, as noted at the beginning of this chapter, Listerian antiseptic was also to be accorded credit for the transformation of medicine more generally.

TWENTIETH CENTURY

In the early twentieth century, the mixed economy of managing wound infections was challenged by the experience of treating injured soldiers in World War I. Surgeons in every army found that asepsis was impossible to achieve in field hospitals and antiseptic also often proved ineffective.⁶¹ The high rates of gangrenous infections and deaths from septicaemia were initially blamed on delays in the evacuation of soldiers to hospitals, but it soon became clear that surgeons were facing new problems. First, there was the sheer number of casualties, which raised the issue of what was the best treatment to be given at triage before evacuation from the front. Second, there was the severity of extensive open wounds, fractures and head injuries due to high explosive artillery, as well as penetrating wounds caused by shrapnel and machine gun bullets. A third factor was the extensive contamination of wounds from the wet, muddy and insanitary conditions at the front, which led to high rates of tetanus and gangrene, which were exacerbated by the bacterial fauna of highly manured French farmland. The first response was to redouble efforts and adopt stricter antiseptic methods: to apply wet dressing with carbolic acid at higher concentrations, rather than dry lint; and to avoid restricting or closing wounds that might be harbouring septic microorganisms. In the operating theatre, surgeons endeavoured to make the wound cavity aseptic by debridement back to healthy tissue, applied stronger chemicals and resorted more readily to amputation to prevent gangrene.⁶²

In combination, all of these responses improved survival rates and outcomes for injured soldiers, but some surgeons remained dissatisfied with the results, especially with deep wounds. Military conditions facilitated experiments and trials for alternatives, the most successful was developed by French surgeon Alexis Carrel,⁶³ and the British chemist Henry Dakin.⁶⁴ Their version of antiseptic treatment used sodium hypochlorite in solution as the bactericide, delivered into wounds by continuous irrigation. It was a complex treatment. What became known as the ‘Carrel-Dakin solution’ had to be sterile and of precise concentration, while its application required close monitoring of the elaborate arrangement of glassware and tubing, and the collection and disposal of waste. When, after the war, British official historians evaluated the various anti-infection technologies, they came to the verdict that more sophisticated use of antiseptics had improved outcomes and that asepsis had been largely irrelevant in the specific conditions of trench warfare.⁶⁵

Between the wars, surgeons remained eclectic and individualistic in their practices, albeit in the context of an increasing number and variety of surgical procedures.⁶⁶ Asepsis and antiseptics continued to be used in tandem; the former with a greater reliance on high temperatures, and the latter with a greater range of chemicals. Asepsis was enshrined in rituals to try to secure sterility in operating theatres, spaces that were increasingly specially designed, white-tile and stainless steel-fitted rooms; amphitheatres for teaching had disappeared.⁶⁷ In elective surgery, the patient was prepared by washing, disinfecting the skin and wearing sterile garments. Surgeons and their assistants scrubbed-up, wore special clothing, gloves and masks, and were encouraged to take care in every action. Equipment, instruments and other materials were steam sterilised and handled carefully by all members of ‘the firm’—as the surgical team was called. Aftercare was ritualised too, with asepsis continued by nurses when changing dressings.⁶⁸

In the late-1930s, surgeons enjoyed an additional aid—chemotherapy in the form of sulphonamide powder sprinkled on wounds, which was effective against streptococcal but not staphylococcal infection. It proved so valuable, that in the UK at the outbreak of World War II, its use was recommended for all wounds likely to suffer secondary infection.⁶⁹ Lionel Whitby, who had pioneered the introduction of the sulphonamides in Britain, wrote in 1940, in the context of the likely problems with injured soldiers, that, ‘In dealing with infection, the surgeon is the handmaiden not the master of nature. His task must be cooperation with nature, which should direct his actions so as to imitate nature’s own methods of protection’.⁷⁰ In other words, antiseptics, asepsis and now chemotherapy were all means to secure microbe-free wounds.

Overall, in World War II, wound infection was not the problem it had been in previous conflicts.⁷¹ Technological and strategic developments changed the character of combat and the nature of injuries. This was the case among combatants and the increased number of civilian casualties from the bombing of towns and cities. By the time of the major offensive campaigns

by the Allies in Europe and the Pacific, a new chemotherapeutic agent was available—penicillin.⁷² The first clinical trial had been conducted in 1941 on a man with a septic wound infection and only failed when the supply of the compound ran out. Its promise excited doctors and politicians, and led to huge investment in its production. By 1944 sufficient penicillin had been stockpiled and improved the outcomes of soldiers with wounds, burns and other infections.⁷³

The outcomes of surgery during World War II were improved by other developments: the better treatment of shock, blood transfusion and more rapid evacuation, which meant the injured were more likely to be operated upon in clean, if not sterile environments. The increased mechanisation of warfare meant that surgeons faced a new challenge through the number of casualties with extensive burns. The wounds, which were often extensive, were washed, treated with topical sulphonamides and covered with sterile dressings. An article in the *Lancet* in 1945 described this as part of ‘a system of preventive measures, analogous to those of the operating theatre but appropriate to the different conditions obtaining in wards’.⁷⁴ The high number of casualties and the shortage of surgeons meant that nurses played a greater role in post-operative wound management, in which non-touch strategies, routinised hand hygiene, strict sterility of dressings and enhanced ward hygiene were emphasised.⁷⁵ The hospital remained the main site of research and of innovation, while the exigencies of wartime gave individual surgeons and teams opportunities for trials on military patients.

The impact of antibiotics on medicine and surgery in the post-war period was immense. It went beyond the treatment of infections, stimulating massive investment in pharmaceutical research and development, along with the growth of government- and foundation-funded medical research for all diseases. Medicine joined science as an ‘Endless Frontier’, with more confidence to invent, test and use new treatments.⁷⁶ Surgery was no exception. With everyday infections, antibiotics made previously common minor surgical excision procedures, such as lancing boils, unnecessary, while with serious disease they encouraged bolder invasive and reconstructive procedures.⁷⁷ Typical of this development was total hip replacement: rebuilding a damaged hip joint by cementing a prosthesis into the femur and cup into the pelvis.⁷⁸ The operation was long, exposed a large area, and involved physical force with sawing and scraping, and the permanent fixing of metal and plastic. To avoid infection, patients were given prophylactic antibiotics, and very strict asepsis was followed. Initially, infection rates were relatively low, but infective complications developed after a year or two in a small number of patients. These required a more radical, repeat operation as infection tended to loosen the prostheses as well as causing sepsis deep in the body. One answer to the problem was the ever-stricter compliance with asepsis protocols as developed by the British orthopaedic surgeon John Charnley. His approach included controlled ventilation of the operating room with purified air, with surgeons and

theatre staff wearing full-body protection suits. The other answer was the greater use of antibiotics prophylactically and post-operatively.⁷⁹

However, surgeons had mixed views on the use of antibiotics: on the one hand they welcomed the security they offered, but on the other they warned of the possible negligence towards achieving full asepsis, as antibiotics would cover up deficiencies in aseptic procedures. Across the whole of surgery, differences in practices were associated with professional interests. While professional bodies and state agencies promoted standardisation, surgeons protected their autonomy. As a result there was considerable variation in the surgical use of antibiotics (as with other aspects of practice, too). From the day of their introduction, antibiotics changed the ecology of wounds and hospitals, as bacteria adapted to the new environment with the selection of strains resistant to a growing number of compounds. Such resistance was recognised early on with sulphonamides and penicillin, but was countered by the number of new antibiotics produced by the pharmaceutical industry. But this changed in the 1980s and 1990s. The number of resistant microorganisms continued to grow, while the number of new antibiotics reaching the market declined.⁸⁰ The treatment of wound infections, now termed Surgical Site Infections (SSIs), was more and more framed in the larger context of hospital-acquired or nosocomial infections.⁸¹ There were calls for a reduction in the use of antibiotics by surgeons, especially broad-spectrum drugs in prophylaxis, and greater reliance on aseptic measures. In practice the use of antibiotics became patterned: being employed sparingly in operations where infection is less likely, and more where it was more probable, for example, in long, open operations and interventions on the gastrointestinal tract.⁸² However, clinical audits showed that prophylactic use was most efficient, as it reduced post-operative complications for which more antibiotics were used for longer.⁸³

CONCLUSION

By the end of the nineteenth century, wound infection was a problem that surgeons were increasingly confident about controlling. The cumulative benefits of better technologies of antiseptics, asepsis, wider improvements in surgical techniques, and advances in bacteriology and pathophysiology had given surgeons the knowledge and the effective means to prevent and treat septic diseases. Listerian antiseptics was important as a catalyst and as emblem of surgery's embrace, albeit unevenly, of laboratory science, but recent historical work has shown that it is mistaken to see it as revolutionary. What we can see is an uneven and mixed development of new ideas and methods. The changes in wound management can be characterised best as evolutionary.

The new challenges of the twentieth century came in both World Wars and with the expansion in the scope and number of radical and reconstructive operations. The solutions to the new problems were worked out in the

hospitals by individuals or groups of clinicians, though they were increasingly backed up by laboratory investigations and supported by the benefits of research and development in pharmaceuticals, medical devices and basic biomedical science. Overall, the surgeon's approach to wound infection has remained divided between the local perspective, where the primary aim remains to make and keep any wounds clean and germ-free, and systemic measures that help the body resist infection. Experience, and latterly clinical audits, have shown that patients who were previously fit and healthy and did not have other diseases, are less prone to wound infections and are likely to recover more quickly if they are affected by them. Antibiotics worked both locally and systemically bringing greater security from infection, but their success led to their routine use and, in hindsight, overuse. Paradoxically, the success in controlling the major cause of surgical wound infection—*Staphylococcus aureus*, led to the evolution of a strain known as Methicillin Resistant *Staphylococcus aureus* or MRSA—which in the twenty-first century has become emblematic of the problem of antibiotic resistance, not just in surgery, but also across the whole of medicine.⁸⁴

NOTES

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3. 'Mischief' in wounds was a term used by the leading eighteenth-century London surgeon John Hunter. James F. Palmer, ed., *The Works of John Hunter*, Vol. 1 (London: Longman, Rees, Orme, Brown, Green and Longman, 1835), 434, 451, 493 and 548.
4. Michael Worboys, *Spreading Germs: Disease Theories and Medical Practices, 1865–1900* (Cambridge: Cambridge University Press, 2000), 73–107.
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7. J. T. H. Connor, 'The Victorian Revolution in Surgery', *Science* (2004) 304: 54–55; Nicholas L. Tilney, *Invasion of the Body* (Cambridge, MA: Harvard University Press, 2011).
8. David Wootton, *Bad Medicine: Doctors Doing Harm since Hippocrates* (Oxford: Oxford University Press, 2006), 224.
9. John Bell, *The Principles of Surgery* (New York, Collins and Co., 1812), 25.
10. *Ibid.*, 28–29.

11. See also chapter ‘[Surgery and Architecture: Spaces for Operating](#)’ by Annmarie Adams in this handbook.
12. See also chapter ‘[Surgery and Anaesthesia: Revolutions in Practice](#)’ by Stephanie Snow in this handbook.
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Acknowledgments I must give warm thanks Thomas Schlich and the authors of other chapters for their comments that greatly improved this chapter.

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Surgical Instruments: History and Historiography

Claire L. Jones

Surgery is intimately linked to technology. Meaning ‘working or done by hand’, surgery requires a high level of manual skill and relies on the use of tools, from simple apparatus for cutting and stitching such as hooks, lancets and knives to more complex, ‘black-boxed’ machines for keyhole surgery.¹ Tools are vital for the successful completion of delicate work on the body as well as for experimentation to generate new surgical knowledge. Historians have long reiterated such assertions and, accordingly, accounts of surgical instruments have formed an integral part of surgical histories. Yet, despite a wealth of scholarship in this area, it remains unclear exactly *how* instruments relate to surgical knowledge and practice, and whether surgical instruments bear any meaning beyond surgery.² Neither is there any consensus on the ways in which historians might fruitfully draw on surgical instruments as source material and incorporate them into their methodological tool kit. Such ambiguities have been most usefully explored not through a historical lens, but through an approach from the field of science and technology studies (STS) known as the social construction of technology (SCOT). Since Trevor Pinch and Wiebe Bijker’s seminal 1987 article, scholars have employed this approach to examine the social circumstances of the development of technologies ranging from bicycles to missiles, and the ways in which design outcomes differed depending on these circumstances.³ Studies adopting this approach have argued that definite outcomes are far from inevitable because technological development is an open process and is a product of intergroup

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negotiations that relate to the body of knowledge and practices adhered to by the particular group in question. The application of this approach to surgical instruments in 1992 by Ghislaine Lawrence highlighted the problematic assumption within contemporary surgical histories that surgical instruments, and indeed images used to depict them, were uncomplicated source material that merely served to reconfirm surgery as having a simple and determined technological history in which human ingenuity was the sole motor of change.⁴ Scholars rarely drew on surgical instruments as evidence, and in cases where they were used, the resulting histories rarely provided anything new or meaningful. Scholarship on surgical instruments has undoubtedly developed since SCOT first made an impact on its study in the 1990s, and this chapter aims to review scholarly work on surgical instruments over the past three decades.

The scholarship addressed in this chapter takes three main forms. The first comes largely from the history of medicine, often as empirical case studies. The second and third forms—on surgical instruments as ‘things’ and on experience with them—are more reliant on approaches from anthropology, cultural studies, the sociology of knowledge and specialised branches of history, including material culture studies, art history and architectural history. While these last two bodies of literature do not always directly address surgical instruments, they are nonetheless relevant for their historical study. In surveying this literature, this chapter suggests ways that historians, scholars of material culture and others have meaningfully engaged with surgical instruments since the first emergence of the SCOT approach and points towards ways in which they may continue to do so in the future. In particular, it aims to demonstrate that surgical instruments have not and cannot only be used for illustrating the surgical past but can also form a part of new avenues of inquiry when viewed as the outcome of processes of innovation, as commodities, and as cultural artefacts embedded in everyday life. Yet simultaneously, it also sheds light on some of the remaining methodological challenges faced by scholars, who have taken the ‘material turn’ in the humanities seriously. In taking this dual historical and methodological approach in three main sections, I suggest that the study of surgical instruments is far from straightforward and that obtaining meaningful knowledge from this pursuit continues to be a difficult but seemingly rewarding challenge. This chapter’s focus on the nineteenth and twentieth centuries not only reflects the fact that these centuries witnessed a ‘technological revolution’ in surgery but also, perhaps ironically, because it is the period on which historians have been most reliant on textual over artefactual evidence.⁵ Indeed, the further back in time one goes, the more frequently archaeological approaches to artefacts are incorporated into the historical method. At the heart of this discussion are several key questions. Is a history of surgical instruments only one *about* surgical knowledge and practices? Should these histories be developed *with* surgical instruments? If so, how can they be meaningful and generate new historical knowledge?

THE SURGICAL INSTRUMENT AS NEGOTIATED INNOVATION AND COMMODITY

A recent key concern of historians of science, technology and medicine sympathetic to the SCOT approach is the historical use (or misuse) of surgical instruments, alongside paintings, photographs, buildings and other artefacts, to illustrate only one narrow aspect of surgery: medical discovery, priority and progress. Historians well conversed in social constructionism criticise studies that emphasise the novelty and indubitable usefulness of instruments as forming part of an older, presentist and Whiggish history tradition, a tradition that has also been rejected by the social history of medicine school.⁶ From at least the 1990s, the incorporation first of the ‘social’—as an agency-centred approach—and then of the ‘practical’—as an approach that explored what those with agency did—into the history of science, technology and medicine has radically shifted scholarly emphases away from the ‘discoveries’ and ‘inventions’ of surgical pioneers to surgical instruments as value-laden technologies developed and used within professional networks and wider technical, social and economic contexts.⁷ Influenced by research on innovation and diffusion within economics and business studies, historians of medicine Ilana Lowy and John Pickstone, followed 10 years later by Jennifer Stanton, Carsten Timmerman and Julie Anderson, were among the first to analyse surgical and medical instruments as socially situated innovations.⁸ Pickstone argued that ‘innovation is a more useful word than “discovery” or “invention”’. It is not a simple question of creation but of social and economic change.⁹ The case studies that formed part of the edited collections these historians produced were invaluable for bringing modern medical innovations centre stage within a science no longer seen as responsible for discovering universal truths. While ‘innovation’ became a decreasingly fashionable concept in the 2000s, growing numbers of empirical case studies of surgical instruments embracing social constructionism emerged. These studies began to emphasise how instruments were ‘fashioned’, not discovered, and ‘negotiated’ within local cultures of surgical practice, rather than universally accepted.¹⁰

As scholarly consensus now states, there was nothing inevitable about the ways in which instruments were introduced and used within surgery, just as there was no objective and eternal scientific ‘truth’ in surgery.¹¹ This consensus has been most clearly articulated in recent years in scholarship on one of the most intensively studied developments in surgical history: late nineteenth and early twentieth antiseptis and asepsis.¹² Along with the advent of anaesthesia, these developments not only ushered in an unprecedented number and range of new surgical technologies in what James Edmonson and John Kirkup have called the ‘aseptic revolution’, but as SCOT scholars knew only too well, it was in antiseptic and aseptic surgery that there was clear potential for a social constructivist account of instruments.¹³ It was here that surgical theory—that is, bacteriology—was most obviously both embedded



Fig. 1 Ivory handled instruments and a case decorated with a mahogany veneer and brass inlay, amputation kit (1866–1871), Wellcome Library, London

within the design of instruments made from nickel and surgical steel and contested among different professional groups (Figs. 1 and 2). Indeed, the re-configuration of tools made from new materials into new forms of practice pointed to the relationship between the surgical device, the task and scientific knowledge, something which Lawrence argued historians found elusive for other aspects of surgery.¹⁴ While a third of Edmonson's extensive and much-needed 1997 history of surgical instruments in America is dedicated to aseptic instrumentation production after 1886, my own analysis of British aseptic instruments in *The Medical Trade Catalogue in Britain, 1870–1914* has highlighted the contested nature of the acceptance of aseptic instruments by demonstrating that some surgeons preferred the use of non-aseptic tools into the 1930s.¹⁵ Sally Wilde and Geoffrey Hirst show the importance of experimentation and trial and error, including the creative process of the invention of new instruments, within early twentieth century aseptic surgery.¹⁶

Moving beyond more traditional cutting, sawing and stitching instruments, Thomas Schlich has demonstrated how different designs of rubber gloves were produced and then negotiated among surgeons in the German-language countries in the 1890s as a way of resolving the problem of control in aseptic surgery. Such insights again demonstrate that the adoption of one glove design into aseptic surgery was by no means inevitable or formed part of a universal aseptic 'master plan'.¹⁷ Crucially, Schlich's work represents a move away from studies that focus on only one type of surgical 'instrument'



Fig. 2 Jetter and Scheerer surgical instrument kit (1939). Wellcome Library, London

in isolation and a move towards approaches common to STS that explain transformations in terms of networks.¹⁸ Schlich sees gloves as part of a network of technologies made up of lights and operating tables, anatomy atlases, anaesthetics and other aseptic instruments, which surgeons found vital for maintaining effectiveness and safety in surgical procedures that were becoming increasingly less conservative, more complicated and more intricate. Expanding on this work with Christopher Crenner and making further use of STS approaches, Schlich has argued that surgery itself was a technology and that the instruments used within it only formed the first layer of technological meaning. The second and third layers of technological meaning are the surgical procedure and the knowledge required to carry it out with the required instruments.¹⁹

The full implications of Schlich's 'network of control technologies' and Schlich and Crenner's surgery as technology approach are yet to be realised, but ongoing research in this area has the potential to further highlight the relationship between device, knowledge and practice and the contested nature of technological innovation beyond aseptic surgery.²⁰ Further study may also provide new insights into how negotiations surrounding instruments affected divisions of labour within the surgical work-place cultures of the operating room, the laboratory, the hospital ward and beyond. For example, agreement on the instruments to include in the new pre-set tray system at the Royal

Infirmiry of Edinburgh in 1964 required a great deal of negotiation across professional hierarchies and between surgeons, bacteriologists, physicians and nurses.²¹ The new system provided the surgeon with everything he required for a given procedure sterilised, which was a radical departure from previous working practices where the surgeon and the nurse had prepared all that was needed themselves.²² An account that focuses on artefacts like bandages as well as knives can also highlight the significant role of those actors that still often neglected by historians of surgery, including nurses, dressers, assistants, anaesthetists and even the patient, as well as the many processes through which instruments passed en route to a procedure, such as sterilisation. In her article on surgical instruments, Lawrence presented self-retaining retractors as an example of a surgical instrument that, with further research, may highlight the past importance of surgical assistants, although no historian has yet accepted this task.²³

There have been fewer studies of surgical instruments in the period after the full incorporation of asepsis into surgical systems, but those that exist demonstrate the continuation of negotiations over instrument adoption. Schlich's 2002 book *Surgery, Science and Industry: A Revolution in Fracture Care, 1950s–1990s* is an exemplar of the ways in which individual approaches to, and preference for, particular tools for World War II fracture management was transformed through the creation of a standard model by the 1950s. Schlich's emphasis on resistance to this standard model, particularly in America, demonstrates that 'even a successful medical technology is the result of specific choices made by human beings'.²⁴ Moreover, Sally Frampton and Roger Kneebone's recent study on late twentieth century minimally invasive surgery similarly highlight the contested nature of a procedure and its tools that eventually resulted in a major shift in British medical practice.²⁵

Significantly, these recent analyses of specific local cultures of surgical practice have also addressed negotiations about instruments beyond the medical profession. Both the valuable works of reference on instruments in the UK and the USA by Edmonson and Kirkup and histories of nineteenth and twentieth surgery by Schlich, Wilde, Hirst and others have highlighted the role of surgical industries and have effectively drawn on relevant but previously neglected source material.²⁶ Paralleling wider growing interest in medical industries, such studies have emphasised the importance of collaboration and the two-way flow of information between the instrument maker with his craft expertise and the surgeon with his medical knowledge.²⁷ Surgical instruments did not only embody contemporary surgical knowledge and practice but also represented the commercial knowledge and practice of the time. For the late twentieth century, negotiations between surgical and economic actors became repackaged within the 'medical-industrial complex'.²⁸ The incorporation of industry perspectives within histories of surgery have also led to closer analysis of previously neglected commercial processes. In my own work, for example, I have drawn on the previously overlooked trade catalogue to focus on the ways in which surgeons and instrument makers worked together to

promote surgical instruments (Figs. 3 and 4). Drawing on personal papers and company archives, Wilde, Hirst, Frampton and I have demonstrated that surgeons took eponymy seriously. For them, it was a way of securing their intellectual property rights for instrument designs and for new surgical procedures that suited the ethics of their profession, although proprietary was often fiercely contested among surgeons wishing to receive professional and public recognition as surgical innovators.²⁹

Viewing surgical instruments as commodities within ‘the medical marketplace’, these studies have further demonstrated the ways in which purchasing, as well as developing, producing and using, particular instruments and techniques was continually negotiated. Choice over a range of designs of the same instrument did not only depend on a surgeon’s preference for particular techniques within a local culture of practice, but it came down to a range of other social and economic factors too. Edmonson, for example, has shown that instruments with handles made from ivory, ebony, pearl, silver and gold handles within specially made surgical kits were important status symbols for well-to-do mid nineteenth century surgeons, while I have demonstrated that some late nineteenth century surgeons were unable to afford elaborate cloth-bound anaesthetic inhalers newly introduced on the market and others had inadequate knowledge of anaesthesia to make informed purchasing decisions. In fact, by reconceptualising the surgeon as both an instrument consumer and user, I have highlighted important yet under-explored practical and intellectual activities that constituted a late-nineteenth and early-twentieth century surgeon’s life other than surgical practice, including reading, inventing, patenting and consuming.³⁰ Into the twentieth century, hospitals became large-scale instrument purchasers, although as Joel Howell has demonstrated in the US context, decisions to purchase the latest innovations like X-ray apparatus could be aimed at enhancing hospital reputations, rather than increasing therapeutic benefit.³¹

Further study of the consumption and use of instruments may uncover an invisible world of surgical technology. It may not only reveal more about the relationship between instruments, knowledge and practice but also challenge our assumptions over which instruments were significant in any given time period. While the common innovation-centric approach encourages us to focus on the introduction of those instruments which we know eventually changed practice, a history of technology-in-use approach of the kind recently advocated by historian of technology David Edgerton, might reveal the significance of an instrument in terms of its sheer ubiquity at any given point in time.³² A swab or a towel clip in the early twentieth century, for example, would have been used in far greater numbers and by more types of surgical staff than an aseptic saw. The promotion of over twenty different designs of dilator for different body cavities in Allen & Hanbury’s catalogue of 1930 suggests the wide availability of this type of instrument, but historians have yet to combine analyses of the many procedures in which an instrument of this type might have been used.³³ A history of technology-in-use

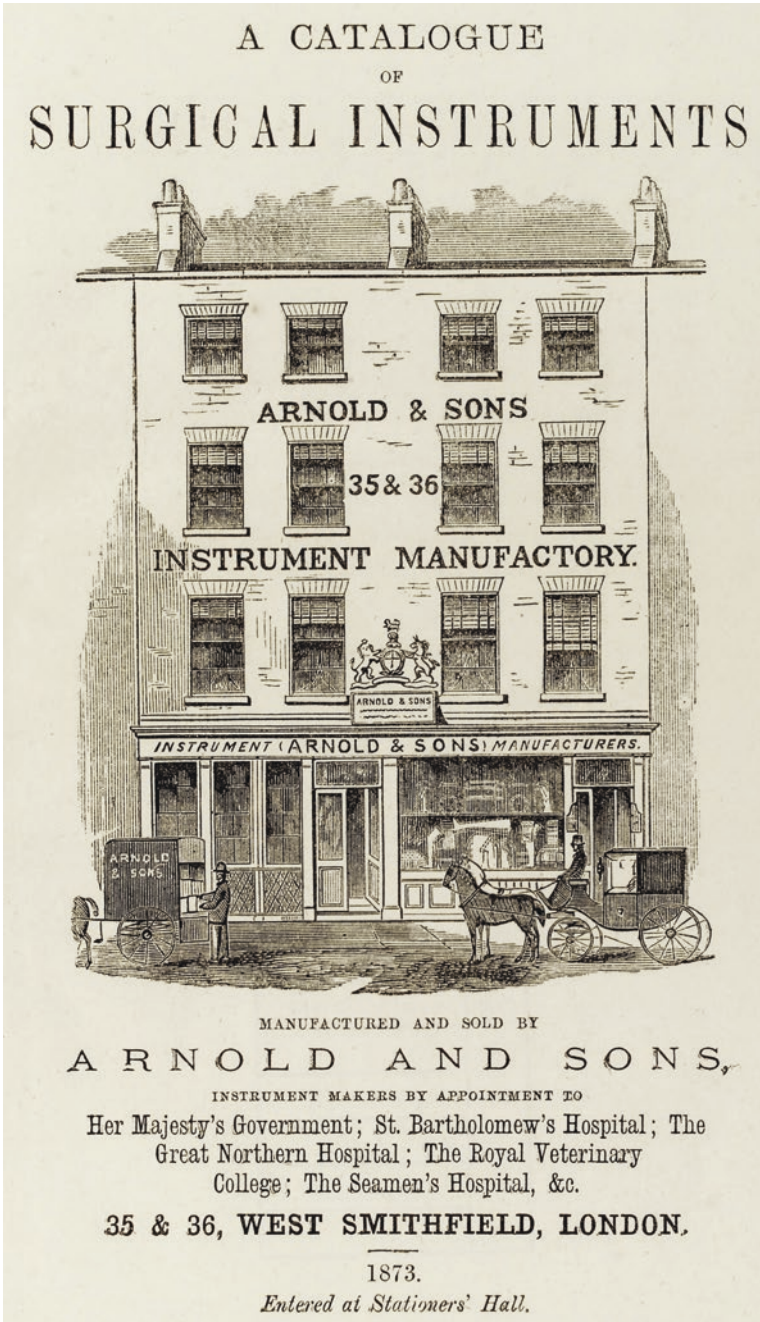


Fig. 3 *A Catalogue of Surgical Instruments*, (1873), Arnold & Sons, London, Wellcome Library, London

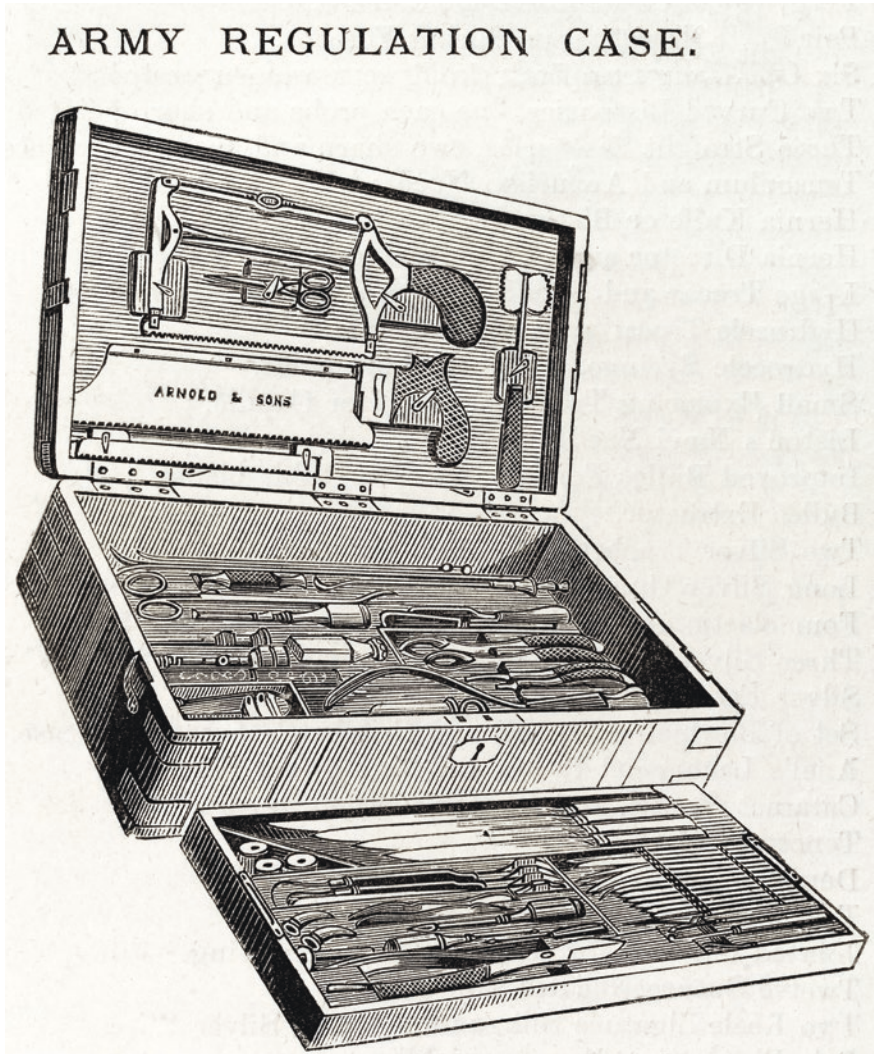


Fig. 4 *A Catalogue of Surgical Instruments*, (1873), Arnold & Sons, London, page 5. Wellcome Library, London

approach may be equally enlightening of instruments that were commercially unsuccessful, and thus commonly of less historical interest.³⁴ A possible fruitful avenue for further research would consist of charting a history of commercially unsuccessful surgical innovations using the patent record alongside prototype instruments produced by makers, such as Down Brothers and Chas F. Thackray Ltd, and instrument catalogues promoting these designs. Paying closer attention to innovations that ‘failed’, that makers never produced

in large numbers and surgeons never adopted wholesale, could shed further light on technological alternatives and on the contingent nature of surgical knowledge and practice.

Moreover, for all their insights, few of the aforementioned studies take the analysis of instrumentation as their starting point.³⁵ Only Edmonson, Kirkup and Jones have taken seriously the materiality of surgical instruments and accompanying catalogues and combined their analyses of physical objects with textual exegeses. While of course the catalogue is not an instrument in the traditional sense, my own work demonstrates its importance and meaning within the surgeon's material world.³⁶ My analysis of the catalogue's features alongside its textual and illustrative content has highlighted the ways in which surgeons came to view catalogues as a permanent part of their reference libraries, placing them on book shelves alongside textbooks in their consulting rooms. Examining evidence of surgeons' interactions with the catalogue, including signatures left within and on the outside of individual editions to demonstrate ownership and holes left behind by cutting out illustrations and sending them to surgical instrument makers as an indication of the instruments they wished to order, highlighted the publication's status. Edmonson and Kirkup, meanwhile, have drawn attention to the importance of makers' marks on individual instruments to highlight how instruments with a basic design were exchanged between companies before such marks made them the product of one company.

As museum curators, Edmonson, Kirkup and Jones' adoption of artefact analyses is unsurprising, but there is potential for richer studies through further use of material evidence. Indeed, the recent cultural and material turns within the history of surgery to date has largely resulted in discussions of how and why the profession came to be authoritative, rather than what surgery meant as an everyday pursuit. This is suggested by the lack of reference to surgery within *Locating Medical History*, one of the leading collections of the new cultural history of medicine, and the inclusion of only one chapter on surgery within a collection on the cultural history of the body.³⁷ Yet, further recovery of the meanings of surgery through analyses of a broader, if not the full, material environment that comprised the life of a surgeon or any other surgical actor, including books, rooms and buildings, appear crucial for expanding our understanding of the complex configurations of knowledge, artefacts and practice.³⁸ But would making surgical instruments not merely the 'starting point' but a main evidential source provide further insights into negotiated knowledge and practice? While this approach is common in archaeology where documents are largely missing and its practitioners are trained in object-based analyses, the same cannot be said for nineteenth- and twentieth-century surgery. It is also revealing that medical museum curators today rely just as heavily on the use of texts as artefacts to meaningfully analyse surgical instruments.³⁹ So, is it possible to tell a modern history of surgery, its trade or indeed its role in everyday life mainly through its instruments? If so, what would this history look like? In order to explore these questions further, we need to discuss approaches to artefacts beyond the

history of science, technology and medicine and explore surgical instruments as ‘things’.

SURGICAL INSTRUMENTS AS THINGS

The SCOT approach as applied to the history of science, technology and medicine stands as an antithesis to approaches from material culture studies and archaeology. While artefact studies, a subfield of material culture studies that has developed since the 1970s, provides scholars with interpretative frameworks through which to identify and evaluate objects, SCOT scholars have found that such approaches rarely result in new knowledge. Lawrence, for example, argued that the application of these methods to surgical instruments only served to reinforce what we already know about surgery and its instrumentation.⁴⁰ Indeed, the level of prior knowledge required to interpret an instrument using artefact study models increases as analyses progress. For example, models proposed by E. McClung Fleming in 1974 and by Susan Pearce in 1993 take us through four and eight stages of interpretation respectively. These models require us to identify the object’s materials before describing designs, style and function, evaluating its physical attributes, categorising it in wider taxonomies within the culture in which it was produced, locating its relationships to other objects in its environment and interpreting it according to the cultural values of our times. But how would we be able to categorise an amputation saw without knowing about the wider surgical culture of which it had formed a part? Finding the necessary information would again require the use of texts. And even if we know nothing of surgery, we cannot ‘unknow’ that the object is in fact a saw. Critics of the value of artefact studies also recognise the danger in assuming that aspects of the material environment are sufficient to define a context. Of course, such criticisms are not unique to the interpretation of surgical or medical instruments. All past craft practices, including the construction of surgical instruments, are difficult to obtain from the artefact alone because the craftsman’s specialist knowledge formed part of an oral tradition that is completely alien to modern science. Objects and records may only contain fragments of this knowledge. A similar assertion can be made about surgery itself. Despite some of the recent studies by Schlich, myself and others, surgical practice is *not always* embedded in a tool but formed part of tacit knowledge that was, as Christopher Lawrence has argued, ‘incommunicable’.⁴¹ Indeed, it would be difficult to identify exactly *who* used an instrument within the operating room from the artefact alone, particularly if numerous assistants were present.

Yet despite this scepticism, new approaches have drawn on the ‘material turn’, which Patrick Joyce has described as ‘the most significant of all recent turns’, to further develop artefact studies.⁴² At a rhetorical level, new scholarship with a scientific focus has moved away from discussion of ‘artefacts’ or even ‘instruments’, ‘machines’ and ‘technology’ in order to talk about ‘things’ and ‘objects’. David Edgerton has recently argued that thinking

about things, rather than about technology, ‘connects us directly with the world we know rather than the strange world in which “technology” lives’.⁴³ In practice, scholars have attempted to provide a more meaningful interpretation of the multiple roles of things in culture. They have combined textual and artefactual evidence to demonstrate that the unique ‘story’ or ‘biography’ of one thing is worthy of study and in effect, metaphorically transforming artefacts into people with agency.⁴⁴ Numerous object biographies have emerged, analysing things from nineteenth century soap bubbles to glass flowers. Lorraine Daston and the research network on scientific objects at the Max Planck Institute of the History of Science in Berlin extended this approach by arguing that not only do things have their own stories but they can also ‘talk’ and in doing so, reveal their stories to us.⁴⁵ Applying this approach to things within the museum, Samuel J. M. M. Alberti sketched the lives of objects through acquisition to arrangement and viewing alongside the many changes of meanings of these objects incurred by these shifts among collectors, curators and museum audiences.⁴⁶ Simon Schaffer argued that ‘things’ in museums in states of disrepair often deemed not aesthetically pleasing and of little scholarly interest are vital for the historical pursuit of technology-in-use.⁴⁷ They are not only illustrative of particular forms of wear-and-tear but also provide insights into the fact that instruments and machines require and required constant care and maintenance.

While the focus on one artefact advocated by the ‘object biography’ and ‘things that talk’ approach may seem at odds with the networks of technologies approach increasingly advocated by historians of surgery, it may be useful for bringing into focus individual instruments that have fallen into disrepair and disuse and have thus taken on new meaning within a museum setting. For ‘things’ like surgical knives, evidence of blunt, worn down or sharpened edges can be an important reminder that instrument maintenance was an important aspect of the surgical past and a vital aspect of relations between instrument makers and surgeons. Surgical instrument catalogues and hospital archives confirm that repair work was a large part of the surgical instrument makers’ job, certainly prior to 1914, and surgeons often preferred to have their instruments repaired because it was considerably less costly than replacing them with new ones.⁴⁸ The repairs form a neglected layer to the ‘life story’ of these objects. Further analyses of surgical instruments in museum collections may also be an important starting point for uncovering the motivations of surgeons to collect and preserve historical instruments and in so doing, seek to memorialise the legacy of their profession (and therefore themselves).⁴⁹ Indeed, many of the medical museums across the world were founded by doctors and there are certainly many surgical ‘things’ within these museums about which very little has been written.

Yet, beyond encouraging historians to pay closer attention to instruments within the museum setting, object biographers’ reliance on the written record to tell an object’s life story suggests that there is little original in this approach. Daston’s claim that things ‘talk’ in particular has come under recent criticism by medical museum curators Thomas Söderqvist and Adam

Bencard who have argued that the reliance on texts and the adoption of human-centric language to analyse things fails to reveal much about their 'thingness'. They argue that this approach is in fact a useful diversion that allows historians to continue to employ the academic tools to which they are accustomed:

By claiming that things talk, scholars today can maintain a certain set of institutionally and traditionally enshrined ideas, while seemingly engaging with a new agenda. Rather than exploring the presence and effects of things qua things, things are turned into something which we, as academics that are trained in a hermeneutical and interpretational tradition, can relate to immediately. It is business as usual on a new subject matter, which still holds out the promise of being something different.⁵⁰

Through this approach then, historians read texts *about* artefacts and interpret them as people in order to make sense of them. It puts things and people on a level playing field, but of course, debates about the validity of such an endeavour have raged since Bruno Latour's Actor-Network Theory refused to prioritise human over object agency in the 1980s.⁵¹ For more meaningful engagement with instruments, Söderqvist and Bencard, along with philosopher Davis Baird, argue for a shift in focus from a linguistic understanding of things to a physical and material understanding. As we will see in the next section, they call for an approach outside of language, semiotics and texts, which Baird in particular suggests has the potential for developing a new epistemology that is not only cognitive but is also materialist.⁵² It is our lack of language for speaking about things, our 'semantic ascent', that makes it difficult for historians of modern surgery to find significance and meaning in artefacts as sources of evidence. Things require a more visual and tactile approach to interpretation and communication than can be achieved through language. Yet, Baird goes further. Drawing on examples from the history of science, such as Michael Faraday's electric motor of the 1820s, he argues that a materialist epistemology for things may be the *only* way we can understand the centrality of things within the history of science, technology and medicine. Things, Baird argues, were and are not simply instrumental to theory but constituted a fundamental part of scientific knowledge as they circulated between scientists and through spaces. Baird does not expect scholars to physically exchange and discuss things in the way that Faraday did to theorise and practise his science in the nineteenth century, but he does nonetheless call for more tactile and experiential approaches to things. Experiential approaches that go beyond language are now a topic of growing interest, as we will see in the next section.

EXPERIENCING SURGICAL INSTRUMENTS

Shifts away from approaches to surgical instruments that use texts, images and language have taken two main forms over the past three decades. The first is an extension of the mechanical testing of instruments through

re-enactments of past practices aimed at uncovering the hard-to-access tacit surgical skill and knowledge embedded in instruments. Historians have emphasised the importance of demonstrations in communicating the tacit knowledge required for the development of surgical skill in the past, but have simultaneously emphasised the fact that these demonstrations can never be accurately replicated.⁵³ Ghislaine Lawrence argued that re-enactments of past practices like ‘trepanning skulls with flint scrapers, or showing that the tensile strength of incisions made with modern scalpels’ was unenlightening of ‘a past so remote that we can have little conception of how the category “surgery” might be separated from categories such as “wounding” or indeed “privilege”’.⁵⁴ More recent criticisms of re-enactments by scholars such as Alexander Cook argue that re-enactments do little in the way of expanding new knowledge, due to the application of modern concepts to past events that bear no relation to our own.⁵⁵ The presence of the subjective experience into a constructed historical situation and the privileging of the emotional engagement of participants and audiences over analytical objectivity has meant that many have only viewed re-enactment as a source of historical entertainment, rather than of scholarly learning. Yet, despite these concerns, scholarly attempts to get at tacit knowledge through re-enacting scientific practices have increased. Not only has the subjectivity of this approach been recognised, but for some, it has all but been embraced as part of knowledge acquisition in postmodernity. Drawing on philosophies of hermeneutics, new work within the history and philosophy of science suggests that our situatedness in the present is the only possible starting point for our historical understanding and that it is a productive starting point.⁵⁶ A new theorisation of tacit knowledge has emerged resulting in case studies that have attempted to uncover how experimenters reached their conclusions, to understand how they thought and to test the veracity of forgotten findings for the purpose of informing present-day science.⁵⁷ Otto Sibum’s replication of James Joule’s nineteenth century paddle-wheel experiment through reconstruction of Joule’s original tools, for example, uncovered the ‘gestural knowledge’ at work in physics. Through the reconstruction of heat experiments with water, Hasok Chang demonstrated the integral role of thermometers in eighteenth- and nineteenth-century attempts to measure the boiling point of water.⁵⁸ In addition, increasing technological development in computer simulation has meant that re-enactments can more easily be presented in virtual formats.⁵⁹ Recognising that the historical re-enactment of past practices will never produce the same results, ‘gestural knowledge’ is understood as knowledge united with an actor’s performance of work, which changes according to the specific kinds of performance (the manipulation of an instrument, for example) and in ever new historical circumstances.

The need for a living human body has of course meant that the reconstruction and computerisation of surgical procedures have been more problematic. Nonetheless, new simulations of procedures from the more recent past have been conducted. Roger Kneebone and Abigail Woods’ incorporation of both

the original instruments and the surgical team who ‘were there at the time’ in the simulation of a reconstruction of an open cholecystectomy from 1983 has been useful for demonstrating how surgical instruments acted as triggers for recollection during a procedure that has rarely been performed since the late 1980s.⁶⁰ Kneebone and Woods implicitly endorse a ‘network of technology’ approach to surgery by demonstrating how these instruments formed part of a network with other surgical and non-surgical technologies, and with a variety of staff within a given space. They found that members of the surgical team drew on ‘a huge repertoire of automated, tacit and shared “ways of doing” that extend to aseptic rituals, technical procedures, appropriate behaviours and use of space’.⁶¹ In this scenario, the hand also emerged as an important instrument in conducting the procedure, a tool which is absent from the relevant textbooks and other relevant source material.⁶² Arguably, the tacit knowledge associated with instrument use of the 1980s is easier to access than that of centuries earlier because those who were there in past conducted and thus relived the procedure as a simulation. Kneebone and Woods certainly agree with historians who have argued that once such procedures pass beyond lived experience ‘they will prove difficult if not impossible to reconstruct, thereby putting these very important aspects of the history of surgery beyond the reach of the historian’.⁶³ Indeed, the tools used for open cholecystectomy are likely to mean very little to those who trained more recently in keyhole surgery.⁶⁴ Their concerns over the authenticity of the simulation and about the difficult process of historical interpretation are also similar to those of Lawrence about the subjective presence of an actor within the interpretation process of reconstructions from the distant past. Despite recent work on the value of the subjectivity of the experience then, the methodological problems of embracing reconstructions and simulations as a non-textual approach to instruments for historians seemingly remain.

The second approach to surgical instruments that attempts to go beyond text has further embraced postmodern subjectivity by calling for the incorporation of our bodily senses and emotional ‘visceral’ responses to instruments into our interpretations of the surgical past. Instead of incorporating the sense of touch of the actors within a re-enactment, this approach implores that the historian’s physical and emotional interactions with the instruments are *part* of the research. Developed from their rejection of the ‘things that talk’ approach, Söderqvist and Bencard suggest scholars can move beyond the ontological terrain of language and semiotics to include the study of how things have a material surface that exerts pressure on different kinds of tactile receptors in our skin and of how foreign molecules interact with the olfactory receptor molecules in our nose and the T-cell receptors in our immune system.⁶⁵ Söderqvist further develops this approach with Wellcome Collection curator Ken Arnold to suggest that the particular ‘visceral’ presence offered by surgical instruments means that the incorporation of a range of emotional responses to instruments into research offers an important and distinctive historiography: a felt history of medical practice. One of the examples

on which they draw is museum visitor interactions of a display of Smellie-type obstetrical forceps of the mid-nineteenth century, which range from personal memories of difficult or even tragic births to a grateful sense of medical progress. Like Baird, Arnold and Söderqvist do not suggest we abandon the use of language altogether, but they emphasise the need for approaches that incorporate the aesthetic immediacy of a surgical instrument to coexist with those uncovering historical meanings in order to mutually enrich our appropriation of medicine's past. These meanings of course do not stay fixed and as with those from historical re-enactments and simulations, meanings change as we change. It is a way of focusing on the immediate presence of an artefact, rather than our interpretation of it based on our prior knowledge. While influenced by another recent 'turn' in the humanities on the 'emotions' and thus presented as new, Arnold and Söderqvist's recommendation for the integration of emotional responses into the interpretation process echo studies criticised two decades earlier for failing to provide any new meaningful information.⁶⁶ Indeed, the lack of response to their call to date suggest it is easier said than done. Historians' lack of interest over subjectivity may again indicate that these pursuits lie beyond their expertise and skills and contradict the professional value they place on objectivity. Yet, while material culture remains a major field of historical focus, such an approach may be necessary if historians truly want to understand the 'thingness' of their sources as distinct from texts.

CONCLUSION

The transformation of academic terrains related to the historical study of surgical instruments since the late 1980s has succeeded in expanding our understanding of various types of surgical instruments and their historical meanings, and have further developed methodological approaches to their study. In particular, the maturing of the social construction of technology approach since the late 1990s and the growing adoption of the 'cultural', 'practical' and 'material' turns in the history of science, technology and medicine has resulted in more sophisticated studies of instruments as negotiated technologies, particularly in early aseptic surgery, but also increasingly in late twentieth century surgical procedures. The surgical instrument is now not viewed as important for 'discovery' in a teleology of medical progress, but as an innovation, a product, a commodity and a thing embodying commercial, social and surgical knowledge and practices according to different contexts and within 'networks' of technologies. More radical approaches have attempted to enhance understandings of the materiality of instruments within historical reconstructions and by focusing on our immediate emotional responses to instruments, which have also offered us the chance to reflect further on the historians' role in shaping historical meaning.

The various 'turns' in the humanities show no sign of abating and new historical case studies on surgical instruments will be important, particularly

for further uncovering use in procedures where the relationship between knowledge, practice and artefact is less obvious. Yet, ambiguities surrounding the surgical instrument as a subject of study within the history of medicine remain. If we accept the surgical instrument as a cultural object with the potential of uncovering historical meanings beyond surgery, we are faced with the reality that it is just one type of object in the lived material environment at any given point in its history. Why should one surgical instrument be privileged as an object of study over any other at any given point in time? Such questions are at the heart of Edgerton's history of technology-in-use approach and its emphasis on significance. It remains to be seen whether a study of the entire material environment of the surgeon, the patient, the surgical nurse and/or indeed of any other actor within the surgical sphere is viable or even desirable, but an interesting paradox seems to emerge the further we embrace the surgical instrument as a cultural object: its role in uncovering insights into surgical knowledge becomes less important and the endeavour becomes of decreasing interest to the historian of surgery. This paradox seems to echo earlier concerns of John Harley Warner and others within the history of medicine over the growing disregard of 'science' from scholars within the discipline once the new socially and culturally informed histories of healthcare increasingly took hold from the 1980s.⁶⁷ Certainly, the relative neglect of surgical technologies over medical ones in the historiography suggests that historians of surgery are still more interested in uncovering the role of scientific knowledge in surgical practice, rather than any wider application of the social construction of technology approach.

Ambiguities surrounding surgical instruments as a source of evidence across disciplines also remain. The continual debate over how to study an artefact effectively, the virtues and pitfalls of objective and subjective approaches to the study of instruments and the role of our own situatedness in the interpretation of findings that go beyond text are far from resolved. The tensions between the historians' use of language as their main interpretive and communicative tool and the inability of language to capture the artefact's materiality have not been overcome. It is not at all clear how these challenges will be resolved, given the very different ontological positions from which scholars within the disciplines of history, of critical theory, of science studies and of material culture studies start. If, like Latour, historians further embrace approaches that view humans, objects and other entities on a level playing field within a network of associations (in surgery or in any other context) then the object ceases to be the central focus. More problematically, the Latourian approach undermines the human agency that is the very foundation of the history of surgery. The fact that most studies about surgical instruments solely rely on textual sources without drawing on the instruments themselves, and are likely to continue to do so, is not only revealing of the privileging of the voices of human actors within the academic discipline of history. It is also the basis of the criticism launched at historians who have attempted to develop new methodological approaches to objects by using the same set of

scholarly tools to which they are accustomed. Those launching such criticisms also appear to have offered little that is new. Despite the growing interest in material culture over the past three decades, debates over what we can learn from the materiality of surgical instruments (or any other object or thing), how we come to know it, and whether these approaches are valid show no sign of abating today.

NOTES

1. Ken Arnold and Thomas Söderqvist, 'Medical Instruments in Museums: Immediate Impressions and Historical Meanings', *Isis* 102 (2011): 718–29, on 721.
2. Andrew Warwick, 'X-rays as Evidence in German Orthopaedic Surgery, 1895–1900', *Isis* 96 (2005): 1–24, highlighted how little we know about innovation in surgery.
3. Trevor Pinch and Wiebe E. Bijker, 'The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other', in *The Social Construction of Technological Systems*, ed. Wiebe E. Bijker, Thomas P. Hughes and Trevor Pinch (Cambridge, Mass.: The MIT Press, 1987), 17–50. A plethora of studies followed including Wiebe E. Bijker, *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change* (Cambridge and London: MIT Press, 1995); Donald MacKenzie, *Inventing Accuracy: A Historical Sociology of Nuclear Missile Guidance*, (Cambridge and London: MIT Press, 1990); Thomas J. Misa, *A Nation of Steel: The Making of Modern America, 1865–1925* (Baltimore: Johns Hopkins University Press, 1995).
4. Ghislaine Lawrence, 'The Ambiguous Artefact: Surgical Instruments and the Surgical Past', in *Medical Theory, Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence, (New York: Routledge, 1992), 295–314. See also Christopher Lawrence, 'The History and Historiography of Surgery', in *Medical Theory, Surgical Practice*.
5. Ulrich Tröhler, 'Surgery (Modern)', in *Companion Encyclopaedia of the History of Medicine, volume 2*, eds. W. F. Bynum and Roy Porter, (London: Routledge, 1993), 984–1028 provides a good overview of modern surgery.
6. While scholars within the social history of medicine tradition have not tended to look into how knowledge and technology have been constructed, the establishment of the *Social History of Medicine* journal in 1988 represents a growing scholarly interest in the 'social' in the history of medicine field. For an early study of social constructionism as applied to the history of medicine, see Ludmilla Jordanova, 'The Social Construction of Medical Knowledge', *Social History of Medicine* 8 (1995): 361–81. Social constructivism in the history of science has had a greater impact. See Jan Golinski, *Making Natural Knowledge: Constructivism And The History Of Science* (Chicago: University of Chicago Press, 1998). For a useful critique of social constructionism in the sciences more generally, see Ian Hacking, *The Social Construction of What?* (Harvard: Harvard University Press, 1999).
7. For the 'pragmatic turn' in which historians of science in particular became increasingly concerned with issues relating to practice including instruments,

- see Michael Worboys, 'Practice and Science of Medicine in the Nineteenth Century', *Isis* 102 (2011): 109–15.
8. Ilana Löwy, ed. *Medicine and Change: Historical and Sociological Studies of Medical Innovation* (Paris: INSERM, 1993); John Pickstone, ed. *Medical Innovations in Historical Perspective*, (New York: St. Martin's Press, 1992); Jennifer Stanton, ed. *Innovations in Health and Medicine: Diffusion and Resistance in the Twentieth Century* (New York: Routledge, 2002); Carsten Timmerman and Julie Anderson, eds. *Devices and Designs: Medical Technologies in Historical Perspectives* (Basingstoke: Palgrave Macmillan, 2006).
 9. Pickstone, *Medical Innovation*, 1. See also Thomas Schlich and Ulrich Tröhler, eds., *The Risks of Medical Innovation: Risk Perception and Assessment in Historical Context*, (London and New York: Routledge, 2006).
 10. 'Innovation' became unfashionable possibly due to its parallels with economics and business studies which were increasingly criticised for overly simplistic interpretation of the relationship between innovation and use. The rise of 'fashioning' and 'negotiating' as frameworks no doubt emerge from historians' increasing embrace of Foucauldian discourse.
 11. On the different meanings of 'scientific', see John Harley Warner, 'The History of Science and the Sciences of Medicine', *Osiris* 10 (1995): 164–93, p. 178.
 12. The historical literature on antiseptics and asepsis is extensive but notable studies include Christopher Lawrence and Richard Dixey, 'Practising on Principle: Joseph Lister and the Germ Theories of Disease', in *Medical Theory, Surgical Practice*; Lindsay Granshaw, "'Upon this Principle I have based a Practice": The Development and Reception of Antisepsis in Britain, 1867–1890', in *Medical Innovations in Historical Perspective*; Thomas Schlich, 'Asepsis and Bacteriology: A Realignment of Surgery and Laboratory Science', *Medical History* 56 (2012): 308–43; Michael Worboys, *Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900*, (Cambridge: Cambridge University Press, 2006).
 13. James M. Edmonson. *American Surgical Instruments: An Illustrated History of Their Manufacture and a Directory of Instrument Makers to 1900* (San Francisco: Norman Publishing, 1997); John Kirkup, *The Evolution of Surgical Instruments: An Illustrated History from Ancient Times to the Twentieth Century* (Novato, CA: Norman Publishing, 2006). See also chapter 'The History of Surgical Wound Infection: Revolution or Evolution?' by Michael Worboys in this handbook. For SCOT scholarship, see, for example, Pinch and Bijker, 'The Social Construction of Facts and Artifacts', 17–50; Bijker, *Of Bicycles, Bakelites, and Bulbs*; MacKenzie, *Inventing Accuracy*; Misa, *A Nation of Steel*.
 14. Lawrence, 'The Ambiguous Artifact', 307–8.
 15. Edmonson. *American Surgical Instruments*; Claire L. Jones, *The Medical Trade Catalogue in Britain, 1870–1914* (London: Pickering & Chatto, 2013).
 16. Sally Wilde and Geoffrey Hirst, 'Learning from Mistakes: Early Twentieth-Century Surgical Practice', *Journal of the History of Medicine and Allied Sciences* 64 (2008): 39–77.
 17. Thomas Schlich, 'Negotiating Technologies in Surgery: the Controversy about Surgical Gloves in the 1890s', *Bulletin of the History of Medicine* 87 (2013): 170–97.
 18. For example, John Law, 'Technology and Heterogeneous Engineering: The Case of Portuguese Expansion', in *The Social Construction of Technological Systems*, ed. Bijker, Hughes, and Pinch, 111–34, see 112.

19. Thomas and Christopher Crenner, 'Technological Change in Surgery: An Introductory Essay', in: idem, (eds), *Technological Change in Modern Surgery: Historical Perspectives on Innovation* (Rochester, NY: The University of Rochester Press, 2017).
20. See also, Thomas Schlich, 'Technologies of Control: The Recent History of Surgery', in *Histoire de la Pensée Médicale Contemporaine*, eds. Bernardino Fantini and Louise Lambrichs (Paris: Éditions Le Sueil, 2013). The research project between King's College London and University of Glasgow 'From Microbes to Matrons: Infection Control in British Hospitals, 1870-1970' running from 2014 to 2016 sought to analyse networks of infection control technologies across four British hospitals. Viewing objects within networks resembles Actor-Network Theory, although Schlich does not explicitly draw on it. See John Law and John Hassard, eds., *Actor Network Theory and After*, (Oxford: Blackwell, 1999).
21. E. F. Catford, *The Royal Infirmary of Edinburgh 1929–1979* (Edinburgh: Scottish Academic Press, 1984), p. 168.
22. Lawrence, 'The Ambiguous Artifact', 301.
23. Lawrence, 'The Ambiguous Artifact', 301.
24. Bill Luckin review of Thomas Schlich, *Surgery, Science, and Industry: A Revolution in Fracture Care, 1950s–1990s* (Basingstoke/New York: Palgrave Macmillan, 2002) in *Bulletin of the History of Medicine* 77 (2003): 258.
25. Roger Kneebone and Sally Frampton, 'John Wickham's "New Surgery": Minimally Invasive "Therapy", Innovation, and Approaches to Medical Practice in Britain, 1950–1980', *Social History of Medicine* 30 (2017): 544–66.
26. Lawrence, 'The Ambiguous Artifact', 303.
27. Both surgical instrument maker and surgeon were typically male for much of the nineteenth and twentieth centuries. For example, Stuart Blume, *Insight and Industry: The Dynamics of Technological Change in Medicine* (Cambridge, Mass.: MIT Press, 1992).
28. For more on the medical-industrial complex, see Stuart Blume, 'Medicine, Technology and Industry', in *Companion Encyclopaedia of Medicine in the Twentieth Century*, eds. Roger Cooter and John Pickstone (London and New York: Routledge, 2003), 171–86.
29. Sally and Hirst, 'Learning from Mistakes'; Jones, *The Medical Trade Catalogue*; See also chapter 'Between Human and Veterinary Medicine: The History of Animals and Surgery' by Abigail Woods in this handbook; Sally Frampton, 'Patents, Priority Disputes and the Value of Credit: Towards a History (and Pre-History) of Intellectual Property in Medicine', *Medical History* 55 (2011): 319–24.
30. Lawrence, 'The Ambiguous Artifact', 301; Jones, *The Medical Trade Catalogue*, particularly chapter 6 and the conclusion. See also chapter 'Between Human and Veterinary Medicine: The History of Animals and Surgery' by Abigail Woods in this handbook.
31. Joel Howell, *Technology in the Hospital: Transforming Patient Care in the Early Twentieth Century* (Baltimore: Johns Hopkins Press, 1995).
32. David Edgerton, *The Shock of the Old: Technology and Global History since 1900*, (London: Profile Books, 2006); idem, 'Innovation, Technology, or History: What is the Historiography of Technology about?' *Technology and Culture* 51 (2010), 680–97.

33. Allen & Hanburys Ltd., *Surgical Instruments, Appliances and Hospital Equipment: A Reference List* (London: Allen & Hanburys, 1930).
34. John Pickstone did suggest commercially unsuccessful innovations may be a fruitful avenue of historical enquiry, although he never followed this up. *Medical Innovations*: 1.
35. Lawrence, 'The Ambiguous Artifact', 296.
36. For similar studies in the history of medicine more broadly, see, for example: Mary Fissell, 'Readers, Texts, and Contexts: Vernacular Medical Works', in *The Popularisation of Medicine, 1650–1850*, ed. Roy Porter (London/New York: Routledge, 1992): 72–96; Elaine Leong and Sara Pennell, 'Recipe Collections and the Currency of Medical Knowledge in the Early Modern 'Medical Marketplace'', in *Medicine and the Market in England and Its Colonies, c. 1450–c. 1850*, eds. Mark Jenner and Patrick Wallis (Basingstoke, Hampshire: Palgrave Macmillan, 2007), 133–53.
37. Frank Huisman and John Harley Warner, eds., *Locating Medical History: The Stories and Their Meanings*, (Baltimore and London: The Johns Hopkins University Press, 2004); Thomas Schlich, 'The Technological Fix and the Modern Body: Surgery as a Paradigmatic Case', in *The Cultural History of the Human Body*, eds. Linda Kalof and William Bynum. Ivan Crozier, ed., vol. 6 '1920-present' (London: Berg Publishers, 2010): 71–92.
38. For a material culture analysis of surgical rooms see Annmarie Adams and Thomas Schlich, 'Design for Control: Surgery, Science, and Space at the Royal Victoria Hospital, Montreal, 1893–1956', *Medical History* 50 (2006): 303–24.
39. This was the conclusion reached at the London Museums of Health & Medicine group (LMoHM) & UK Medical Collections Group (UKMCG), *Making the most of Research* workshop, 4 February 2016, Dana Studio, Dana Centre, 165 Queens Gate, London SW7 5HD.
40. E. McClung Fleming, 'Artifact Study: A Proposed Model', *Winterthur Portfolio*, 9 (1974): 153–73. See also Susan M. Pearce, 'Thinking about Things', in *Interpreting Objects and Collections*, ed. Susan M. Pearce (London and New York: Routledge, 1993); 125–32; R. Elliot et al, 'Towards a Material History Methodology', in *Interpreting Objects and Collections*, 109–24.
41. Christopher Lawrence, 'Incommunicable Knowledge: Science, Technology and the Clinical Art in Britain 1850–1914', *Journal of Contemporary History*, 20 (1985): 503–20.
42. Patrick Joyce, 'What is The Social in Social History?', *Past & Present*, 206 (2010): 213–48, p. 219. See also Tony Bennett and Patrick Joyce eds., *Material Powers: Cultural Studies, History and the Material Turn* (London and New York: Routledge, 2010).
43. Edgerton, *The Shock of the Old*, p. xvii.
44. See, for example, Igor Kopytoff, 'The Cultural Biography of Things' in *The Social Life of Things: Commodities in Cultural Perspective*, ed. Arjun Appadurai (Cambridge: Cambridge University Press, 1986): 64–91; Lorraine Daston, ed., *Biographies of Scientific Objects* (Chicago: University of Chicago Press, 2000).
45. Lorraine Daston, ed., *Things that Talk: Object Lessons from Art and Science* (New York: Zone Books, 2004).
46. Samuel J. M. M. Alberti, 'Objects and the Museum', *Isis* 96 (2005): 559–71.
47. Simon Schaffer, 'Easily Cracked: Scientific Instruments in States of Disrepair', *Isis* 102 (2011): 706–17.

48. For example, Burgoyne, Burbidges & Co, *Catalogue of Surgical Instruments* ([NP], 1900), 'A staff of experienced workmen are specially engaged for repairing instruments', preface. See also, Penny Wainwright, *Opposite the Infirmary: A History of the Thackray Company 1902-1990* (Leeds: Medical Museum Publishing, 1997).
49. For cultures of collecting more generally, see Susan M. Pearce, *On Collecting: An Investigation into Collecting in the European Tradition* (London: Routledge, 1995); James Clifford, 'Collecting Ourselves', in *Interpreting Objects and Collections*, 258–68.
50. Thomas Söderqvist and Adam Bencard, 'Do Things Talk?', in *The Exhibition as Product and Generator of Knowledge*, eds. Susanne Lehmann-Brauns, Christian Sichau and Helmuth Trischler (Berlin: Max Planck Institute for History of Science, 2010): 92–102 on p. 97. This is similar to earlier arguments in archaeology about material culture as language. See Ian Hodder, 'This is Not an Article about Material Culture as Text', *Journal of Anthropological Archaeology* 8 (1989): 250–69.
51. See, for example, Bruno Latour, *Science in Action: How to Follow Scientists and Engineers through Society* (Cambridge, MA, 1987); *Reassembling the Social: An Introduction to Actor-Network Theory* (Oxford, 2005).
52. David Baird, *Thing Knowledge: A Philosophy of Scientific Instruments* (University of California Press, 2004).
53. For example, see Warwick 'X-rays as Evidence'.
54. Lawrence, 'The Ambiguous Artifact', 297.
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PART II

Links

Surgery and Architecture: Spaces for Operating

Annmarie Adams

Historians have written about architecture for surgery in two distinct ways: as the passive setting for social, technical and medical accounts of surgeons and their techniques, or, alternatively, as an active signifier of modern hospital architecture.¹ In general, historians of medicine tended to see architecture as an environment for medical progress and have portrayed architectural change as following or reflecting a narrative about advances in medical knowledge and practice. This list would include historians such as J.T.H. Connor, Joel Howell, Guenter B. Risse, Charles Rosenberg and Rosemary Stevens.² This first approach, perhaps shaped by the concerns of social history, tends to support the famous nineteenth-century dictum, associated with Chicago architect Louis Sullivan, that ‘form ever follows function’. While Sullivan posited architecture as responsive to changes in other areas, hence his use of the verb *follows*, the dictum became the rallying cry of Modern architecture after about 1930. Despite the fact that Sullivan himself was a strong believer in the power of ornament to express the significance of architecture, the dictum became the justification for a diminishing use of ornament.³ This dictum is relevant to the history of surgery because many researchers have presumed architecture to be reactive, responding to reforms in surgery rather than general cultural shifts. For example, Michael Essex-Lopresti opened his survey of operating room design in *The Lancet*: ‘In the past 300 years, the design of operation rooms and their ancillary spaces has responded to changes in surgical needs and practice.’⁴ Some writers have suggested that certain medical luminaries ‘designed’ hospitals or surgeries, assigning no credit whatsoever to architects or builders.⁵ Conversely, Connor has argued that medical

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buildings should be analyzed as large-scale artefacts. He suggested expanding the mandate of medical museum collections, calling on architecture to be included as an important element of material culture. Intriguingly, he saw a study of the operating room as a fruitful link between the domain of the museum and what he called a 'wider arena', urging curators to examine architectural spaces in the same ways they interpret individual objects.⁶

Many architectural, urban and material-culture historians, however, have cast buildings and artefacts as evidence, rather than illustration, in narratives that are sometimes independent of other sources. Architectural histories that focus on building types, for example, tend to focus less on medicine than on the evolution of architecture as such.⁷ Often such histories are based on visual evidence—maps, buildings, furniture, photographs, films, paintings—and privilege such visual sources over traditional textual ones. Typically, they raise questions in which the artefact or space figures first: What does the evolution of artificial lighting tell us about the changing roles of nurses? How has the accommodation for viewing surgery shaped medical education? Which has been more important—interior finishes that are easy to clean or those that appear to be clean? Such questions demand an explanation beyond how form follows function.

Medical, architectural and cultural historians have thus differed in their respective accounts. Connor cited three innovations—anaesthesia, antiseptics and X-rays—as catalysts for architectural change. 'Operating rooms and their furniture, too, were remodelled to incorporate smooth, impervious surfaces that did not harbour germs and could be readily cleaned', he wrote.⁸ David C. Sloane also saw medicine driving hospital architecture when he mentioned a period during which 'medicine slowly reshaped the hospital experience and with it, the physical design of the buildings.'⁹ Architectural historian Alistair Fair took a different approach, exploring Johns Hopkins as a test site for different ideas about ventilation.¹⁰ Similarly, Jeremy Taylor saw no medical imperative in the construction of pavilion plan hospitals. 'The fact that Florence Nightingale's views on miasmatism were to be discarded and superseded in the 1880s by the germ theory made little difference to the architectural concept', he wrote.¹¹ Taylor's protagonists were architects, not doctors, and the book explored the pre-World War I practice of architecture as an iterative process. Similarly, Katherine Carroll accorded architecture an active role in her research on buildings for medical education, insisting that they 'shaped the education formulated in their halls and nurtured a particular understanding of medicine'.¹²

Historians considering the place of surgery in hospitals have been even more particular on the question of agency. Some scholars have seen form following function, while others have seen it shaping function. Like Rosenberg, Allan Brandt and Sloane, Jeanne Kisacky foregrounded the role of surgery in her book *Rise of the Modern Hospital*, where she argued that anaesthesia transformed surgical spaces.¹³ She covered materials, lighting and the location of surgeries in her account, arguing that architectural changes resulting from the spread of germ theory appeared gradually over a long period of time.¹⁴ She pointed to the first

two decades of the twentieth century as the time when the influence of germ theory and the shift to asepsis, with its concept of contact transmission, changed architecture. In this regard, Kisacky's account differed from earlier hospital histories, such as a much-cited paper by sociologist Lindsay Prior, who had suggested that the demise of the pavilion plan had been tied to the development of the germ theory.¹⁵ Like Prior, Adrian Forty and Anthony King insisted on a similarly direct link between theories of disease transmission (especially miasma) and hospital plans.¹⁶ Recent work on general hospital planning has shown that pavilion plan hospitals continued to be built well into the twentieth century, generations after the development of the germ theory, a point also made by Taylor.¹⁷

The location of surgery within the general hospital is of special interest to architectural historians. Surgery has occupied a variety of sites over the last 200 years, from the outer edges of the sprawling pavilion plan institution to the centre of today's high-tech healthcare centre. In the history of the general urban hospital, three key spaces with their specific designs stand out among these ever-changing sites: the Victorian surgical amphitheatre, the surgical suite and the so-called OR (operating room) of the postwar period.¹⁸ In all three cases, some historians have argued that form follows function, while others have argued the opposite. Historians who subscribe to either approach have asked questions about the size, location, furniture, materials and lighting of the surgical environment. Architectural changes, they have found, served surgeons and patients by ensuring more reliable operative outcomes. Thomas Schlich referred to the constellation of things that make up the surgical space as 'the diverse elements of the surgical control networks' that 'enable visibility and manipulability in many ways'.¹⁹ Architecture for surgery encompasses this constellation of material culture aimed at control.

Surgery has always taken place in a distinct zone. Such specialness has ironically led to its complete invisibility. At certain points in history, a passer-by on the street would have been able to point to the place in a hospital building where surgery was performed by the recognizable shape of an amphitheatre, its relationship to the street, signature windows and skylights, sometimes rounded massing to accommodate theatre seating and extraordinary efforts at ventilation. Such legibility was important when the hospital cited antiseptic surgery as one of the main reasons patients should come to the hospital.²⁰ Now, by contrast, ORs are embedded in the centre of hospital complexes, invisible from the exterior. A parallel present-day example is the way we easily recognize old movie theatres (especially from the rear), by their special cross-sections, but new theatres are contained within generic, box-like architectural shells.

Surgery has gone from being the most open and perhaps most recognizable feature of the hospital building in the nineteenth century to being completely hidden at its core. As Sloane has noted: 'physicians ... made the hospital a scientific laboratory in which specialized responses to specific illnesses replaced the general, limited treatments of the past.'²¹ Surgery and its special architecture were thus one such specialized response. Throughout the twentieth century, however, the operating table and a special arrangement for lighting (skylights, fixtures) have situated the place where patients underwent dramatic interventions. In the

history of architecture, this material continuity has perhaps only been matched by the history of church design, where the altar and/or pulpit have retained symbolic power while the overall massing of churches has changed considerably through the ages.

This chapter surveys three major types of specialized spaces—the Victorian amphitheatre, the surgical suite and the so-called OR of the postwar period—as three ideal environments for surgery. These are presented in chronological order and through multiple examples, in order to show the relocation and growing isolation of operating spaces in the general urban hospital.

VICTORIAN SURGICAL AMPHITHEATRE

The surgical space most readily associated with the history of surgery is heroic and monumental: the surgical amphitheatre. Many of us know the amphitheatre through famous paintings, such as Thomas Eakins' *The Gross Clinic* of 1875²²; and even through real amphitheatres that have survived and are now popular tourist destinations, such as the operating theatre from 1804 at the Pennsylvania Hospital in Philadelphia; or Old St Thomas Hospital in London from 1822, now part of a medical museum in St Thomas' Church, Southwark. A third, common way of acquiring a visual image of surgical amphitheatres is through films and television shows, where surgery often provides the perfect moment for a sudden twist of the plot. The monumental design of the amphitheatre, in reality as well as in fabricated movie sets, is suitably dramatic in its scale, not least because of the presence of many viewers in the space. Like other theatre types, for example the ancient Colosseum or the nineteenth-century opera house, its power derived from the fact that many people witnessed something simultaneously.

Scale is thus key to the symbolic power of the surgical amphitheatre. In the recent and popular television series *The Knick*, presented on Cinemax, for example, much of the dramatic action takes place in a recreated amphitheatre inspired by the New York Presbyterian Hospital, where Dr John W. Thackerey ('Thack') showcases now familiar surgical procedures. Set designer Howard Cummings made a direct link between the size of the television version of the operating theatre and the potential for showmanship: 'It is sort of the heart of the show', he said. 'Thackerey is a showman. If anything besides being a brilliant surgeon, he has a giant ego, and this was the perfect opportunity for him to sort of expound and tell people his pioneering techniques.'²³ Schlich noted the essential role of setting for surgeons in enabling technical capabilities: 'Surgeons, like scientists, derive much of their power from the settings in which they work.'²⁴ Other professionals whose special powers—social or functional—are derived from purpose-built architecture would include: judges (courtroom), priests (church) and soldiers (battlefield). Interestingly, these professionals don special costumes, too, when they perform their professional duties. In other words, architecture, clothing and tools synchronize to reinforce the special status of these experts.

Even though paintings, buildings and TV depictions have focussed on the interiors of the amphitheatre, the exteriors of these spaces were also distinctive. As mentioned above, their often asymmetrical forms, based on the building's cross-section, made theatres instantly recognizable. A typical late nineteenth-century surgical amphitheatre (in a general urban hospital) would be adjacent but minimally connected to patient wards and accessible through a separate entrance directly from outside. This requirement for exterior access meant that amphitheatres were frequently located on the edges of hospital sites, since the entrance needed to be visible. The predominance of windows also characterized the exteriors of surgical environments. These were typically high on the exterior (usually north-facing) walls or even in the roof structure itself, since top lighting casts fewer shadows on a patient's body. The exterior of the operating room of the Bradlee Ward of the Massachusetts General Hospital (see Fig. 1) was typical of this arrangement, featuring an exterior door and an elaborate skylight and windows. The architecture resembled a glass house or greenhouse, seemingly set into a larger brick rectangular form. A viewing gallery, separated from the surgical field only by a railing, occupied the opaque part of the building, with wards adjacent.

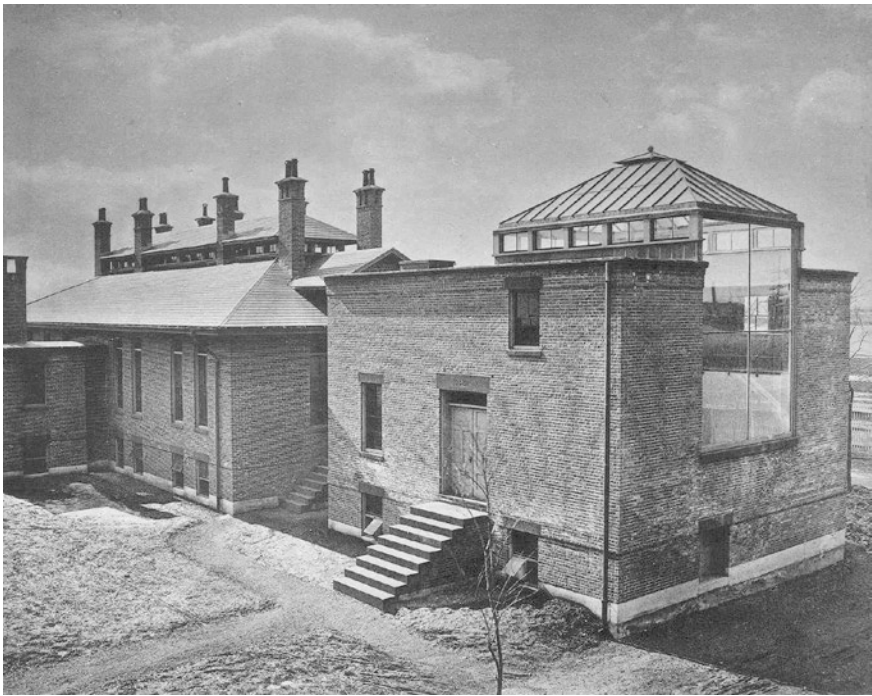


Fig. 1 Exterior of the operating room of the Bradlee Ward of the Massachusetts General Hospital, about 1888, Massachusetts General Hospital, Boston

The sheer scale of the windows in the Bradlee operating theatre signified what went on inside. The painting *Before the Operation* by Henri Gervex shows this genre of surgical space from the interior. The figure of Dr Péan appears in front of two monumental windows. One of these windows has knotted curtains suspended from above the frame of the painting and is blocked off by a piece of wood or tabletop below. In the painting, natural light floods across the female patient's body and the assembled crowd. The viewers are thus simultaneously 'enlightened' by the surgeon's deeds and words, and by the large window.²⁵

Lighting fixtures displaced the role of windows and skylights as hospitals gained electric power. Artificial lighting offered surgeons better control, as skylighting is highly dependent on weather conditions. Schlich identified lighting as one of the reasons for relocating operations from earlier ad hoc spaces, such as kitchens, houses and wards, to the general hospital: 'surgeons traditionally set great store on good lighting', he has reminded us.²⁶

Similarly, the architecture of surgery was often characterized by elaborate systems for ventilation, including exhaust towers. The pavilion plan hospital optimized ventilation. According to medical ideas of the time, surgery in particular needed good ventilation because the open wounds of the surgical patient were highly susceptible to wound disease, thought to be caused by air-borne germs. Archival photographs of surgeries through the mid-twentieth century appear to be simply flushed with 'fresh' air from the presumably polluted environs of many general urban hospitals. Did vitiated air affect buildings and landscapes in their immediate contexts?²⁷

Functional (an architect would use the term 'programmatic' here) requirements are only part of the story. The location of surgery within the hospital plan also had tremendous symbolic import, expressing the growing prestige of surgery. Used continuously from 1804 to 1868, the round surgical theatre on the top floor of the neoclassical Pennsylvania Hospital (see Fig. 2f) was at the centre of the building, its symbolic heart, and legible from the street. This design language displayed to passers-by the high cultural value of surgery. The hospital's carefully placed windows, arches and classical columns communicated a message of dignity and order, taking cues from other building types such as English country houses, banks, museums, libraries and perhaps even Protestant churches.

Inside, tiered seating provided uninterrupted sight lines of the 'stage' area, where the patient lay on a specially designed table. This special table held the patient's body in very precise positions, allowing surgeons to operate comfortably for long periods; anaesthesia rendered the patient unconscious, guaranteeing stillness and quiet. Medical students, other physicians and possibly even family members of the patient occupied the sloped seating, as in a theatre. Since some viewers arrived from outside, surgeries provided lobbies, coat storage and washrooms for visitors, as we would expect to find in a playhouse or concert hall. The surgeon and patient occupied centre stage. Note that just as the surgery connected directly to the outside world, there was no barrier between audience and surgeon. Before about 1860, surgeons wore

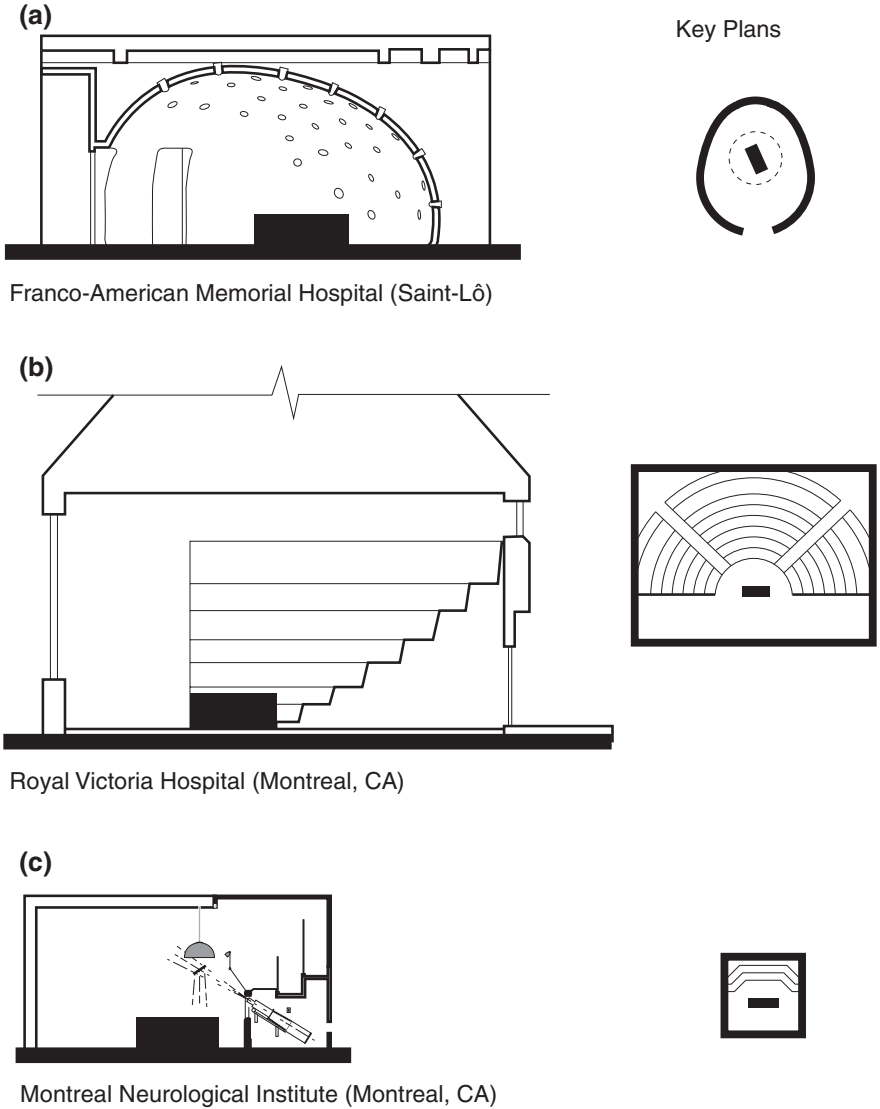
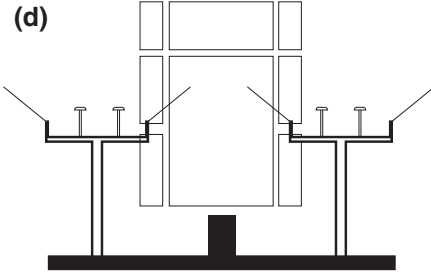


Fig. 2 Comparative cross-sections of surgical spaces, redrawn by Leina Godin from archival documents

regular street attire, a further connection to the outside world.²⁸ And surgeons spoke to the audience, like an actor on a stage. Audience members witnessed the event (presumably many times), including both visual and aural dimensions.²⁹

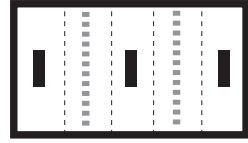
An image (See Fig. 3; see also Fig. 2b) taken by the celebrated photographer William Notman of the surgical theatre built at the Royal Victoria

(d)

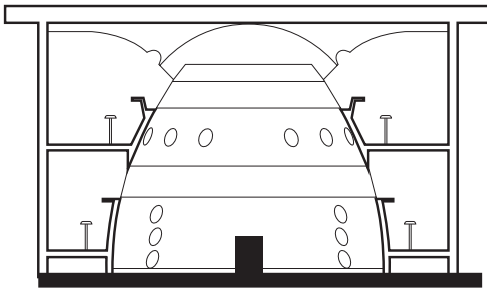


Boston Children's Hospital (Boston, USA)

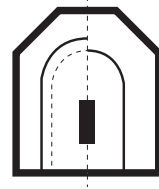
Key Plans



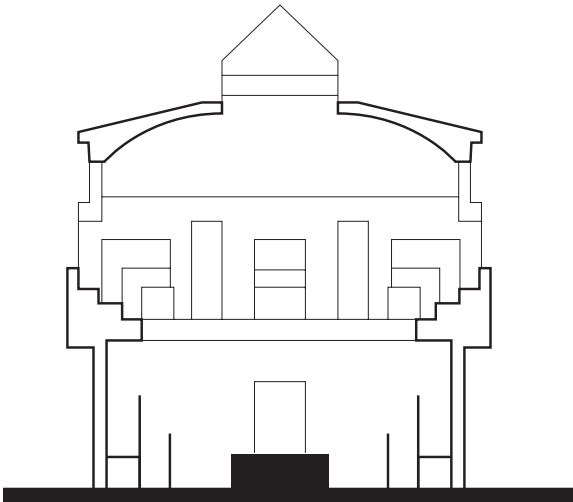
(e)



Century of Progress exhibition (Architect: Carl Erikson)



(f)



Pennsylvania Hospital (Philadelphia, USA)

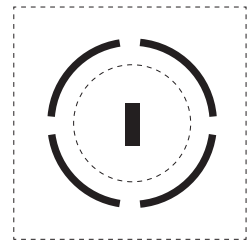


Fig. 2 (continued)



Fig. 3 Surgical theatre at the Royal Victoria Hospital in Montreal, taken by William Notman, about 1894, Notman Photographic Archives, McCord Museum, Montreal

Hospital in Montreal illustrates many of these architectural features, especially the proximity of those watching and listening. In the image the surgical table is fixed to the floor and instruments are held in a glass, wall-mounted cabinet. The sink is located in the theatre itself, forming the boundary between the stage area and the seating, a distinction that became more significant with time. The left side of the image shows the link to the rest of the hospital. Separating surgery from the wards was standard by the late nineteenth century, allowing the surgeon to ‘withdraw to this special space of control, where things can be separated and ordered and all distracting influences are shut out’.³⁰ High, large windows show the continuing dependence on natural light in this time period. Note the absence of a lighting fixture over the table, a feature that would become iconic for surgery in the twentieth century. The upper portion of this space, not showing in the Notman image but visible in many architectural drawings of the Royal Victoria Hospital, featured clerestory lighting and natural ventilation. Clerestory windows have had a continuous role in the history of architecture. Such high windows located on a vertical wall were used in ancient temples, medieval churches and modern factories (even train cars) to introduce natural light in a space from above.

There are two important points to keep in mind about the architectural of surgical amphitheatres. First, historians believe they are based on earlier anatomy theatres. Second, the amphitheatre type changed drastically over the course of the nineteenth century. Some early examples are nearly stand-alone theatres. With time, architects appended more and more service spaces to the surgical space: for preparations, patient recovery and eventually the sterilization of equipment.³¹ The nineteenth century also witnessed the ‘demise of the large surgical amphitheatres’.³² By about 1900, hospitals built multiple and smaller theatres, allowing for simultaneous surgeries and excluding members of the public. When architect Edward Stevens published his classic how-to book on North American hospitals in 1918, he opened the chapter on ‘The Surgical or Operating Unit’ by warning readers that in hospitals of 100 beds, it was common to have five or six operations going on simultaneously. He noted this as a distinction of North American hospitals, pointing out that much bigger European hospitals were likely to have fewer surgeries. The Rudolf Virchow Hospital in Berlin with 2,000 patients, he wrote, had four operating rooms; while the Massachusetts General Hospital, with 250 beds, had five operating rooms.³³ This potential for simultaneous surgeries can thus be read in hospital floor plans of the time, which include many smaller surgeries grouped around shared service rooms.³⁴

THE SURGICAL SUITE

In the early years of the twentieth century—perhaps a few years earlier in some places—surgery moved farther into the hospital, from its edge to a floor (usually an upper one) that looked similar to patient units from the exterior. Surgery thus became less visible in the architecture, providing cues that it was no longer accessible to passers-by. Part of this message derived from its new scale, as the surgical suite was much smaller than the amphitheatre and was surrounded by a series of small preparation rooms, hence the name ‘suite’, which means a set of purpose-built rooms. Clustering surgeries meant viewing galleries could work for two surgeries at once. The Boston Children’s Hospital (see Fig. 2d), for example, featured low galleries separated by plate glass; from six to 30 students could gaze down into two surgeries at the same time.

Archival photographs reveal that viewers may still have been accommodated on mobile seating or shallow, sloped seating, sometimes along the outer edges of the room. Additionally, viewing galleries in this period were sometimes separated from the surgical field by glass or plastic, in recognition of the need to control the immediate environment of the patient. Consequently, audio equipment appeared at about this time, enabling the surgeon and the audience to communicate by voice. Neurosurgeon Wilder Penfield, for example, included a viewing gallery separated by canted glass in his famous Operating Room 1 at the Montreal Neurological Institute in 1934.

He communicated with colleagues in the gallery by microphone, while a photographer documented the surgeries from a special booth installed below the seats (see Fig. 2c).

In the era of electrification, special lighting fixtures augmented surgeons' vision. While some hospital architects still argued for natural lighting through the interwar period, most surgeons preferred the control offered by artificial light. Stevens advocated strongly for natural lighting, in spite of strong push-back from surgeons. A signature feature of hospitals designed by his firm, Stevens & Lee, was floor to ceiling windows that met a skylight or angled window at the ceiling, providing continuous side and top lighting. Stevens described several arrangements like this in all three editions of *The American Hospital of the Twentieth Century*.

Surgeons disliked the quality and colour of daylighting. Moreover, they couldn't control the direction of natural light, which was considered less 'scientific' than artificial lighting.³⁵ Stevens illustrated several popular lighting tactics in his book, recommending three strategies: small lights around the perimeter of the room, a central light with a bowl-shaped reflector and a fixture with multiple arms, so devised to avoid shadows. The potential for movement also reduced the accumulation of dust.

There is some evidence that ad hoc arrangements made by individual surgeons drove the changes, rather than purpose-built designs by architects. A handful of well-known surgeons sought out small-scale environments where they could gain more control and published their surgical outcomes that occurred in the newly designed operating spaces. Perhaps most famously, the surgeon Gustav Neuber converted three small rooms for surgery in 1883 into germ-free spaces and then built this new type of space two years later in Kiel, Germany.³⁶ Neuber's work set the standard for the twentieth-century setting for aseptic surgery as his five-room operating suite showcased different operations with different levels of asepsis in each room.³⁷ He published his architectural ideas in 1886. At almost the same time, William Halsted famously used his own funds to construct a tent with hardwood floors as a surgery at Bellevue Hospital in New York.³⁸ These examples illustrate how surgeons actively modified spaces to their own needs, showing considerable architectural sophistication.

The material specified for these spaces served numerous purposes. The William J. Syms operating pavilion at Roosevelt Hospital in New York, generally understood to be the first American hospital to use Neuber's concept of separation, was, as Kisacky noted, a 'marble palace'. It had walls, ceilings and floors of marble. Marble's whiteness, beauty and high prestige made it an attractive choice for architects, but as Kisacky commented, cleaning the porous material was difficult. Nonetheless, its potential in 'glorifying the surgeons and surgery ... [vaulted] the hospital into a loftier social position' into the twentieth century.³⁹ Surgery was performed in the Syms theatre until 1941.⁴⁰ Such marble palaces linked surgical theatres visually to other familiar stone

structures such as churches and museums. A useful comparison might be the continuing symbolic power of fireplaces in houses today. Since the invention of central heating there has been no real need for domestic fireplaces. They continue to be desirable to many people, however, because of the close association of fireplaces with widely shared concepts of home, comfort and family life.

The interwar period saw the construction of influential avant-garde surgical spaces, anticipating the operating-room-as-high-tech-control-centre that dominated surgical design in the postwar decades, many of which accommodated viewers. Carl Erickson's ideal surgical theatre (see Figs 2e and 4), shown at the Century of Progress exhibition in Chicago in 1933 as a quarter-inch model, featured a dome-shaped room. Forty-four viewers could watch the featured bone transplant operation from not more than 12 feet away.

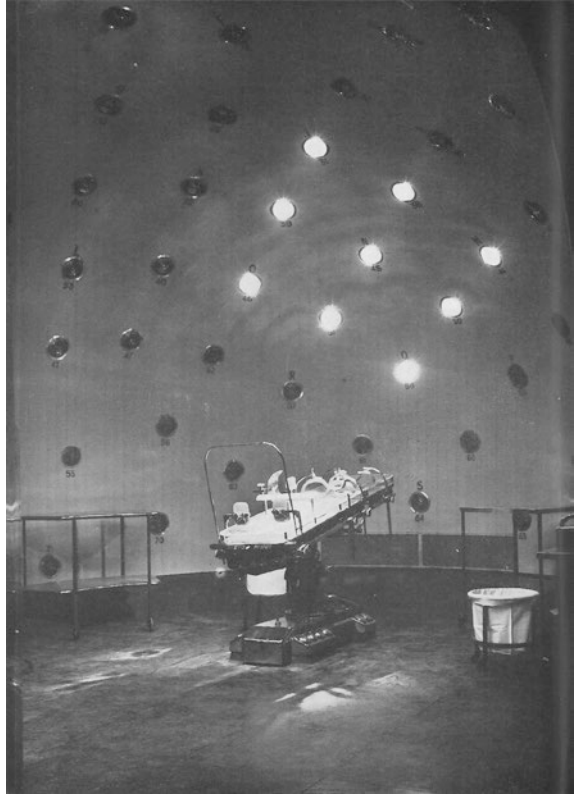
Constructed to show the potential of electricity for surgery, lighting was distributed over the domed walls, including the table itself, and mechanical ventilation in the floor flushed the air constantly.⁴¹ Two years later, Chicago's Henrotin Hospital featured an operating room with a domed gallery, allowing viewers to see directly down into the surgical room. About the same time the Columbia-Presbyterian Medical Center in New York published advertisements with viewers using binoculars to gain close-up views of surgery.

The ultimate domed surgery, however, was constructed after World War II. Architect Paul Nelson designed the Memorial Hospital in Saint-Lô, France, in 1946–1954, which included four egg-shaped surgeries, grouped in a central sterile zone. Nelson embedded the egg-shaped spaces in a square plan,



Fig. 4 Carl Erickson's ideal surgical theatre, shown at the Century of Progress exhibition in Chicago, 1933, Crain Communication Inc.

Fig. 5 Operating room, Memorial Hospital in Saint-Lô, France, from *Progressive Architecture* 38 (1957)



each poised in a corner. General lighting and the fresh air supply were provided in the ceiling, or at the top of each egg, directly from the sterile zone (see Figs 2a and 5). This extraordinary cross-section also featured 71 evenly spaced spotlights in cement mesh walls, ‘resembling golden artificial suns projected against the ceiling of a planetarium’.⁴² This ‘canopy’ of lights could be individually controlled, depending on specific needs, which ‘gives surgeons the greatest freedom of choice’.⁴³ A writer in *LIFE* magazine compared it to a musical instrument: ‘The lights can be turned on and off individually, and the whole constellation is controlled by an assistant who manipulates a master switch panel like an organist at a console. During an operation all a surgeon has to do is to call out for whatever combination of lights he needs to get a clearer view of even the hardest-to-see parts of his patient’s anatomy.’⁴⁴ It is unknown why Nelson thought egg-shaped spaces were ideal for surgery; he specified the same shape for two delivery rooms in the maternity ward of the same hospital, perhaps playing on the metaphor of birth. Nelson designed other buildings, too, with curvilinear walls, including a suspended house and several other hospitals.⁴⁵

Novel forms and flexibility are two major themes in twentieth-century architecture. In *The American Hospital in the Twentieth Century* Stevens noted the challenges in designing ‘new forms’ for surgery, since the techniques change constantly. He advised architects to isolate surgical departments, favouring a separate building and, if attainable, the upper story. He stressed the need for a close-up view for students and viewers. ‘The day of the amphitheatre in the modern hospital, as an operating unit for teaching, seems to have gone’, he declared in 1918. ‘[T]he majority of surgeons have come to the conclusion that in order to gain an intimate knowledge of live tissue the student must be very close to the patient under operation, and small and more numerous classes are formed’. He warned that operating rooms should be void of plumbing and that fresh air was necessary for ventilation (by plenum, gravity or inlets). Stevens prescribed a series of adjacent rooms for the provision of modern surgery: sterilizing room, nurses’ workroom, laboratory, locker room, anaesthetizing room. His suggestion to put scrub sinks in a corridor or open alcove, accessible to anyone who happens to pass by, contrasts strongly with today’s surgery, which is wholly inaccessible, exclusive and invisible. Stevens also recounted the common practice of renovating the attics of older hospitals for surgery. Renovating older surgeries frequently resulted in subdivisions for simultaneous surgeries.⁴⁶ In 1928, in the third and final version of Stevens’ book, he cited 300 square feet as sufficient for most operating rooms. He illustrated his ideas with many plans of his own designs and those by other architects. A good example of a well-planned surgery, he said, was his own Grace Hospital in Detroit (see Fig. 6). Note that this plan includes four operating rooms of three different sizes, presumably for different operations. As shown by the dotted lines on the plan, all four were sky-lit, even at this late date.

These developments in architecture for surgery reflect more general trends in architecture. At precisely the same time that spaces for surgery were becoming a series of purpose-specific, separate rooms, the typical middle-class house was undergoing the opposite transformation, also in the name of health. A signature feature of the Victorian house was a floor plan with a distinct circulation system and rooms that were box-like and closed off. This spatial arrangement fell from favour in the period between 1890 and 1914 with the rise of the ‘open plan’ and the popularity of multi-purpose rooms with overlapping functions. Architectural historians have identified this as a signature feature of modern architecture. Frank Lloyd Wright’s so-called ‘prairie houses’, for example, comprise overlapping masses anchored by a massive chimney, rather than rooms separated by walls. While this revolution in domestic architecture provided for increased ventilation (by facilitating cross-breezes, for example), changes in hospital architecture at the same time, especially as seen in surgery, enabled increased control through isolation and containment. I have argued, in fact, that while ventilation was the central concern of the nineteenth-century hospital, planning was key to its twentieth-century counterpart.⁴⁷

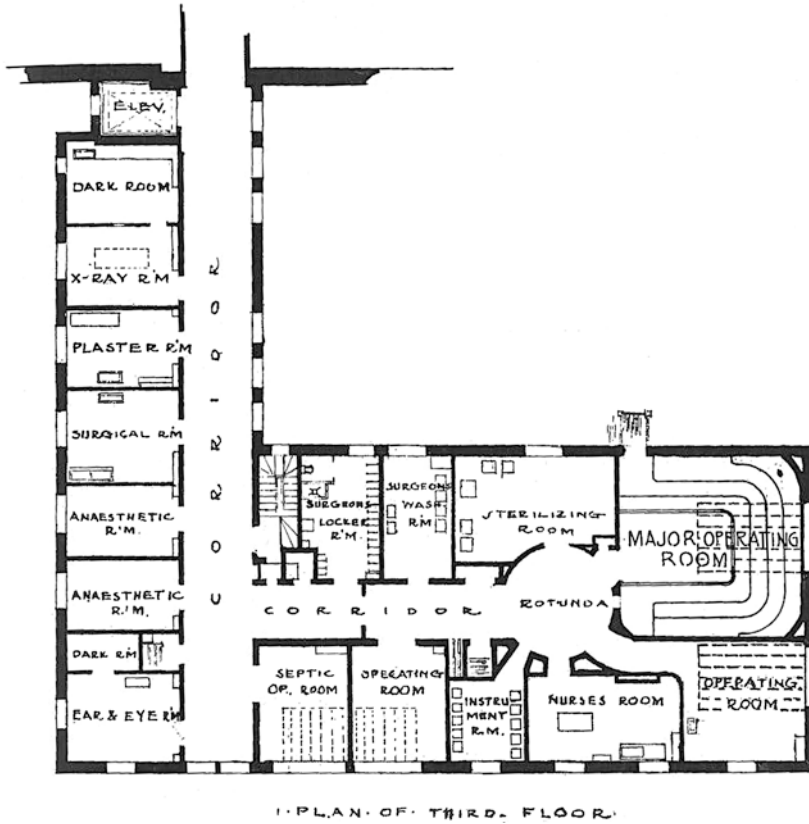


Fig. 6 Floor plan of Grace Hospital, Detroit, Edward Fletcher Stevens, from *The American Hospital of the Twentieth Century* (New York: The Architectural Record Company, 1918)

THE OR OF THE POSTWAR PERIOD

By the post-World War II period, the operating room was completely isolated, artificially illuminated and arranged in a series of smaller, identical rooms within a dedicated zone of the hospital. Like the earlier suite arrangement, the postwar OR typically occupied an upper floor of the main hospital, in an area only open to the surgical team and those in training. Pairs of operating rooms continued to share sterilization and scrub rooms. Many hospitals were multi-storey towers, resembling office blocks, and the operating rooms were located in the center of a doughnut-shaped or racetrack plan, rather than along the exterior walls as they were in hospitals built before World War II. By the mid-twentieth century, it was the aim of hospital architecture to 'avoid all external influence on the working conditions inside the operating rooms'.⁴⁸ This interiorized location, therefore, was ideal for total control,

where air, noise, people and any other influences could be easily filtered out. As Ervin Pütsep said in his 1969 how-to book on the planning of surgical centres: ‘Planning should be aimed at influencing the conduct and attention of the staff by careful adaption of architectural means.’⁴⁹

While many late twentieth-century operating rooms had no viewing galleries whatsoever, some had small viewing areas which were completely sealed off from the surgical field. The lighting and ventilation of postwar surgeries was wholly artificial, making for an environment that was completely controlled by the surgeons and designed for the highest aseptic and hygienic standards, which generally meant tiled walls. Numerous annexes surrounded the operating room, including a completely independent recovery room or unit where patients would awaken. These operating rooms became increasingly like laboratories, isolated from the rest of the world and hyper-clean. They functioned like a bubble within the hospital, protected from view, bad air and any noise.⁵⁰

Postwar surgical spaces had nothing in common with theatres or churches, but rather took their cues from science-based architecture such as laboratories and scientific control centres, or from technologies like airplanes or cars, and even from kitchens. Like these reference points, the OR was a technological space.⁵¹ Hoses with various gases were suspended from the ceiling within easy reach of surgeons, assuring minimal chance of error. Such built-in error-correction has been common in transportation engineering, for example, where the potential for human error has been countered by design. With regards to domestic architecture, the postwar kitchen was the closest parallel to the operating room, where appliance design was reconfigured to allow postwar mothers to cook, observe children and speak on the telephone or watch television simultaneously and safely. I have described the postwar kitchen as ‘a virtual command post for a person whose full-time job was watching’.⁵² In the surgical spaces of the same era, technologies were wheeled around on industrial-style carts for similar convenience of reach, as the occupation of operating rooms was in great demand.

At a symbolic level, this conception of the operating room as a technological control centre was the ideal setting for the role of surgeons as heroes with special powers. ‘Physicians became society’s new magicians, armed with magic potions, arcane spells, and terrifying tools’, wrote Sloane. The rather protected performance of surgery in this sealed-off, inner sanctum accentuated the image of surgery as both magical and dangerous. On this symbolic aspect Schlich wrote that ‘the localization of surgery in specific spaces has helped to sanction it ... The meaning attributed to the operating room permitted surgeons to do things in those special settings that would be considered insane if they were done anywhere else.’⁵³ Just as the amphitheatre enabled surgeons to showcase their skills, the exclusive postwar OR, with its sophisticated technologies, highly qualified personnel, special costumes and learned behaviours, accentuated the technical power of surgery and surgeons. That two spaces

with such opposite architectural characteristics could ‘function’ so similarly is remarkable.⁵⁴

For many of us who have never seen an operating room, the OR is inextricably linked to double-loaded hospital corridors, including the ubiquitous double swinging doors that mark the threshold of the surgical zone. In many films featuring operating rooms, patients are rushed to the OR on stretchers and pushed through these doors, increasing the tension about what might happen in these seemingly secretive surgical spaces. Similarly, it is quite common in many television and film depictions for worried families to be waiting for surgical results ‘down the hall’ from the operating room, in generic empty lounges with armchairs and low tables displaying outdated magazines. Fictionalized surgeons often emerge in their scrubs and face masks, bursting through these doors to give families good or bad news. These double doors mark a significant boundary between public space and the inaccessible space of the operating room, underlining the power of surgeons to change lives.

CONCLUSION

Both functional and symbolic forces have shaped the architectural evolution of surgical environments. Architects revamped hospital floor plans to accommodate the ‘programmatic requirements’ of surgeons. For example, as we have seen, by about 1900 most hospital architects had moved away from the tradition of surgical amphitheatres and specified, instead, a suite of smaller, specialized rooms. At the same time, they re-located surgery departments to the top floors of hospitals, thus clearly disconnecting surgery from the public realm of the street and the city. As roles for surgeons and nurses became more standardized, adjacent spaces became associated with particular instruments and processes. In general, and as time progressed, the necessity for measurably good operative outcomes and efficient use of the spaces brought surgical spaces in line with trends in the design of factories and kitchens. Likewise, the ‘surgical control networks’ contained in hospital surgeries changed from a reliance on ‘natural’ materials and resources (daylight, fresh air, marble) to ‘artificial’ ones (light fixtures, mechanical ventilation, ceramic tile). These changes gave surgeons more and more control, by limiting distractions and enhancing their vision and dexterity.

Concurrently, the symbolic power of design accounts for conservative forces within the architecture of surgery. The appearance of an up-to-date surgical room persuaded staff and patients that care and treatment was up-to-date. At the same time, amphitheatres were modelled on other architectures of spectacle, such as theatres and opera houses, where audiences came together to witness events in grand settings. As surgical architecture evolved, the rooms shrank and came to look more like spaces with close links to science and engineering: laboratories and even kitchens. A series of avant-garde spaces in the mid-twentieth century were modelled on domes and eggs,

resembling planetaria or perhaps domed churches. Despite these likenesses to other interiors, surgical environments remained highly distinctive. Occupying a purpose-built, high-technology and exclusive environment illuminated surgeons' enhanced cultural status.

Architectural and medical historians have produced excellent work on the place of surgery within nineteenth- and twentieth-century hospitals. They have identified the most significant sites of architectural change and have ensured our familiarity with how architectural change correlated with timelines of surgical progress. Thanks to historic preservation efforts, museums, and film and television productions, many of us appreciate surgical environments of the past. Future research, however, could contextualize the history of operating rooms within a general history of architecture. How has architecture for surgery related to other architecture for science and/or technology? What cues has surgical design taken from other sites that privilege performance, innovation and technology? Linking surgery to histories beyond the history of medicine will continue to enhance the ways we understand its material past.

NOTES

1. I am grateful to Justin Bouttell, Christiane A. Buhl, Duncan Cowie, Leina Godin, Christine Hallett, Mary Hunter, Jeanne Kisacky, Adriana Mogosanu, Jeffrey Reznick, Thomas Schlich, David Theodore and members of the surgery history group at McGill University for assistance with this chapter.
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24. Schlich, 'Surgery, Science and Modernity', 237.

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Visualizing Surgery: Surgeons' Use of Images, 1600–Present

Harriet Palfreyman and Christelle Rabier

Images and image-making practices are central to surgical work. From the diagnostic scans that indicate whether surgical intervention is needed to the laparoscopic cameras and screens that guide many of these interventions, reading and understanding images is now a core surgical skill. Though today's surgery may seem to have little in common with the practices of the Early Modern barber-surgeon, surgery has a long history of image use. Surgeons have experimented with a wide range of visual techniques that have developed together over time and come to represent a fundamental element of surgical theory, practice, and identity.

Historians have recently begun to explore the ways in which images have contributed to making sense of surgical practice. Whether as sketches, engravings, photography, film, scans, or computer-generated visualizations, images offer important information for historians of surgery about how surgeons worked as well as how they conceptualized their own practices and identities. Furthermore, as screens have invaded the operating room, historians of medicine have questioned anew the relationship between surgeons and visual artefacts, drawing new attention to the images that have come to permeate surgery in a variety of media during the past four centuries. Throughout this period, the visual representations used by surgeons have included expensive

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and lavishly illustrated anatomical atlases, pen and pencil sketches in workaday notebooks, photographs of the stages of operations, depictions of patient anatomy and surgeons' own bodies, visualizations of instruments and equipment, diagrammatic representations of surgical techniques, image-modelling simulations, and even designs for the operating theatre.

Surgical images present an interesting case within the thriving 'visual turn' which grew out of the history of science and medicine in the 1980s. In their 1985 work *Leviathan and the Air-Pump* historians of science Steven Shapin and Simon Schaffer included images among the 'technologies' that served to promote experimental science in the seventeenth century, emphasizing their prominent rhetorical dimension within scientific discourse.¹ Medical history too recognized the valuable role of images at this time. Writing in 1988, historian of medicine Sander Gilman argued that images had often been too easily overlooked as mere illustrations and that they actually played sophisticated roles in the construction of medical knowledge.² Historian of medicine Ludmilla Jordanova reinforced this point arguing that historians should not only pay attention to what was portrayed but also to how 'aesthetics is constitutive of knowledge'.³ Historians of art such as Martin Kemp, focusing on Early Modern atlases of anatomy and natural history, also pointed to the important role of aesthetics, identifying the new 'naturalistic' style of sixteenth-century representations as an important technology in the development of anatomy and medicine at this time.⁴ Thus, the history of surgical images has so far drawn from several complementary disciplinary standpoints, ranging from art history and the history of the book to the history of technology, science, and medicine. Archivists and curators of medical collections have embraced this historiographical trend with an unprecedented effort to preserve, inventory, and publish the various visual artefacts of surgery.⁵ In this chapter we assess more recent historiographical developments that have understood visualization as constitutive of surgical practice and in doing so shed new light on the history of surgery. As we shall see, historians have shown how surgeons have used images to market themselves and their skills, to educate their students and other practitioners, and finally to assess and aid surgical intervention.

DISPLAYING SELVES AND SKILLS

Historians of medicine exploring surgery from the sixteenth century onwards have found that images can greatly aid in understanding various elements of surgery. Jordanova suggests that images can be revelatory of 'areas like professionalization, identity formation and power relations', prompting works on occupational representations and their transformations over time.⁶ Among the healing occupations, surgery was characterized, and indeed sometimes denigrated, as a physical craft, the surgeon touching, manipulating, and invading the patient's body for healing purposes. Surgeons' portrayals of their own practice offered them a medium to play out medical conflicts and to

define and redefine their occupational identities. Kemp has shown how anatomist and surgeon Andreas Vesalius (1514–1564) used images in his 1543 *De humani corporis fabrica* to define the craft of the anatomist through the depiction of carving, clamping, and cutting instruments.⁷ Kemp argues that the illustrations of tools in the *Fabrica* served to ‘underline the veracity of Vesalius’ representations’ and to draw attention to the fact that his comments on anatomy were the product of first-hand experience gained through the application of such tools to the body.⁸ In short, Vesalius used the illustrations of tools to argue for the importance of dissection and trusting one’s own visual evidence even if it contradicted the ancient authorities at a time when medical men were still reluctant to dispute the word of Galen. Furthermore, the images visually placed these cutting tools at the core of the occupational identity of the anatomist. To cut was to see, to see was to know. The visual analysis by art historians such as Kemp can be similarly applied to the work of surgeons in order to reveal many of the surgical characteristics and skills that they sought to emphasize.

For instance, illustrations from surgical works from the Early Modern period frequently depicted their surgeon-authors in the process of a common surgical procedure such as bleeding or amputation. One such image comes from German surgeon Hans von Gersdorff’s *Feldbuch von Wundartzney* (*Fieldbook of Surgery*) (1517) and shows a surgeon and assistant amputating a man’s lower leg (see Fig. 1).

Gersdorff’s *Feldbuch* included numerous woodcut illustrations. Alongside the amputation image the book also included images of a ‘wound man’, various anatomical views of the skeleton and internal organs, illustrations of instruments, as well as depictions of other common surgical treatments such as trephining and bone-setting. In the amputation image the surgeon’s work is visually constructed as an expertise based on tactile and invasive knowledge of the body. Surgeons were often shown wielding sharp cutting instruments, using physical skills, and interacting directly with the bodies of their patients. In Gersdorff’s amputation image the viewer’s eye is immediately drawn to the very centre of the image where we can see the sharp, serrated blade of the surgeon’s saw as it bites into the patient’s leg; the cutting tool at the centre of the image demonstrating the essence of the surgeon’s practice. Interestingly, we can also see a patient standing in the background who has had his hand amputated and bandaged. The image then suggests a sequential view of the skill of the surgeon; his physical prowess is demonstrated in the foreground and his previous successful interventions in the background.

Over the centuries following Gersdorff, the practices of surgeons changed markedly yet they continued to use images to shape and define their new skills and identities. Art historian Mary Hunter has highlighted how artistic depictions of surgeons in the eighteenth and nineteenth centuries showed them clad in respectable garb, surrounded by instruments and books—the traditional trappings of their surgical practice—as well as new artefacts



Fig. 1 A man having his leg amputated. Hans von Gersdorff, *Feldtbuch der Wundartzney* (Frankfurt on the Main, 1551). Wellcome Library, London

indicating their developing theoretical knowledge of bodies.⁹ These images retained the surgeons' association with the cutting tools and sharp instruments of their work, yet removed the overt displays of blood and bodies that signalled their craft-based origins. These representations did important work in dissociating surgery from the figure of the barber-surgeon and claiming intellectual legitimacy for surgery in the nineteenth century.¹⁰

As well as revealing changing ideas of occupational and professional identity, illustrated surgical works also offer valuable insight into standards and practices of a developing field. In their work on the history of objectivity, historians of science Lorraine Daston and Peter Galison have argued that scientific atlases have not only been central to practice but also 'set standards for how phenomena are to be seen and depicted'.¹¹ Cognizant of the power of these images to formulate their professional identities, surgeons often exercised a high degree of control over the production and use of those used to portray themselves and their work. Eighteenth-century English surgeon and anatomist William Cheselden (1688–1752) was one such figure who sought total control over the images used in his work. In the production of his 1733 atlas *Osteographia, or the Anatomy of Bones* he employed two artists—engraver Gerard van der Gucht and one Mr Shinevoet—to create images using a *camera obscura*, in order to produce more faithful images of the specimens he selected. His pride in this representational fidelity was such that he even included an image of himself and the two artists using the *camera obscura* to produce an image of the ribcage on the title page of *Osteographia* (see Fig. 2).

However, Cheselden was careful to note in the text that no mechanical intervention could completely replace the authority of the surgeon writing that 'where particular parts needed to be more distinctly expressed on account of the anatomy, there I always directed; sometimes in the drawings with the pencil, and often with the needle upon the copperplate'.¹² Indeed, the title page image shows Cheselden standing directly behind one of the artists directing the whole production of positioning the ribcage for the draughtsman. As Daston and Galison point out, for Cheselden, even the mechanical intervention of the *camera obscura* could not negate the ultimate authority of the surgeon.¹³ The frontispiece image reinforces not only the idea that the images included in the book are as accurate as possible, but also that the surgeon is the ultimate arbiter of this accuracy. Much like the depiction of instruments aligned the surgeons of the sixteenth century with the bodily practices of cutting and bleeding, Cheselden's image visually associated the eighteenth-century surgeon with the skills of visual acuity and accuracy, as well as the character of the gentleman.

Examples abound of individual surgeons' engagement and interference with printing processes. French surgeon Claude Pouteau (1724–1775) provided his own sketches of instruments to a professional draughtsman and engraver to complete the illustrations for his own publication. He was dismayed however by the 'vicious' image reversing necessitated by the printing

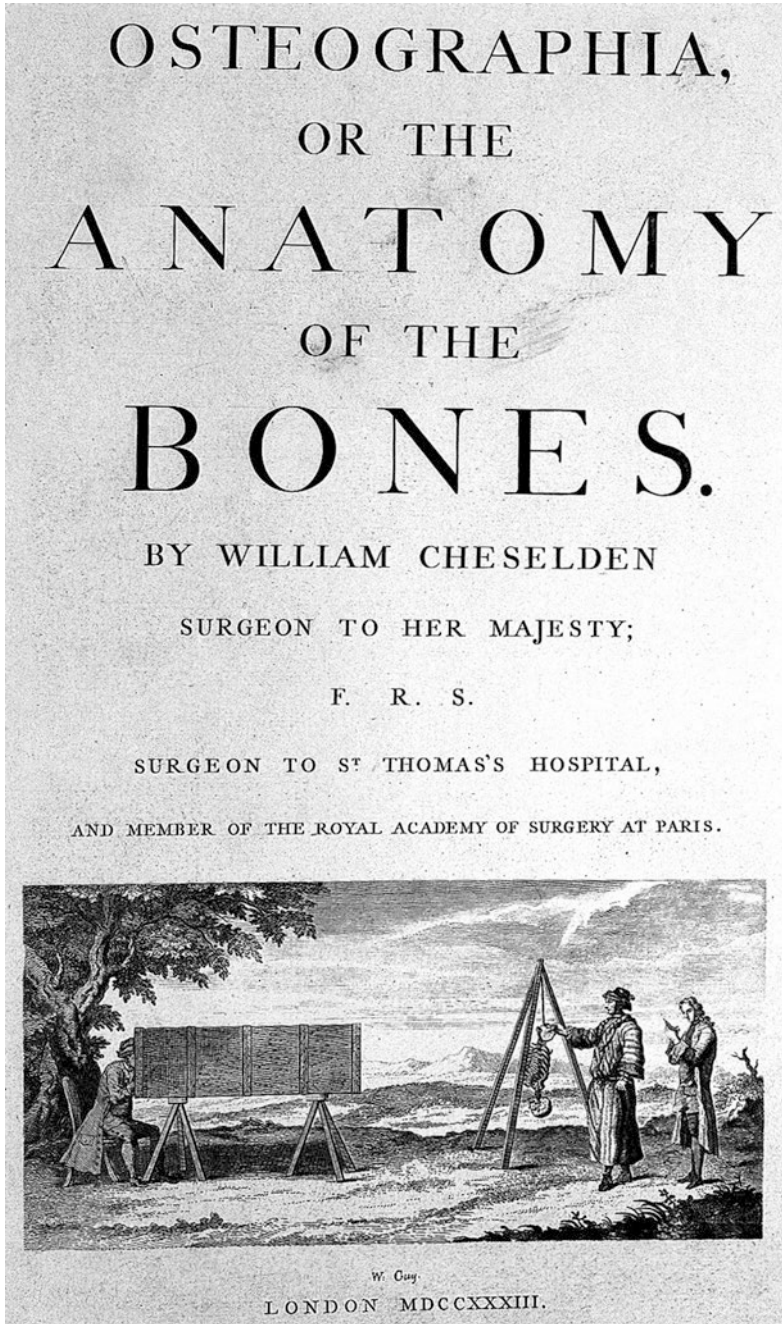


Fig. 2 Frontispiece. William Cheselden, *Osteographia or the Anatomy of the Bones*, (London 1733). Wellcome Library, London

process and sought to correct it by suggesting his reader view the illustrations through the reverse of the transparent paper. French obstetrician André Levret (1703–1780) discovered to his annoyance that the printing processes of watering, laminating, and drying resulted in a slight shrinkage of the image on the paper, thus thwarting his intention of producing images that were exactly to scale.¹⁴ Historians such as Claire Jones have investigated the costs incurred by illustrating surgical textbooks, uncovering a whole economy of potlatch, where instrument makers subsidized plate engravings used in medical treatises and sale catalogues in order to advertise their wares.¹⁵

In the twentieth and twenty-first centuries, surgeons have gained new partners in their image making endeavours in the form of the radiographer and radiologist who controlled X-rays and later scanning technologies (to be discussed in more detail later). The emergence of such technologies in the early twentieth century entailed a reconceptualization of the role of the surgeon as image-maker. Surgeons had to learn to work alongside practitioners of the new discipline of radiology that swiftly took charge of making and controlling surgical images. The days of the surgeon standing over the shoulder of his engraver in order to ensure fidelity of representation were seemingly gone and a new discipline devoted wholly to producing such faithful images emerged. In the later twentieth century with the further development of technologies such as computed tomography (CT) and magnetic resonance imaging (MRI) the radiologists' role came to even greater prominence in surgery. Scan images are routinely used in surgical atlases and training programs alongside more traditional drawings and diagrammatic representations, even if their ostensible purpose is diagnosis and intervention.¹⁶

TECHNICAL EDUCATION AND MARKETING

Early Modern historians have recognized the importance of visual representations in the communication of surgical research as well as the education of their trainees. From the sixteenth century onwards, sketches presented to medical societies' meetings or published in their proceedings routinely conveyed non-textual information about patients' symptoms, surgical instruments, or the outcomes of operations very much like photographs or video-clips today. The use of such images has long been a vital element of scientific education, yet, in the case of surgery, Christelle Rabier has argued that this education involved an additional critical dimension of learning to also create images. Scottish surgeon Charles Bell (1774–1842), himself a talented artist, championed the use of images in his work and even encouraged his students to practice drawing themselves, alongside the more conventional pedagogical method of dissection of cadavers, in order to improve their understanding of the body. In his 1820–1821 work, *Illustrations of the Great Operations of Surgery*, Bell wrote that,



Fig. 3 Surgical removal of a stone from the bladder. Charles Bell, *Illustrations of the Great Operations of Surgery* (London, 1821). Wellcome Library, London

The student of Surgery should teach himself to comprehend drawings, if he does not execute them; for there is much professional knowledge which he cannot easily attain by any other means. If a drawing of all that we see in an operation, be an imperfect demonstration, so is the lesson of an operation performed on the dead body imperfect, for the circumstances most essential to know cannot be presented there, from the partial and rapid view which the spectator obtains. And, finally, as to description, words alone will never inform the young surgeon of the things most necessary to a safe operation.¹⁷

Learning to draw, or at least to read images, provided then the ‘things most necessary to a safe operation’; this was, according to Bell, the full understanding of the procedural stages of an operation. Bell and others developed sophisticated visual strategies in order to portray operative movement and sequence through static images. In his *Great Operations of Surgery* Bell included a plate illustrating the lithotomy in which he employed multiple visualizing strategies to describe the operation (see Fig. 3).

He included three different drawings of the operation on a single page, representing different anatomical details and approaches. He also used dotted lines to indicate multiple stages of an operation in one image. Naturalistically

shaded hands contrasted with unshaded outline diagrams of instruments, like the scalpel, to show the depth of the operation in the body. Similarly, the use of anatomical cross sections, the inclusion of instruments and the surgeons' disembodied hand all serve to demonstrate the exact placement of these elements in relation to the patient body during an operation. Though depicted naturalistically, these illustrations were not meant as realistic portrayals of the lithotomy but were carefully considered representational strategies that worked together to allow the image to demonstrate sequence, movement, and depth.¹⁸

Developments in printing technologies allowed atlases like Bell's a greater role in education beyond surgical trainees. In the nineteenth century the development of steel-engraving and steam printing machines meant cheaper production and increased circulation of illustrated surgical works. The widespread success of atlases such as *Gray's Anatomy* may be explained by a combination of surgical expertise, skilled drawing and engraving of the plates, a flourishing print industry, and a growing medical audience.¹⁹ As printing techniques continued to develop into the twentieth century, images took on new powers to standardize surgical knowledge and practice. In his work on the novel 'Arbeitsgemeinschaft für Ostersynthesefragen' (AO) system for fracture repair developed in mid twentieth-century Switzerland historian Thomas Schlich notes that the AO surgeons realized early on the need to ensure the success of their system required the development of a standardized way of teaching. One of their answers to this was the production of a heavily illustrated textbook accompanied by the circulation of slide series, teaching films and operation film footage.²⁰ As historians such as Schlich have shown then, technical education was not so far removed from the marketing of technology as we might suppose, and the standardizing power of the image often played a central role in both.

Historians of medical film such as Kirsten Osther have shown that visualizing strategies for depicting the stages of an operation similar to those seen in nineteenth-century images were regularly put to work in the creation of many twentieth-century surgical training films. The production of such films involved not only the filming of operations in progress but often the addition of animated sections that could demonstrate minute maneuvers or anatomical features that would have been difficult or impossible for the cameras alone to pick up.²¹ This technique mirrored earlier ways of depicting dynamic processes in static images like Bell's. The editing of film and the use of animation worked to arrest the temporal dimensions of the operation to highlight certain details of the anatomy or operative technique in a similar way to earlier uses of diagrammatic touches such as dotted lines used to indicate different stages of operations.

Surgeons today rely heavily on a new form of surgical image in education. The training films of the twentieth century have now been supplanted by the creation of a host of simulators, ranging from simple 'bench-top'

models comprised of animal tissue on which students learn basic skills such as suturing, to complex virtual reality programs and technologies that introduce students to bodily anatomy in three dimensions, to ever more sophisticated software and machinery that replicate the haptic as well as the visual dimensions of various operations.²² More and more though these image technologies are not now produced by clinicians themselves but designed and engineered outside of the surgical sphere. A new medical simulation industry has emerged with large companies such as Simbionix (USA) and Immersion Medical (USA) holding the patents to simulation technology. Designed for students in their early stages of training there are, of course, elements of surgery that simulators cannot easily replicate; fine understanding of anatomy and physiology, decision making, interpersonal relationships, communication, and risk-awareness are surgical skills that mechanical simulation cannot easily represent.²³ Alternative diffusion of new techniques exist now also; co-edition of DVDs by private firms or public funders and new journals publishing videos, such as the *Journal of Visualized Experiments* (JoVE), which provide cameramen in the operation room when a surgeon's abstract is accepted.

ASSESSMENT AND INTERVENTION

Photography, film, and scanning technologies have greatly expanded the potential of images to document outcomes and guide surgical interventions.²⁴ In the early twentieth century for instance, photography allowed for sequential records of surgical healing. Albert Norman (1882–1964), official 'scientific photographer' to the British Army, collected many photographic images of soldiers disfigured in wartime who had undergone reconstructive surgery (see Fig. 4).

Norman's iconic photographs that show the successes of reconstructive operations were central in gaining further support and funding for facial reconstructive surgery in the post-war period. The photographs show stark sequential images of soldiers with once devastating disfigurements and the striking improvements made after surgery. Historian of medicine and photography Beatriz Pichel, writing about similar photographs of facially disfigured French soldiers in the aftermath of World War I, has argued that images like these functioned in several different ways. These images went beyond only surgical interest and 'can also be seen as metaphors of a broader reconstruction, as symbols of a collective national regeneration after the war, as the visual representation of an individual moral change, as the emergence of a new radical pacifist human being and as an artistic revolutionary paradigm'.²⁵ Pichel notes that whereas the prosthetic replacement of missing limbs could restore a soldier to economic productivity, the restoration of his face was necessary to restore his humanity and identity. Norman's photographs do not just suggest physical healing but, in the transition from unconscious patient lying in a hospital bed to young man sitting dressed, apparently healthy and



Fig. 4 Six photographs of plastic surgery cases at King George Military Hospital. Albert Norman (1917). Army Medical Services Museum

even smiling, they demonstrate that surgery had the power to return patients successfully to society; to not only mend faces but to also restore social normality.

Thus, photographs such as Norman's worked on multiple levels; they served as scientific proof of successful surgical intervention and as tools to allow others to assess these outcomes, and, as we have seen, they also functioned as metaphoric representations of wider political post-war regeneration. These multiple meanings were heavily reliant on the characteristics unique to the photograph as medium. Historians of photography have long pointed out the assumptions made about the 'truth' of photographic images from the early development of photography in the nineteenth century. Daston and Galison have shown that the sort of 'mechanical objectivity' of photography offered scientists an ostensible escape from subjectivity, a 'freedom from will' that could guarantee passive objectivity. Gone were the days of surgeons like Cheselden 'intervening' in their images, a different form of visualizing

truth was now being sought. This new form of objectivity was inherently image-based.

The development of X-rays served to further transform the definition of successful surgical interventions, not only by the external appearances that could be captured in a photograph, but by reference to the internal anatomy now made visible through X-ray imaging. Historian of science Andrew Warwick has written about the importance of X-rays in the growth of orthopedic surgery in the late nineteenth century.²⁶ The success of X-ray as a medical imagining tool lay in its similarity to photography. Sociologist of science Bernike Pasveer has shown that in the immediate aftermath of their development people 'read' X-ray images in much the same way as they did photographs; 'as the visual evidence of the presence, the existence, out there, of the phenomenon depicted.'²⁷

We can see this well in the case of psychosurgery in the second half of the twentieth century. In the early days of leucotomy (lobotomy) X-rays were used to assess the success of the operation. Lipiodol, a poppyseed oil used as a radiological contrast agent, was injected into the skull so that the area of the operation could be assessed following the intervention. If the lipiodol was distributed in the brain where the operation had occurred on the X-ray the procedure could be judged as successful.²⁸ The descriptions of these results note a discomfiting lack of patient assessment and a heavy focus on the visible results from the X-rays, a testament to the primacy of visualization in surgical culture.²⁹ From the 1950s new discussions about surgical alternatives to leucotomy for treating serious psychiatric disorders began, resulting in experiments with the implantation of electrodes in the brain. This necessitated the use of various tests to ensure the electrodes were situated in the right area of the brain.³⁰ Correct placement of electrodes was important to make sure that any stimulation did not engender an epileptic reaction and so complementary use of X-ray images assured the right placement of the electrodes through the use of an imaging technology that had already gained trust value in revealing the anatomical success of surgical interventions³¹ (see Fig. 5).

However, Pasveer has argued that there was more to the phenomenon of X-rays that historians of radiology have often overlooked; specifically, she asserts that X-rays did not 'reveal' an objective interior body, '[t]his body had to be crafted carefully out of historically specific other bodies, in order to become a referent for the images'.³² Crucially, the ideas of the interior body came from the older practices of pathological anatomy which had created a version of what the body's insides looked like through examination of the dead. Thus, it was this nineteenth-century 'anatomical body' that initially became 'the primary frame of reference according to which X-ray workers sought to see and *read* the shadows.'³³ As a diagnostic tool, X-ray images were also encoded 'with the visual analogues of the result of other, well-established diagnostic methods' such as percussion and auscultation; practitioners were therefore taught to read living processes into these

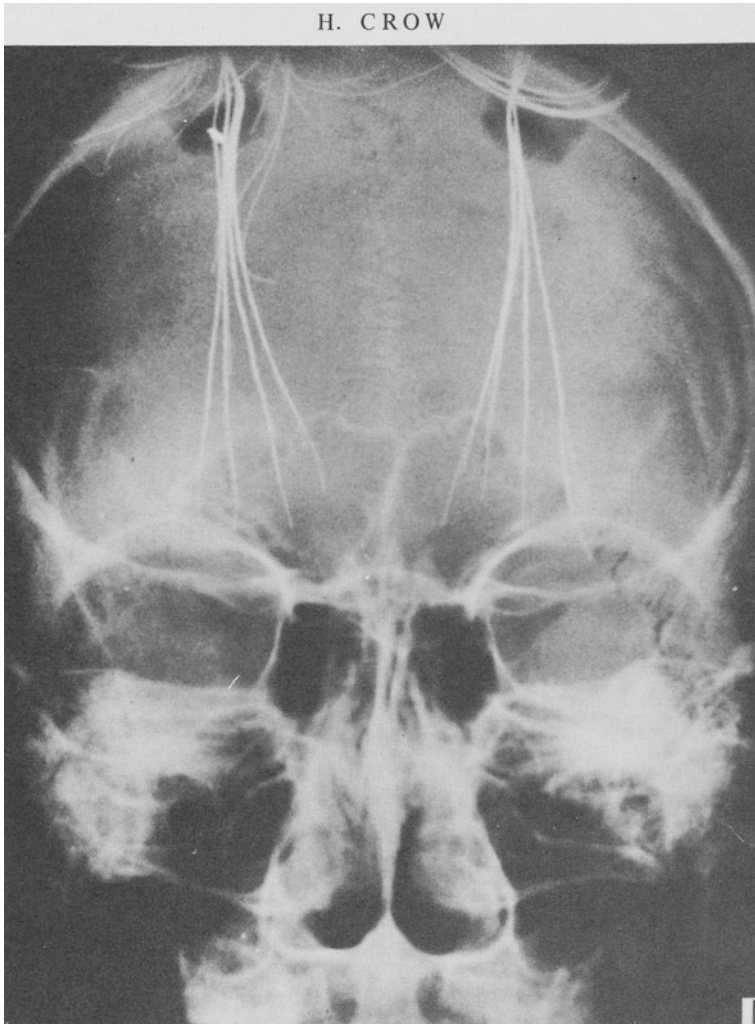


Fig. 5 Postero-anterior X-ray of skull indicating the placement of sheaves of implanted electrodes. J. Sydney Smith, L. G. Kiloh (eds.), *Psychosurgery and Society : Symposium Organised by the Neuropsychiatric Institute, Sydney, Australia 26–27 September 1974* (Oxford: Pergamon Press, 1977). Wellcome Library, London

new images.³⁴ As the technology developed over the twentieth century the X-rayed body required more interventions, such as the injection of contrast dyes, in order to make its images readable.

The cases of photography and X-rays are demonstrative of the cognitive centrality that visualization practices have in surgery. Historian of medicine Caitjan Gainty includes the X-ray as one of several developments that began

to separate surgery from other branches of medicine in the early twentieth century. Gainty notes that visualizing technologies like X-rays gave surgeons new and immediate proof of the efficacy of their interventions. 'Tumours and other growths could be removed, for example, quite suddenly changing the shape of the body's inner landscape and sometimes also visibly altering its outer geography'.³⁵ This was in contrast to the outcome of internal medicine where the visual evidence of cure was much more subtle, gradual, and difficult to visualize.³⁶ The successes of surgeons' visualizing interventions impacted greatly on their professional identity, meaning the practices of visualization became ever more integral to surgical intervention. Images and image making have become a central part of surgical work in multiple ways. After spending time in a late twentieth-century operating theatre, sociologist and ethnographer Stefan Hirschauer suggested that during invasive procedures surgeons were looking for an idealized anatomy within the body they operated upon, arguing the 'artificial authority of the anatomical atlas resulted from the sculptural activity of surgery'.³⁷ However, this is not only a twentieth-century phenomenon. Barbara Stafford, focusing on the anatomical atlases of the Enlightenment, analysed the tactile and artistic analogies between dissection and engraving; engravers cut images out of wood- or copper-blocks in very much the same way that surgeons excavated their anatomical knowledge from corpses.³⁸ For both Stafford and Hirschauer both the scalpel and the pen made visible the internal structure of corpses or patient bodies during invasive procedures. Although there is a three-hundred-year difference in Hirschauer's and Stafford's subject matter, they both consider images as constitutive of surgical practices, whether they linger at the background of surgeons' know-how or represent the aim of anatomical surgical work.

Surgeons in the twenty-first century continue to be reliant on imaging technologies though in wholly new ways, most notably in the realm of minimally invasive (keyhole) surgery. The development of endoscopy demonstrates the successful dominance of sight in the diagnosis of disease within the patient body. The impact of laparoscopic surgery that relies on the surgeon viewing two-dimensional images on a monitor has been a source of interest for sociologists and is now gaining the attention of historians.³⁹ Sociologists have drawn attention to the 'complex visual dynamics' of minimally invasive surgery highlighting that, as with earlier surgical images, what can be seen on a monitor during an operation does not represent an objectively 'real' body but is a highly mediated image dependent on optic technologies and lighting.⁴⁰ Just as the development of X-rays was dependent upon the construct of an interior anatomy that came from older visualizing practices of pathological anatomy, so the endoscopic body has been built through X-rays, photographs, and other scanning technologies. Endoscopic images present, in many ways, a whole different view of the surgical body, its structures and textures magnified to an extent unrecognizable to the naked eye, that surgeons must

relearn how to see. New laparoscopic technology has challenged surgeons to rethink their approaches to surgery and body vision, to both master new technologies and instrumentation and to relearn their fundamental skills of hand-eye coordination.⁴¹

These new forms of visualization have also transformed surgeons' professional identity and work. Endoscopic visualization has had profound implications for the redefinition of surgical work. With radiologists taking over the production of surgical images, professional boundaries are blurred even further as interventional radiological techniques are seeing surgery moving from operating theatres to radiological suites. For example, with the emergence of techniques such as intraoperative angiography radiologists are performing their own therapeutic interventions into the body and moving beyond their previous diagnostic remit.⁴² Through the wielding of visualizing technologies, the interior of the body now arguably belongs to the radiologist as well as the surgeon. The challenge for historians now is to explore the meaning of these new visualizations, the body they imagine, and the impact on surgical thought and practice in a new century.

CONCLUSION

It would be easy to think that it is only with the invention of the laparoscope that surgeons have had to integrate visualizing tools into their practice, but surgery has a much longer heritage of both making and using images. Surgeons have created images to market their own skills and forge professional identities, they have made images central to the teaching and communication of their skills as well as embracing new technologies to assess and guide their interventions. Thus far there has been little sustained historical attention to surgical images. Historians of medicine have focused heavily on anatomical images, medical photography, and X-rays, while the discussion of minimally invasive visualization has mostly been the preserve of sociologists. However, images have been integral to the theory, practice, and identity of surgery since the Early Modern period. The making, use, and understanding of images has long been an important part of surgical work and is a skill that surgeons must continue to develop alongside their interventional abilities. Considering images as part of surgical work should enrich historians' understanding of surgical theory, practice, identities, and cultures.

NOTES

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4. Martin Kemp, 'Taking it on Trust: Form and Meaning in Naturalistic Representation', *Archives of Natural History* 17 (1990), 127–188. See also chapter 'Art and Surgery: The Expert Hands of Artists and Surgeons' by Mary Hunter in this handbook.
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Art and Surgery: The Expert Hands of Artists and Surgeons

Mary Hunter

INTRODUCTION

This chapter examines artwork with surgical themes produced between the late nineteenth century and present time. During this period, there were major advances in surgery, from the rise of anaesthesia in the 1840s to the advent of minimally invasive surgery in the 1990s. Similarly, art of this period experienced major transformations as it moved from privileging naturalistic representations of the world to abstracted ones. As the twentieth century progressed, art became more conceptual and idea-based, and the materials of art also changed; ready-made objects, film, and the performing human body took their place alongside painting and sculpture as valid art forms. While surgery is not one of the most popular narratives in the history of art, it has been explored by numerous artists in diverse ways since the advent of surgery itself.

The majority of publications on art and surgery tend to be lavishly illustrated survey books or specialised scholarly articles. This chapter, by contrast, provides wide ranging yet focused analyses of the various functions of art in the history of surgery by exploring works that represent, embody, or signify surgery, with specific attention to visual analysis, the history of commissions, historical context, and how an artwork's narrative adheres to or contradicts historical accounts. This art-historical approach will not focus on the most famous artists, or provide detailed accounts of surgical progress, but will concentrate on three very different case studies that exemplify key artistic and

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thematic tropes in depictions of surgery in modern and contemporary art. Through close visual readings, it will consider how painting, drawing, and filmmaking have been understood and visualised as parallel practices to surgery, particularly through the representations of hands and manual dexterity. Hands are a suitable example because they have long played a central role in surgery-themed artworks. From the bloody scalpel-wielding hand of Samuel Gross in Thomas Eakins's *The Gross Clinic* (1875) to the gloved hands of cosmetic surgeons in performance artist ORLAN's body-altering videos (1978–), depictions of surgeons' hands have symbolised occupational dexterity and linked medical and artistic skills (Fig. 1).



Fig. 1 Thomas Eakins, *Portrait of Dr. Samuel D. Gross* (1875), oil on canvas, 240 x 200 cm. Philadelphia Museum of Art, Pennsylvania. ©Bridgeman Images

We only need to be reminded of the centrality of hands in the frontispiece to Andreas Vesalius's *De Humani Corporis Fabrica* (1543) and Rembrandt's *The Anatomy Lesson of Doctor Nicolaes Tulp* (1632)—two influential images depicting anatomists that have served as visual models for portraying surgeons for hundreds of years—to see how the gesturing hands of medical men have long denoted professional excellence. Both surgical and artistic practice requires a connection of mental and manual ability and expert hand-eye coordination; drawing, painting, sculpting, and performing surgery are all visual and haptic activities that utilise similar specialised knowledge.

The importance of hand-eye coordination and the ties between mental ability and manual dexterity are central to the histories of artists and surgeons. The examples in this chapter foreground tensions between the understanding of surgeons' hands as respectable, trained, and professional, and the violence symbolised by hands holding surgical tools (particularly bloody ones) that are typical of surgically-themed artworks produced over the past 150 years. While some images of surgeons showcase their expertise and leadership, as represented in Adalbert F. Seligmann's *Theodor Billroth Operating at the Surgical Clinic* (c. 1890) and Eakins's *The Agnew Clinic* (1889), others suggest or avoid what one could call the 'barbarism' of surgery through the inclusion or exclusion of related objects, instruments, and figures.¹ For example, a representation of the vulnerability invoked by surgery can be found in Edvard Munch's *On the operating table* (1902–1903), where the artist portrayed himself naked on a bloody operating table under the scrutiny of faceless onlookers and the surgeons who will perform surgery on his hand. The artist's state of undress, horizontal pose, broken hand, and lack of visible genitalia signify his powerlessness when confronted by a group of clothed, standing surgeons.

The case studies in this chapter evince the relationship between artistic and surgical practices and demonstrate how conceptualisations of surgeons have (and in some ways have not) changed over time. The first case study, a large nineteenth-century oil painting by the French painter Henri Gervex (1852–1929), portrays a surgeon, Dr. Jules-Émile Péan (1830–1898), in a Parisian operating theatre in the late 1880s (Fig. 2). The second is a self-portrait that Mexican artist Frida Kahlo (1907–1954) gave as a gift to her surgeon, Dr. Juan Farill (1902–1973), in 1951 (Fig. 3). Unlike the publicly exhibited portrait of Péan, this small private painting provides a different account of surgery: it is a personal counterpart to the heroic narratives of surgery that dominated commissioned works for hospitals and medical schools in nineteenth-century Europe and North America. The third case study is a series of videos by contemporary Austrian artist and sociologist, Christina Lammer (1968–) (Fig. 4). Neither portrait nor homage, Lammer's projects consist of up-close recordings of surgeons' hands performing intricate manoeuvres during operations. Far removed from the rational façade of nineteenth-century portrayals of surgery and the personal experiences displayed in Kahlo's paintings, Lammer's films encourage consideration of the humane aspects of



Fig. 2 Henri Gervex, *Before the Operation: Dr. Péan at the Saint Louis Hospital presenting his new technique of clamping blood vessels* (1887), oil on canvas, 242 x 188 cm. Musée d'Orsay, Paris. ©Bridgeman Images

surgery. These three examples are emblematic of the shifts in images of surgery from the nineteenth century to the present: they exemplify the move from naturalistic yet idealised images typical of commissioned portraits (in the nineteenth century), to more introspective views that utilised more abstracted styles, colours, and compositions (in the twentieth century), to contemporary art that often uses new technologies and media to explore patient and surgeon interactions and subjectivities (from the 1960s to the present). The three artworks also evince the diversity of artistic approaches to visualising



Fig. 3 Gisèle Freund, *Frida Kablo and Dr. Farill* (1951), silver gelatin-brome negative, 6 x 6 cm. ©IMEC, Fonds MCC, Dist. RMN-Grand Palais/Gisèle Freund/Art Resource, NY

surgery. Likewise, my analyses of these works are informed by a range of art-historical approaches, particularly by methodologies and theories linked to the social history of art, visual culture, gender studies, iconography, and visual analysis. I introduce these methods to allow for an understanding of surgically-themed art that moves beyond narrative readings.

Generally, nineteenth-century surgical and artistic training focused on the human body. Artistic traditions enabled medicine to visualise ‘normal’ and ‘pathological’ human forms while medical thought helped artists to produce life-like depictions of ‘healthy’ and ‘sick’ bodies.² Medical discourse played a key role in influencing the public’s conception of bodies, diseases, and sexualities, even though precise medical understandings intended for educated audiences often took on different meanings when influenced by external motivations, including artistic ones. As many scholars, including Anthea Callen, James Elkins, Ludmilla Jordanova, and Martin Kemp have shown, artistic

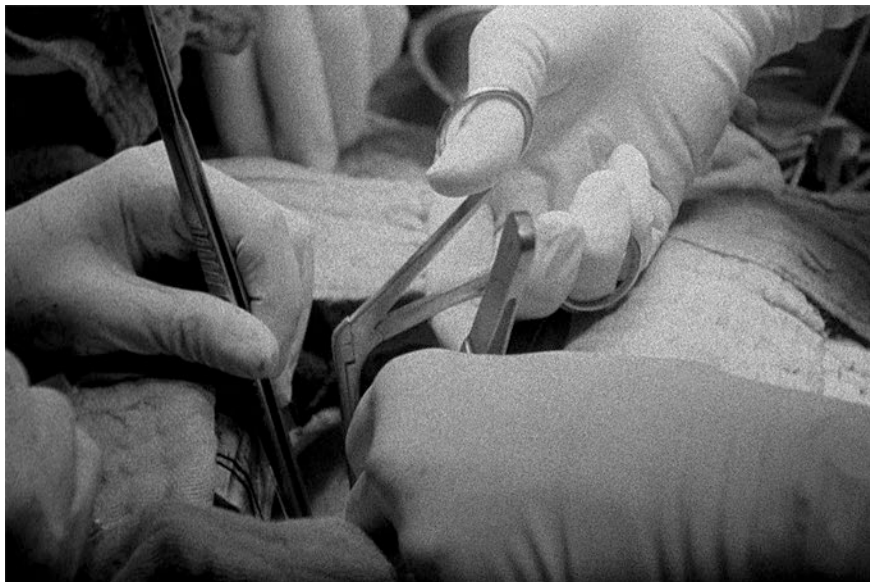


Fig. 4 Christina Lammer, still images from *Matters of the Heart* (2015), 16 mm. ©The Artist

circles were familiar with emerging theories of modern surgery and medicine, and medical communities were aware of the power of artistic conventions.³ Artists often appropriated medical models to create representations that were considered ‘real’, ‘truthful’, and ‘objective’; they engaged in medical culture to elevate art’s status to that of scientific medicine. Physicians contributed to the circulation of representations of bodies by commissioning portraits of themselves and other medical leaders, as well as images for medical buildings, publications, and their homes. The history of commissions is of great importance, as the commissioner (working with an artist) chose who and what was recorded for posterity.

While surgery was historically tied to the artisanal practices of barber surgeons, from the late nineteenth century onwards surgeons were increasingly linked to scientific practices and knowledge due to the perceived success of medical science.⁴ At this time, the scientific self was often seen as diametrically opposed to the artistic self. As Lorraine Daston and Peter Galison posit, objectivity was aligned with science while subjectivity was associated with the arts.⁵ However, many artists utilised the rhetoric of scientific medicine to promote their art and identities, and physicians and surgeons relied on visual practices, languages, and images borrowed from art. As Thomas Schlich has shown, many surgeons compared themselves to artists and believed in the ‘art’ of their practice.⁶ The intersections between art and surgery continue today. Surgery figures prominently in art in a variety of ways. For example,

in Damian Hirst's 2011–2012 'scalpel blade paintings', scalpels are geometrically arranged to kaleidoscopic effect. The shine of the sharp edges is decorative and destructive, thus signifying surgery's binaries of beauty and violence, healing and death. In ORLAN's 1990 *The Reincarnation of Saint-Orlan*, the artist underwent many operations to transform herself into the ideal image of female beauty as conceived by male Renaissance painters. Shown at museums worldwide, ORLAN's films of the surgeries show the artist and surgeon working together with the artist's body as medium; the artwork is not only the film, but also the performance of surgery and the artist's post-op body. Like artists, plastic surgeons are informed by social and cultural conceptions of beauty and normality, including those produced in art: they utilise them—consciously or not—in their surgical reconstructions.

Definitions of art, like conceptions of surgery, have changed over time; like the history of medicine, the history of art has distinct histories, theories, and methodologies. While art influences and is influenced by visual culture, from advertising to medical imaging (art can be considered its own category or a form of visual culture), this chapter concentrates on images that are considered forms of 'high' culture. In other words, the artworks under debate were intended to be 'art' at the time they were made rather than, say, medical illustrations or art therapy. While the surgical subject matter of the works was certainly important to the artists, aesthetic concerns regarding style, composition, line, colour, display, reception, genre, medium, and the work's relationship to other artworks were equally important. One may learn about surgical procedures from surgically-themed art, but it was not intended for medical study. Rather, the artworks are cultural products from distinct historical moments that engage with artistic conventions, theories, and histories while simultaneously representing surgery and surgeons in their varied manifestations.

Art has often been used in historical accounts of surgery as illustrations of surgical feats and leaders. This approach is evident in Roy Porter's *Illustrated History of Medicine* (1988), where the text accompanying the illustrations focuses on surgical inventions or personalities. Using images as illustrations, however, often fails to examine the politics and social impact of visual representations and their role in producing distinct conceptions of surgeons and surgical procedures. Sander Gilman's publications provide a different model by concentrating on the political aspects of medical images; for example, he has shown how plastic surgery is informed by cultural conceptions of beauty and racial ideologies.⁷ Art can also have a documentary impulse; some artists have produced meticulously detailed images of surgery or have linked their work with known historical events. This is evident in Christian Schad's precise depiction of surgery in *Operation* (1929) and in Henri de Toulouse-Lautrec's roughly rendered 1891 paintings of the surgeon Péan (whose surgeries he frequented). Yet, other artists are less interested in accurate renditions of the visual reality of surgery and rather focus on feelings and sensations; this is apparent in paintings, such as those by Kahlo, that privilege patients'

experiences of surgery, and in some idea-based artworks that don't depict surgery but reference it through conceptual or symbolic means. For example, Christine Borland's 2003 *The Velocity of Drops: Surgical Ward* consists of 4 photographs of watermelons that have been dropped on the floor of the stately house, Mount Stuart, in Scotland. There is nothing obviously surgical about these images, yet they are referencing the room's use as a surgical theatre during World War I, and the splayed watermelons are surrogates for the bloodied bodies of soldiers during surgery. As this example demonstrates, artworks cannot be read solely based on narratives and literal subject matter.

The three case studies in this chapter show how an analysis of artworks with surgical themes must account for more than the surgical feats or failures depicted. If images are used as simple renderings of past reality, the symbolism and politics of styles, media, conventions, commissions, and history are ignored. For example, Barbara Hepworth's images of surgery are as much about their narrative (surgeons performing leading-edge bone operations), their historical moment (surgery in England during the late 1940s), and the artist's personal circumstances (Hepworth was invited to sketch operations after meeting the surgeon, Norman Capener, when he operated on her daughter), as they are about their status as innovative, modernist art. In these works, Hepworth transformed the abstract style of her sculptures into drawings and paintings that highlight the similarities between the gestures of surgeons performing an operation and her own dynamic sculptures.⁸ Hepworth's images show how surgically-themed artworks can do many things, such as: evince lay conceptions of surgery through the depicted scenes; promote the identities of surgeons and surgical practices, and present them in a positive or negative light depending on the commissioner's or artist's positions; embody cultural understandings of surgery; show surgery from the perspective of surgeon, patient, or caregiver; utilise visualising techniques, modes, and styles to produce distinct visual messages; critique or praise surgery through the choice of subject matter, style, genre, and composition; invoke feelings associated with surgery; and be imaginary or steeped in historical detail. As the case studies below demonstrate, artworks with surgical themes often do a variety of these things simultaneously.

PÉAN'S SKILLED HANDS: NINETEENTH-CENTURY PORTRAITURE AND SURGICAL INVENTION

In 1887, Henri Gervex exhibited a life-sized portrait of the surgeon Péan at the annual Parisian Salon—a spring exhibition featuring thousands of artworks and frequented by thousands of viewers.⁹ The work shows Péan, a surgeon of celebrity and controversy, in a surgical theatre discussing his invention, a new type of haemostatic clamp,¹⁰ before a crowd of medical experts. An anaesthetised female patient—naked to the waist—lies on the operating table, her hair flows down the side of the table, and her lips are slightly parted. Péan commissioned Gervex to paint the work as a memorial of his

acceptance into the Académie de Médecine in 1887, and, as evinced by painting's exhaustive title, *Before the Operation: Dr. Péan at the Saint Louis Hospital presenting his new technique of clamping blood vessels*, to show his role as surgical innovator.

The later nineteenth century was a time of rising faith in modern surgery, partly due to the use of general anaesthesia and new procedures of antiseptics and asepsis.¹¹ Anaesthesia allowed for longer and more complex surgical procedures and decreased pain, while antiseptics lowered infection and increased survival rates.¹² New conceptions and visualisations of surgeons accompanied this progress and they were reflected in the heightened cultural, social, and financial status of surgeons. Portraits played a crucial role in forming public understandings of surgeons as trustworthy and skilled professionals. As an artistic genre with a history of depicting figures of power and authority, portraiture signified status and promoted idealised identities. Most nineteenth-century portraits of surgeons showed healthy medical men that contrasted with the representations of sick patients found in medical texts and atlases. With their newfound wealth and status, surgeons like Péan commissioned artists to depict important events in their careers, securing their place in history through portraiture. Portraits of surgeons—in both paint and photography—were regularly reproduced in popular and medical publications, further distributing idealised images of surgeons to the public. Similarly, hospitals and medical groups commissioned portraits of surgical leaders for public display, such as Thomas Eakins's well-known portraits of the surgeons Agnew and Gross. While many of the conventions of portraiture have remained in images of surgeons today—as evidenced by the heroic portraits of medical leaders in hospital hallways that show learned men pursuing practiced medical feats—such images are, for the most part, excluded from what is considered 'ambitious' art from the twentieth century to the present.

Portraits, however, should not be accepted at face value. Commissioned portraits are the product of exchange between artist and sitter in which a glorified image of the sitter's likeness and character is formed through the artist and sitter's joint decision making. The performative elements of portraiture, surgery, and the surgical persona are exemplified in *Before the Operation*. The depiction of a surgical theatre filled with medical men and new surgical tools provided an ideal stage for showcasing celebrity and invention—both surgical and artistic. Péan, like other surgeons in Paris, held weekly events in which he performed surgery on as many as six patients over the course of few hours in front of a crowd. He cultivated the spectacular side of surgery by instructing his audience: 'move aside, gentlemen, so that everyone can see!'¹³ Gervex emphasised Péan's dominant position by placing him at the head of the operating table and by prominently displaying his two hands—one raised to show that he is addressing a crowd while the other holds the clamps he claimed to have invented. His role as a grand orator, skilled surgeon, and medical leader is on display. Gervex's stressed Péan's hands, and thus manual dexterity and association with the clamps, by depicting them in great detail and in

a light flesh-tone colour that stands out against the solid black backdrop of the men's dark suits. Significantly, Péan is the only figure holding a surgical instrument.

Péan's invention of the clamps was controversial. During the 1880s, the medical press questioned whether Péan or Dr. Verneuil invented this particular instrument (other versions of arterial clamps were in use both before and during this period). The controversy arose when Verneuil claimed that his discovery of *forcipressure* (applying pressure to blood vessels to restrict blood flow) preceded Péan's invention. Péan, who called his invention *pincement des vaisseaux* (clamping of the blood vessels), insisted that his clamping came before Verneuil's pressure. Although the controversy continued until Péan's death in 1898, his identity as inventor of the haemostatic clamps was secured historically through the public display of his portrait (and its extensive coverage in newspapers). By commissioning a painting by a fashionable artist, Péan exploited the authority of the Salon to claim the role of the creator.

The artifice of the construction of Péan's identity is evident when one examines how Gervex utilised the artistic conventions of realism (lifelike colours, naturalised perspective, intricate details, etc.) to create a trusted surgical persona for Péan. Salon critics often equated realistic styles of painting with the truth claims of scientific medicine and used the rhetoric of scientific objectivity to describe Gervex's portrait. Many considered the work an accurate historical document for future viewers: Georges Lafenestre commended Gervex for 'no personal invention whatsoever ... this is to remain, in a word, a copyist of reality, pure and simple',¹⁴ while the critic Maurice Hamel wrote that the portrait has 'the eloquence of the truth ... with the certainty of a scientific claim'.¹⁵ By using a style associated with verisimilitude to portray men in a surgical setting, Gervex presented himself as an innovative modern artist, while also drawing on the desire for scientific objectivity shared by medical men and artists alike. Surgical practice and its ties to objectivity lent Gervex, as well as his portrait, the positive characteristics commonly associated with modern medicine, such as intelligence, skill, education, and neutrality.¹⁶

Realist strategies, however, are no more objective than any other artistic style; all styles are bound to professional, institutional, cultural, and political imperatives.¹⁷ If audiences assume that representations are true because of a painting's mimetic capacity, they ignore the influence of artistic convention, historical context, and (conscious and unconscious) intentions. The reality effect of realistic paintings is produced by strokes of paint and coloured pigments, perspectival norms, detailed depictions, lifelike colours, and convincing shadows, among other painterly tricks and traditions. The *mise-en-scènes* of realist paintings, such as the surgical setting, evince representational conventions, particularly since the scenes depicted are often staged in artists' studios and encompass artistic imagination. An obvious break in *Before the Operation's* façade of objectivity is the inclusion of a semi-clothed young patient who adheres to nineteenth-century notions of beauty in art rather than illness in medicine. This nude disrupts the clinical scene by introducing

elements of sexuality and desire. The eroticised medical touch of Doctor Zacharian, whose fingers take the patient's pulse and sit dangerously close to her nipple, potentially shatter this scene of surgical skill and control.

On the one hand, surgeons were ideal models of an accomplished masculinity, and surgical theatres were sites where they exhibited their education and professionalism. On the other, popular understandings of surgeons as untrustworthy and surgery as gruesome destabilised these ideals.¹⁸ The professionally sanctioned access that medical men were granted to observe and touch female bodies threatened their assumed neutrality, as did their fascination with what was popularly perceived as grotesque and violent. The practical demands of surgery—cutting, slicing, and suturing—required an aptitude for both empathy and detachment. Such procedures problematised the presumed objectivity of the surgical elite, especially when a naked patient was the focus of a surgeon's hands and eyes.

The salaciously rendered patient in *Before the Operation* garnered much attention from Salon critics and viewers because Gervex painted the patient according to academic conventions of female nudes: the body is smooth and white; there is no evidence of body hair or genitalia; her features are idealised and timeless; she shows no signs of illness. This representation, however, contradicts historical accounts that claim that female patients wore hospital caps and had their bodies covered during surgery (except for the section being operated upon). Gervex's reliance on artistic conventions enabled him to produce a scene where the sexual gratification of viewing the naked patient was unaffected by the surgical theme and its implied narrative of a diseased woman in need of surgery. The aestheticisation of the patient's unclothed body belies the illness that the surgical theme suggests, and thus exposes the trouble with realist claims to truthful documentation.

The naked female body in *Before the Operation* is shown as the site of Gervex's artistic and Péan's surgical performance. Whether by Gervex's brush or Péan's scalpel, she is the passive object of men's dexterous work. Whereas visual representations of dissections produced during the Early Modern period showed male and female cadavers, by the mid-nineteenth century, the naked female body was most prominent in artworks showing surgeries or dissections. Gabriel von Max's *Der Anatom* (1869), Eakin's *The Agnew Clinic*, and Gervex's *Before the Operation* all show a bare-breasted woman under the scrutiny of clothed men. As historian Ludmilla Jordanova has argued, the practice of dissection was often understood as gendered in nineteenth-century medical and artistic culture, particularly since the relationship between anatomist and cadaver was commonly conceived as one of male mastery over the female body, despite the fact that men did dissect other male bodies.¹⁹ Through the use of artistic conventions, Gervex's staged a voyeuristic medical scene where viewers could enjoy his painterly skill, the spectacle of surgery, and their shared object of study—a naked woman—without having to turn away from the violence of the painting's impending surgical narrative. Rather than painting the bloody act of surgery, Gervex depicted the moment before

the operation—a time of cleanliness and calm. The spots of blood that Gervex painted among the medical tools intimate what is to come. They work to bring out the artist's blood-red signature, to foreshadow Péan's cut, and to connect the specialised skills of both artist and surgeon.

The technical ability to create a life-like image through the use of artistic conventions presented Gervex as a highly trained artist. In the left foreground of the portrait, he depicted surgical utensils and sponges with attention to accuracy. The surgical tools stand in for paintbrushes as indicators of shared occupational dexterity and expertise. In the nineteenth century, the tools of realist painters and writers were frequently equated with the scalpel and their stylistic strategies were often aligned. Gustave Flaubert, for example, referred to his novel *Madame Bovary* (1857) as a book 'written with the point of a scalpel'.²⁰ Eakin's *The Gross Clinic* also played with the notion of the scalpel as a tool for painting, drawing, writing, and surgery: Gross and the younger scalpel-wielding surgeon both hold bloodied surgical tools in the same hand position as someone writing or drawing.²¹ Artists often linked themselves to surgeons in order to stress their identity as masculine, modern, and skilled. Surgeons also conceived of themselves as artists. As Schlich explains, the 'art' of surgery is the degree of individual choice and subjectivity involved in surgical decision-making, which can be regarded as akin to that of artists.²² Furthermore, surgeons like Péan were actively involved in commissioning artworks and other forms of visual documentation for personal and professional reasons. Péan had, after all, expressed in the popular press that if he had not been a surgeon, he would have been an artist.

As the Gervex example demonstrates, it is necessary to consider paintings of surgery beyond a surface reading of narrative in order to understand their full historical significance and their role in perpetuating certain masculinist and, sometimes, false narratives in the history of surgery. In this case study, I examined *Before the Operation* in relation to its historical context; artistic conventions (such as portraiture and the nude); contemporary art criticism; nineteenth-century understandings of masculinity and femininity; and current histories of art and surgery. These approaches give a broader understanding not only of painting in Paris at this moment, but also of how art and art history as a method of critical analysis can promote, question, and hinder heroic understandings of surgery and surgeons.

KAHLO'S BLOODY BRUSHES: SURGICAL IDENTITY AND EXPERTISE IN TWENTIETH-CENTURY ART

The convention of using a paintbrush to symbolise a scalpel thereby linking painting to surgery, and establishing ties between artistic and surgical identities, continued throughout the twentieth century. For example, Kahlo's use of surgical iconography and visual metaphors engaged with nineteenth-century artistic norms of portraying surgeons yet also extended beyond them in various ways. In 1951, Kahlo made a small oil painting to thank Juan Farill,

a leading orthopaedic surgeon in Mexico City who had recently performed a spinal bone graft on Kahlo's frail back (he ultimately performed seven surgeries on Kahlo between 1950 and 1951. It has been suggested that he was fixing a botched surgery that another surgeon had performed years before). Later that year, Gisèle Freund photographed the artist and surgeon posing together with the portrait (Fig. 3). 'Dr. Farill saved me,' Kahlo wrote in her diary, before explaining that she was working on a painting that was filled with 'all my affection for him.'²³ In *Self-Portrait with the Portrait of Doctor Farill*, Kahlo is shown sitting in a wheelchair next to an easel that holds a head-and-shoulder portrait of Farill dressed in a suit and tie. Kahlo, by contrast, wears a white *huipil* (a traditional Mexican tunic), full black skirt, and an assortment of chunky indigenous jewellery. Despite the differences in the sitters' sizes, poses, and sexes, their faces mirror one another with stern expressions, tight lips, pale skin, and heavy brows. Sharyn Rohlfen Udall argues that Kahlo portrayed Farill with a face and brow like her own to share the artist's role with him.²⁴ The close connection between the artist and surgeon is further emphasised by Kahlo's depiction of her hands, which occupy a central position in the painting's composition. Her left hand holds a painter's palette, adorned with an anatomical rendering of a heart, while the right grasps a collection of thin paintbrushes that look like scalpels. These scalpel-like brushes drip blood red paint to symbolically link artistic and surgical skill.

The majority of analyses of this painting, and Kahlo's work more generally, have stressed Kahlo's biography, focusing on her long medical history.²⁵ She had polio as a child and suffered numerous injuries as a result of a violent bus accident she endured at age 18. Her adult life was plagued by decades of surgical interventions on her spine, hips, and legs, as well as medical procedures during miscarriages (she was unable to carry a foetus to term). Biography can situate a painting within the artist's life and reveal intentions, but biographical readings are troublesome because they rely upon the artists' views of themselves, and/or the story or identity they wish to project to the painting's viewers. Kahlo certainly emphasised biographical elements in her work by including herself in many of her paintings and by utilising the genre of self-portraiture, yet artworks invite many interpretations—not just the meanings promoted by artists.

Various biographers and art historians, including leading Kahlo scholar Hayden Herrera, have argued that Kahlo's self-portrait is a homage to Farill. They claim the heart painted on the palette indicates Kahlo painting directly 'from the heart' to show her admiration for the surgeon. Richard Cork suggests that the portrayal of Farill's head as much larger than Kahlo's was a means of stressing his greatness.²⁶ Certainly, there is a tone of veneration in this work, yet to analyse the painting in purely biographical terms fails to acknowledge the painting's symbolism, its relationship to Kahlo's other 'surgical' paintings as well as the subtle undertones of the self-portrait, particularly the dual understanding of surgery as a healing procedure that first causes bodily pain and violence. While the heart is, as others have suggested, a way for Kahlo to show 'heartfelt' thanks, it is also a medical heart—anatomically correct and

disembodied. The heart is missing a part of its top left chamber because of the palette's thumbhole. Her homage to Farill is thus tinged with the detachment of surgery, which is exacting yet partial; there is a hole in this heart.

The ties between painting and surgery in Kahlo's art are not straightforward, nor is surgery always shown in a positive light. Part of this can be explained by surgery at the time: it was much more invasive and dangerous than most surgeries today. Many scholars have argued that Kahlo used painting as a means of freeing herself from pain during her long hospital stays (she had over 30 surgeries). Surgery both aided and damaged her body, it eased pain but also caused it.²⁷ This dichotomy is evident in Kahlo's double self-portrait *Tree of Hope, Keep Firm* (1946), where she is portrayed as an ornately clothed woman and as a naked patient on a gurney, whose bare back exposes bloody surgical slashes. In *Henry Ford Hospital* (1932), Kahlo emphasised the clinical and industrial aspects of surgery by juxtaposing her naked bleeding body outstretched on a bed with a variety of floating objects, including a steel machine used to sterilise surgical instruments. Rather than celebrating the modernity of surgery, the metal form signifies surgery as mechanical and impersonal. In contrast, the floating organic forms in this surrealist landscape—foetus, pelvis, snail, orchid, and the artist's exposed body and crying face—point to the patient's subjective experience of a medical miscarriage and subsequent trauma. As David Lomas and Rosemary Howell claim, Kahlo worked on 'an imaginative plane with surgery that aimed at restoring her disrupted physical self', and that 'medical anatomy converses on an equal plane with myth and popular Mexican beliefs about the body and illness; each is affirmed as a legitimate source of meaning'.²⁸ Kahlo drew on universally accessible medical imagery but individualised it through her artistic style and personal narratives. One could speculate that through painting, Kahlo symbolically sutured and healed the body, but left the surgical cuts and scars exposed.

The complexities of surgical and artistic practice and identities are evident in Kahlo's portrait for Farill where she portrays herself as surgeon, artist, and patient, and shows Farill without the accoutrements of his profession. Kahlo represents the instability and dual nature of surgery at the time, and the associated variability of the surgeon's and patient's persona, by manipulating the genre of portraiture to point to the volatility of identities. As Oriana Baddeley suggests, 'the line between art and life is a particularly hard one to draw in Kahlo's case. The majority of her work is self-portraiture; her aesthetic concerns grew from her fascination with the falsity of appearance. Dressing up, role playing, and masquerade form the conceptual basis of Kahlo's work'.²⁹ Unlike Gervex and Péan's use of portraiture to stress identity and status, Kahlo played with these categories to simultaneously emphasise and undermine them. On the one hand, the work contains a relatively conventional portrait of Farill and self-portrait of Kahlo. The head-and-shoulder

depiction of Farill in a suit is like a passport photo or an official portrait. Kahlo's self-portrait is like her others: she is shown in a wheelchair and wearing a *huipil*—indicators of her self-identification as disabled and Mexican. The particularities of her face and her quintessential style (a mix of folk art and surrealism) showcase Kahlo's individuality, uniqueness, and avant-gardism. On the other hand, Kahlo enacts her own artistic persona and takes on Farill's surgical one. Through the integration of surgical iconography, such as the scalpel-like paintbrushes, Kahlo utilised key aspects of Farill's professional identity (that she did not depict in his portrait) to identify herself as a surgeon-like figure and to point to surgery's multiple significations as both healing and painful, curative and violent.

Kahlo often portrayed herself wearing colourful *huipils*, but in this work, the blouse is white and without indigenous embroidery, making it similar to a surgeon's gown. This is accentuated by the pristine blue and beige walls of the surrounding room, which are more akin to a hygienic twentieth-century hospital than an artist's messy studio. Kahlo highlighted her manual skill and dexterity over Farill's by including her hands holding work tools—brushes and a palette—while Farill's hands are not shown. The brushes, however, are symbolically aligned with Farill's scalpels through their sharp tips and dripping red paint. Kahlo had previously represented herself wielding a surgeon's tool in her double self-portrait, *Two Fridas* (1939), where she portrayed herself in European garb holding surgical pinchers, similar to the haemostats invented by Péan, to stop the flow of her blood. Whereas blood pools on her dress in *Two Fridas*, here the paint/blood that drips from the brushes lightly stains the gown in pristine teardrops. The violent aspects of surgery are hinted at, but never made explicit. Rather, Kahlo enacts the surgeon's part by holding the bloodied 'instruments' while remaining the patient, as evinced by the wheelchair, a symbol of her recovery and permanent disability. The brutal components of surgery are removed from Farill, mapped onto her body, and transformed into the actions of the artist. Kahlo's skilful use of brush and paint formed her body and Farill's on the canvas, just as Farill and his tools rebuilt her body in surgery.

By painting Farill as a suited man sitting for a portrait rather than a surgeon in medical garb, Kahlo did not actively engage with artistic precedents, such as Gervex's or Eakins's depictions of surgeons in operating theatres, nor did she follow the lead of her husband, Diego Rivera, who portrayed surgeons at work in the two large panels he made for the National Institute of Cardiology in Mexico City in the early 1940s.³⁰ While Rivera's mural is radically different in style and medium from nineteenth-century portraits of surgeons, it nonetheless consists of celebratory images that show medical men performing the procedures with which they were associated. Kahlo's *Self-Portrait with the Portrait of Doctor Farill* is not a history painting or a portrait that attempts to preserve a surgical feat but is nonetheless approving of surgery. Kahlo rendered Farill in the manner of a secular *retablo*.³¹ A *retablo* is

a devotional painting popular in Mexican folk art that usually depicts a holy image, such as Christ, the Madonna, or a saint. They are used to venerate saints and spirits and facilitate communication with the divine. For the outspokenly secular Kahlo, the re-appropriation of this traditional Mexican and Catholic art form to celebrate a surgeon, whose occupation exemplified cutting-edge Western medicine, was a provocative way to highlight her faith in the prominent status of medicine not only in her own life, but in modern Mexican culture more broadly. Through the *retablo*, Kahlo positioned Farill as a god-like man deserving awe and respect.³² However, it is his qualities as a man, not a working surgeon, that are on display.

Margaret A. Lindauer offers a different account of Kahlo's relationship with Farill through an analysis of the letters written by Kahlo and her sister, Mathild.³³ She argues that Mathild questioned Farill's expertise. In her letters to Dr. Leo Eloesser, an American surgeon with whom Kahlo had become friends after being his patient in the early 1930s, Mathild writes that Kahlo was not recovering, that her wounds were infected, and that she had to undergo multiple surgeries and recoveries.³⁴ Lindauer argues that this painting shows Kahlo under Farill's controlling medical gaze and that Kahlo portrayed herself as docile and inferior.³⁵ Lindauer's analysis differs from the heroic readings of surgeons that this painting has provoked from many art historians. The two approaches to analysing this work point to the unstable nature of surgeons' identities as courageous healers and ineffectual butchers; they may also embody twentieth-century anxieties about surgeons—healing men whose livelihoods depended on the suffering of others. Despite major technological changes that made surgery more humane, it was nonetheless plagued by the bloody act of cutting into the body and its historical ties to barbarism. Kahlo's portrait fluctuates between these two poles and encompasses a representation of surgery that accounts for these varied identities and conceptions of surgery.

Self-Portrait with the Portrait of Doctor Farill differs from the paintings of surgeons where a female patient is objectified or sexualised as the object of surgical performance. Rather, Kahlo's work can be read as a feminist painting: she gives herself agency by taking over Farill's surgical identity while maintaining her role as patient and artist.³⁶ By occupying the positions of patient and surgeon, Kahlo displayed the binary opposition between conceptions of surgeons and patients (active/passive, masculine/feminine/, subject/object) yet also critiqued them by showing their malleability. She reiterated her professional role as artist over Farill's as surgeon again in 1951 when Freund photographed her with Farill next to the painting in Kahlo's studio. Although it is evident that the work was finished, Kahlo nonetheless posed with the brush and palette in her hands. In contrast, Farill stands behind her like a husband, not a leading surgeon. In an earlier portrait Kahlo made in 1931 to thank Eloesser, she also showed the surgeon as a well-dressed man rather than surgeon at work. Portrayed in a dapper suit next to a model of his

treasured sailboat in a domestic setting, Eloesser's surgical identity is erased. This portrait is more like eighteenth-century portraits of medical men in their studies, such as Joshua Reynolds's 1786 portrait of the surgeon John Hunter, where mental abilities and gentlemanly comportment are stressed over physical capabilities. Can we read Kahlo's avoidance of portraying the surgeons she admired actively performing surgery as a sign of the difficulty of depicting surgery in an empathetic and admiring manner? Did the violence of surgery make this impossible? Kahlo did not shy away from showing herself as a blood-covered patient in many of her works, yet she did not portray herself under a known surgeon's knife or as the material of surgical performance in any of the paintings she made for surgeons. How could Kahlo pay homage to men who aimed to fix her yet caused so much pain, and whose work was not always successful? In *Self-Portrait with the Portrait of Doctor Farill*, the brutality of surgery is displaced from Farill, yet it haunts the scene. The healing and violent aspects of surgery are transferred to the realm of art and put in the artist's own hands, where Kahlo skilfully employed medical iconography, indigenous Mexican art, and Euro-American avant-garde approaches to create an individualised and embodied experience of surgery that pushed the boundaries of art, surgery, and identity.

My analysis of this work has shown how art can mix the personal and idiosyncratic with wider historical beliefs and those of particular communities (medical, national, artistic, etc.). Kahlo's surgical paintings exemplify the type of medically-themed art that utilises biography and personal experience. However, by analysing *Self-Portrait with the Portrait of Doctor Farill* in relation to the signification of objects (like scalpels and paintbrushes) and genres (portraiture, *retablo*, self-portraiture) in the history of art, and by situating the work in relation to Kahlo's other medical paintings and to the gender politics of the time, it is evident that her painting was not simply a form of 'art therapy' or a straightforward portrait of a surgeon or personal experience. Rather, it was the product of an innovative artist who was creating a new visual language to represent surgeons and the experience of surgery in mid-twentieth century Mexico, and who was, simultaneously, changing the face of modern art.

EMPATHETIC HANDS: SURGERY IN CHRISTINA LAMMER'S CONTEMPORARY ARTWORKS

In 2013, Christina Lammer described the relationship between artistic creativity and surgery in her analysis of her film series *Hand Movies* (2012), a trilogy of five-minute films that show artfully edited up-close footage of surgeons' hands performing operations:

There are parallels between artistic creativity—an aesthetic activity that restores the living body of another person a value, based on a particular cultural

setting—and the field of plastic surgery. Almost like a sculptor, the surgeon approaches the other and his or her mental images and revises the reality by penetrating into it. It is the equivalent of the camera operator, as Walter Benjamin notes in his studies of art sociology: ‘The attitude of the magician who heals the sick by laying on of hands is different from that of the surgeon who performs an intervention in the patient’s body.’ According to Benjamin, the relation of the magician to the surgeon is the same as the painter to the cameraman. ‘The painter maintains in his work a natural distance to reality, whereas the camera operator penetrates deeply into the fabric of reality ... That of the painter is whole, that of the cameraman is in many ways fragmented, and its parts combine themselves following a new law’.³⁷

Benjamin is an apt reference for Lammer who, by describing herself a ‘camerawoman and ethnographer,’ links her approach to Benjamin’s cameraman/surgeon: she intervenes in the surgical performance by her parallel practice of cutting and creating films.³⁸ Lammer’s artworks encompass videos of surgeries and interviews with medical specialists and patients, among other medically-themed investigations. Her videos are exhibited on their own or in thematic series, often accompanied by texts and objects, and discussed in detail in her publications. Lammer is a trained sociologist and integrates ethnographic research in her ‘experimental visual and sensory ethnography’.³⁹ Lammer occupies a dual role as artist and academic: her artworks are included in international art exhibitions and she writes for academic publications. Her analysis of her methods explores this identity: ‘I never stopped seeing myself as a sociologist working with a video camera. Instead, I started to think like an artist’.⁴⁰

As the camera-operator, Lammer’s artistic identity is linked to the surgeons she films and analyses. Surgery and film editing share the verb ‘cut’ and Lammer is conscious of the parallels. ‘In fact, my way of videoing and later editing is similar to the surgical approach in some respects’, she writes in relation to *Hand Movies*. ‘The artistic work is generated later, in the course of cutting the video material and experimenting with light and dark’.⁴¹ Lammer used her camera, the medium of film, and editing procedures to frame her narratives of surgical hands in action in *Hand Movies*. Her own hand movements perform during the surgery through the act of handling the camera to film the operation, mirroring the hands of the plastic surgeon whose actions are caught by her camera. Lammer adjusted, added, and removed elements of the film until she reached a point where she was aesthetically and intellectually content with the finished result. Through cuts and light adjustments, Lammer’s own hand is further integrated into this collaborative project.

In *Hand Movies*, Lammer explores drawing in surgical practice, especially how drawing and cutting into the body are similar. Many surgeons draw on the body before and during surgery before cutting. Drawn lines foreshadow the impending cut as the scalpel will follow the line when surgery begins. The link between drawing, as an art form, and surgery is fitting in the case of

plastic surgery—a specialty infused with aesthetic concerns because it requires restoring bodies to their ‘normal’ states or altering them into more ‘perfect’ ones. By highlighting the importance of drawing in surgical procedures, Lammer demonstrates that surgery is not only high-tech but requires skill in the age-old art of drawing.⁴² This trope has been taken up by other contemporary artists, such as Jenny Saville, whose large oil painting *Plan* (1993) shows a naked woman whose body has been drawn upon to show the areas that will undergo liposuction. In Saville’s work, the ‘drawn’ lines of paint over the heavily-worked painted surface also point to the similarities between the artist’s drawing and the surgeon’s cut.

Lammer’s films merge artistic and surgical practice by bringing artistic references into contact with contemporary surgery. For example, *Hand Movies* is indebted to Yvonne Rainer’s 1966 film, shot when the dancer/choreographer was confined to her hospital bed after surgery. Filmed by fellow dancer William Davis, the movie shows Rainer’s hands stretching and contracting against a grey background to enact a dance of sorts. Lammer’s *Hand Movies* invoke Rainer’s minimalist choreography and her ability to display the expressive potential of hands and gestures. As Lisa Cartwright explains, ‘The hand of the surgeon is not simply a precision tool for getting things right mechanically. It is also an empathetic and creative extension of the feeling—the hand of the surgeon feels for the body of the patient’.⁴³ Cartwright’s and Lammer’s conceptualisations of the surgeon’s touch as empathetic differ from many nineteenth- and twentieth-century accounts that valorised surgical detachment. They conceive, and construct, the surgeon and surgery as compassionate; the representation of a hygienic surgical scene here is a sign of personalised attention and care, not a symbol of emotional distance as it was in most earlier artworks. Unlike Gervex’s and Kahlo’s paintings that stress the individuality of surgeons, Lammer presents surgery as a collaborative practice by filming the interplay between the multiple gloved hands that anticipate one another’s movements as they share instruments, open cavities, suction fluids, and penetrate flesh during an operation. Cartwright argues that Lammer’s work explores the intersubjectivity of surgical practice as various bodies (surgeons, nurses, assistants, etc.) work together in a highly coordinated manner that exhibits the intimacy and kindness of surgery.⁴⁴ Lammer’s project is not simply a documentary recording of the changes in open surgery over the past decades (such as the move towards minimally invasive operations and the changing nature of teamwork in operating theatres in contrast to the solitary surgeon-operator of the nineteenth century): its main motivation is to show the emotive and relational qualities of surgery.

Lammer’s current work-in-progress, *Matters of the Heart*, stems from her ‘artistic research’ project *Performing Surgery*.⁴⁵ It consists of short films (16 mm projections) of different types of surgery, including one showing the gloved hands of surgeons performing heart surgery, which will be shown on a loop alongside wire objects (Fig. 4). The film moves chronologically through

an operation: the chest is covered with a plastic film, the surgeon makes an incision through the chest and uses a saw to cut through the breast bone, the heart is exposed, operated upon, and then the body is stapled and stitched back together. The movements of the surgeon's scalpel-wielding hands are smooth and precise—one is mesmerised by the graceful choreography of surgery until the film's cut reminds us of the artist's presence. The movie's subtle lighting, grey colour contrasts, and close-up framing display Lammer's expert hand-eye coordination: she holds the camera still, moving back and forth between the artistic and practical demands of the camerawoman/ethnographer. In this film, the cut, or stopping, of the camera filming is somewhat more jarring than the surgical cuts, which look smooth and precise. Lammer explains that all editing for this film was done 'in the camera' while watching the surgery as this was part of the work's concept: 'I like to capture the situation and the feeling of 'being there' ... [I] do not like the manipulations/operations in the editing room. Also in terms of the material body of the film—I do not use the knife, only the imaginary one.'⁴⁶ By stopping the film rather than cutting it, Lammer positions her practice as an empathetic one.

The film's lack of sound encourages a sense of seamless calm and presents the surgical acts as soft and delicate. Lammer plays with elements of time and duration by moving back and forth from longer three to nine second intervals of filming to segments that are interrupted by cuts/stops. This mirrors the acts of surgeons whose procedures also shift between fast and slow motions, and whose actions fluctuate between the violence of the cut (and the detachment evoked by medical technologies and metal tools) and the compassionate probing of a surgeon's gloved hand and reparative stitch. The empathetic touch of the surgeons' hands is evident when a surgeon's hand slips under the patient's heart and holds it gently. Symbolically and metaphorically, this image suggests the god-like status of surgeons who hold their patient's life in their hands, yet there is also a sense of vulnerability for both surgeon and patient who hope that the operation is successful. Lammer's movie, like the surgeons' work, moves between objectivity and subjectivity, detachment and empathy, cut and connection. It evokes these themes and feelings through the framing and editing of the film, which create a continuous surgical narrative that starts with an incision and ends with a stitch.

My analysis of Lammer's work uses the artist's own interpretation as a starting point to show how many artists not only think about what their works depict but are equally concerned with the signification of materials, narratives, methods, themes, and subject matter. For Lammer, the materiality of the film and the process of filming and editing were symbolically tied to surgical procedures (even though the act of cutting was never depicted, it was signified by the film's edits); Lammer's artistic acts mirror a surgical performance and vice versa. While her explanations point to one meaning of her art, they also evince some of the long-standing traditions of art with surgical themes, such as: the crucial symbolic role played by the representation

of skilled hands; the fascination with and fear of the surgical cut; and the visualisation of the parallel practices of artists and surgeons. While Gervex's, Kahlo's, and Lammer's artworks are visually and, for Lammer, materially, very different from one another, they are also very similar: they all demonstrate how artists have strived to represent the surgeons and surgical practices of their own historical periods while also experimenting with, and promoting, their own artistic practice.

CONCLUSION

Art historical methods examine the history of surgery in a different light than other historical perspectives as they are concerned not only with the histories of surgical techniques but also with how such practices were, and continue to be, visualised in art. Art historians approach artworks as historical evidence of a culture's understandings of surgery and surgeons—including their associated anxieties, beliefs, and fantasies. Surgery and surgical identities have long fascinated artists who 'dissect' humanity and put it back together in the form of the 'body' of an artwork. Surgeons' interest in art at both personal and professional levels also continues, as evidenced by the integration of drawing classes into surgical training at some medical schools and hospitals, as well as the continued commissioning of portraits of leading surgeons. Although surgery and art are increasingly incorporating new visual and haptic technologies, the hand of the artist or surgeon remains a key symbol of identity and expertise. Patients want the hands of specific surgeons to perform on their bodies while the mark of certain artists' hands can ensure a place in history and higher prices for their work. Although individual identities are removed from Lammer's videos and are highlighted in the medical portraits by Gervex and Kahlo, in all three cases, the artists symbolically enacted the role of surgeon, 'performing' it to different extents and to different ends.

Artworks with surgical themes can show us how the visualisation of surgery in art has changed over time, yet they also demonstrate how some of our understandings of surgery and surgeons have remained the same. The gloved fingers of the surgeons performing intricate tasks with cutting-edge tools in Lammer's movies show the great technical feats of contemporary open surgery, particularly in contrast to the relatively unhygienic (by present standards) atmosphere of Péan's 1887 surgical theatre, yet Lammer's works' emphasis on empathy also evinces how we are still coming to terms with surgeons' intervention into the body, as well as the dual nature of surgery—as a pain-causing set of procedures intended to cure, as was investigated by Kahlo. Art has helped create and conserve surgical identities and inventions, as well as personal homages and explorations of subjectivity. Yet it also makes us aware of our own subjectivity and vulnerability when under the knife. While there are similarities among artworks with surgical themes, art, in its infinite variations and possibilities, has the ability to address all aspects of surgery—from the global grandeur of its advancements to the intimate suffering

evoked by its failures. As surgery and human experiences of it continue to change, so too will art.

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Surgery and Emotion: The Era Before Anaesthesia

Michael Brown

INTRODUCTION

In July 1824 an anonymous correspondent wrote to the recently established reform-minded medical journal, *The Lancet*, to express his concern about the manner in which operations were being conducted at the London hospitals of Guy's and St Thomas'. 'When the fiat of an hospital surgeon has determined a patient to an operation', he began, 'the space of time from that moment to the moment of his conveyance to the theatre must be a time of increasing anxiety and distress'. This period, he acknowledged, could vary from a few hours to a few days and was often requested by the patient themselves, but whatever was the case, it was the duty of the surgeon to 'make this anxious interval as short as possible'. Yet if the period of waiting was fraught, then it was as nothing compared to what took place when the patient was finally brought into the operating theatre:

Feverishly heated, and frequently very much exhausted by his previous sufferings, every additional moment, at this dreadful crisis, becomes to him an hour, and every additional moment that he continues under the torture of the different instruments, diminishes the chance of success and ... increases the danger of his life.

With this in mind, the correspondent was pained to recall a recent operation he had witnessed for the removal of a stone from the bladder of a young boy.

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Despite having already inspected the child, or so the correspondent assumed, the surgeon chose this ‘dreadful moment’ to re-examine him, inserting a metal sound through his urethra and into his bladder. ‘Unfortunately he could not feel the stone, till after trying in all directions, and putting the boy in excruciating pain for several minutes, he, at last, satisfied himself and gave the instrument into the hand of another surgeon, for further testimony’. This surgeon likewise had great difficulty in locating the calculus and so handed the sound to a third colleague. According to the correspondent:

These examinations occupied a full twenty minutes, during the whole of which time the boy continued screaming and was nearly exhausted before the operation commenced ... Now a great part of this painful process might be, or ought to be avoided. It is woeful to the patient, it is disgraceful to the surgeon ...

This letter was only one of a number of accounts of botched and bungled operations to appear in *The Lancet* in the first three decades of its existence and it paints a vivid picture of the potential terrors of pre-anaesthetic surgery. It suggests that the successful prosecution of surgery in this period was dependent upon a carefully calibrated performance designed not simply to reduce the pain and suffering of the patient but also to manage their psychological correlates, fear and anxiety. What is also remarkable about it is the emotive register of the language employed. The correspondent not only expresses deep regret at the agonies of the boy but, by imagining himself into the patient’s position, appears to affect a profoundly intersubjective emotional engagement; ‘the operation ... was tedious’, he states, ‘and the effect of the whole upon my mind was distressing—What must it have been to the young sufferer?’¹

This chapter explores the place of emotion in the practice and representation of surgery in the first half of the nineteenth century, with a particular focus on the UK.

The historical study of the emotions is a burgeoning field, but to date it has made relatively little impact on the historiography of surgery. This is somewhat peculiar because surgery represents one of the most profoundly challenging emotional, psychological and physiological experiences that, as a patient, it is possible to undergo. Becoming an object of surgical expertise and subject to direct physical intervention can produce intense feelings of fear and anxiety, even in an age of anaesthesia and keyhole surgery. Likewise, the feelings of joy and relief at a successful operation can be as subjectively powerful today as they were for Samuel Pepys when he had his bladder stone removed in 1658.² Moreover, there is every reason to believe that emotion, or the supposed mitigation of it, has been, and continues to be, central to the construction of surgical professional identity. In 2013, for example, an Australian study found that surgeons tended to adopt a ‘heroic’ mode which focused on ‘fixing’ problems and established an emotional distance between themselves and their patients.³ By contrast, the personal testimonies of

surgeons, such as that of the neurosurgeon Henry Marsh, often talk of the influence of a range of emotions from pity and regret to elation and pride.⁴

These issues are therefore as relevant to the post-anaesthetic period as they are to that which preceded the introduction of ether and chloroform in the 1840s. Nevertheless, there is something about the early nineteenth century that makes it particularly suitable for a study of the emotional cultures of surgery. In relative terms, of course, surgical operations in this period were nowhere near as ambitious as those of the later 1800s, let alone those of today. In the absence, not only of effective pain relief to manage shock, but also of adequate measures to stem blood loss or the ability to control post-operative infection, surgeons were generally unwilling or unable to intrude into the body's three main cavities of abdomen, thorax and cranium.⁵ Even so, the mere thought of having a leg amputated without any kind of anaesthetic, let alone submitting to a protracted lithotomy, such as the boy referred to above had to endure, is liable to make the modern reader flinch in sympathy. Moreover, the historical record abounds with accounts of surgical procedures that give full expression to the reality of suffering. Of these perhaps the most famous is Frances Burney's mastectomy, performed in 1811 during her time in France. Burney was attended by an unusually large team of practitioners, including two of the leading surgeons of the day, Dominique Jean Larrey, surgeon-in-chief to the Imperial army, and Antoine Dubois, consultant surgeon to Napoleon himself. She was deeply apprehensive about the procedure, confiding to her sister Esther that the 'dread and repugnance, from a thousand reasons *besides* the pain almost shook all my faculties'.⁶ She had every reason to be fearful; Dubois had told her that she must expect to suffer very severely, and so she did:

Yet—when the dreadful steel was plunged into the breast—cutting through veins, arteries—flesh—nerves—I needed no injunctions not to restrain my cries. I began a scream that lasted unremittingly during the whole time of the incision—and I almost marvel that it rings not in my Ears still! so excruciating was the agony.⁷

Burney fainted twice during the operation but she was lucky; she survived and went on to live for another twenty-nine years. Her testimony provides a profound insight into the pain and mental anguish experienced by surgical patients in this period. But what is less well known about this account is the light it sheds upon the emotional dispositions of the operators themselves. It is revealing that men of deep experience such as Larrey and Dubois, men who were used to witnessing the sufferings of the battlefield, were profoundly moved by Burney's situation. Larrey reportedly 'had tears in his Eyes' on contemplating the procedure, while Dubois found himself unable to speak when Burney asked whether 'he could feel for an operation that, to *You*, must seem so trivial'.⁸ In fact, so powerful were the surgeons' emotions that, during the operation itself, Burney spoke only to assure them how much she



Fig. 1 Thomas Rowlandson, 'Amputation' (1793), Wellcome Library, London

pitied them, 'for indeed I was sensible to the feeling concern with which they all saw what I endured'.⁹

This image of the emotionally attuned and expressive surgeon contrasts markedly with much of the received wisdom on surgical identity in the pre-modern era. Surgeons are, for the most part, thought of as coolly dispassionate, and those of the past as brusque or even cruel. Satirical representations, such as Thomas Rowlandson's 'Amputation' of 1793 (Fig. 1) sustain this impression, as do the statements of subsequent surgical generations who often had an active interest in presenting the past as grossly inferior to the present.¹⁰ So too, for that matter, does the historical scholarship. One of the few works to explore the relationship between surgery and emotion in the Early Modern period is Lynda Payne's *With Words and Knives: Learning Medical Dispassion in Early Modern England* (2007), although her book is more of an intellectual history of surgery and anatomy than a history of the emotions per se. The very first sentence of her book makes clear the assumption which underpins its central premise. 'In practice', she states, 'physicians, and especially surgeons, have always had to learn some type of detachment (or dispassion to use the Early Modern term) in order to cope with the more revolting aspects of their art'.¹¹ This presumption of a kind of emotional ahistoricity notwithstanding, Payne presents a convincing argument that the seventeenth and eighteenth centuries saw the elaboration of a culture of surgical dispassion rooted

in anatomical observation, Epicurean restraint, religious stoicism and bodily self-discipline. Her study culminates with the example of the great eighteenth-century surgeon-anatomist brothers William and John Hunter. The former famously told his students that anatomy not only ‘informs the *head*’ and ‘gives dexterity to the *hand*’ but also ‘familiarizes the *heart* with a sort of necessary inhumanity, the use of cutting instruments upon our fellow creatures’.¹² Occasionally this state of dispassion, which Payne takes as indicative of a much wider mind-set, could shade over into a caricature of the surgeon as unfeeling brute. In William Blake’s *Island in the Moon* (1784), for example, the surgical character Jack Tearguts (a thinly veiled satire of John Hunter) is described thus: ‘he does not mind their crying—tho they cry ever so [-] he’ll Swear at them & keep them down with his fist & tell [them] that he’ll scrape their bones if they don’t lay still & be quiet’.¹³

This model of the surgeon as rough, physical and relatively insensitive to pain and suffering has also been applied to the nineteenth century. In his essay ‘Medical Minds, Surgical Bodies: Corporeality and the Doctors’ (1998), for example, Chris Lawrence acknowledges the rising status of surgery during the century but maintains that surgeons hardly escaped their established associations with the butcher’s trade. Quite the contrary, in fact; he suggests that surgeons built upon these associations to shape identities that were in keeping with contemporary social values: ‘it was the sorts of qualities embodied in the butcher, a capacity for physical endurance, solidity, and honesty—that were highly prized in the Victorian cult of manliness’.¹⁴

Between Payne’s eighteenth-century stoics and Lawrence’s rough-and-ready men of action, however, we have something of a lacuna. To employ a somewhat arbitrary institutional benchmark, the years between the creation of the Royal College of Surgeons of London in 1800 and the granting of a second Royal Charter to extend the College’s authority to the whole of England in 1843 were pivotal to the social and professional establishment of English (and, more broadly, UK) surgery and yet they remain relatively understudied. One of the few books to cover this period is Peter Stanley’s *For Fear of Pain: British Surgery, 1790–1850* (2003). As well as providing a broad overview of surgical practice in this period Stanley also points the way to a more embodied and emotionally nuanced history. Thus, while acknowledging that ‘clinical accounts rarely describe or explicitly reflect surgeons’ reactions to or feelings about their work’, Stanley does not simply assume that stoicism or dispassion were the order of the day.¹⁵ Rather, he cites numerous examples of operators expressing fear, anxiety, dread, pity and sympathy, particularly where vulnerable patients such as children were concerned.¹⁶ He also provides a number of cases where patients expressed their feelings about the prospect of an operation or reflected on the outcome of one.¹⁷

Similar insights have also been provided by the literature on pain and anaesthesia. In 1985 Martin S. Pernick challenged the widespread popular perception that anaesthesia brought about a sudden, near miraculous, end to hundreds of years of agonising surgery, demonstrating instead how the

volatility and unpredictability of early anaesthetics, as well as the continued resonance of pain as an indicator of sensibility, meant that many practitioners were extremely cautious about how, and with whom, they employed them.¹⁸ As he also demonstrates, understandings of pain were shaped by a complex 'social politics' of class, race and gender, something which has also been borne out by Stephanie Snow in her study of anaesthesia in the UK.¹⁹ More recently still, in her broad account of the history of pain, Joanna Bourke acknowledges the traditional image of pre-modern medicine as cruel or uncaring before suggesting that sympathy might actually have played a more important social and rhetorical function than has generally been recognised.²⁰

Bourke's work offers suggestive avenues for further study and is part of a growing literature on the history of the emotions. To date, much of this literature has been theoretical and abstract as scholars continue to debate terms and concepts; there has been relatively little application of these methodologies to specific historical case studies. Historians of emotion have sought to chart a difficult path between an essentialist model of emotions grounded in psychology, which maintains that emotional responses are neurologically hard-wired, and an anthropological reading which would suggest that the experience of emotion is culturally and historically relative. Historians have likewise grappled with the thorny issue of whether we can truly access and interpret the phenomenology of emotions, that is their felt experience, or whether we must restrict ourselves to the expression of emotions, that is emotional discourse and the discourse of emotions.²¹ Two of the earliest pioneers of the history of the emotions, Carol and Peter Stearns, were inclined towards the latter view, coining the term 'emotionology' to distinguish the prevailing emotional standards of the day (which are historically recoverable) from the lived experience of emotion (which is not).²² Another notable contribution to the terminology of the field comes from Barbara Rosenwein, who introduced the concept of 'emotional communities' as a way of thinking about how emotions are shared, sustained and policed within specific social groups.²³ Rosenwein is also helpfully critical of what she calls the 'hydraulic model' of emotions, a linear historical concept promoted by Norbert Elias' *Civilising Process* (trans 1969) which assumes that, over time, societies learn to 'control' themselves more effectively.²⁴ Of equal value to historians is the work of William Reddy. Reddy's signal achievement is the concept of 'emotives', which reconciles the psychological/anthropological divide by suggesting that emotions share certain essential qualities but that their meanings and expression (particularly verbal 'utterances') are historically relative and, more than this, serve to shape experience and social relations. He is also responsible for the concept of 'emotional regimes', similar in many ways to Rosenwein's 'emotional communities', albeit perhaps more restrictive and oppressive, requiring 'emotional navigation' and occasionally productive of 'emotional suffering'.²⁵

Whatever one thinks of the utility of Reddy's concept of emotional regimes there can be no doubt that his work has done much to emphasise the politics of emotion, particularly in relation to his given case study of the

French Revolution. Such an approach is potentially fruitful for enhancing our understanding of the history of surgery. Bourke's argument about the neglected place of sympathy in medicine is well-observed but, as is perhaps inevitable with such a synoptic account, she does not provide much by way of explanation or analysis as to the roots of this culture of sympathy, how it developed or, without wanting to be too instrumentalist, what political functions it served. In this chapter I therefore want to offer some tentative suggestions in this general direction. Specifically, I want to suggest that, shaped by the cultures of Enlightenment sensibility, early nineteenth-century surgeons, who were increasingly turning their backs on the heroic surgery of the preceding era, reframed the notion of what it was to be a good surgeon, combining, if not necessarily displacing, the physical model of the 'capital operator' with the moral ideal of the man of feeling who could not simply amputate a limb in under a minute, but who, in the most profound sense, was capable of sympathising with his patients and who sought at all times to minimise their pain and suffering. Needless to say, this transformation in identities and practices had a complex set of origins, but it was a profoundly political process. The later decades of the eighteenth and early decades of the nineteenth century were a period in which British surgery came to fruition as a self-consciously scientific discipline. In 1800, the Company of Surgeons had become the Royal College of Surgeons and surgical practitioners were looking to the legacy of men like John Hunter in order to present themselves as informed, considered and capable performers.²⁶ Indeed, so successful was this process of refashioning that, by the middle of the nineteenth century, surgery had arguably overtaken medicine in terms of reputation and prestige. At one level then, this emphasis upon physical restraint and emotional sophistication allowed surgeons to challenge the conventional stereotype of the ill-mannered and ignorant sawbones with a more culturally resonant ideal. At another level, however, it also played a more antagonistic political function. As with the rest of the British medical world, early nineteenth-century surgery was split by an emergent movement for reform in which politically radical and professionally marginal surgeon-apothecaries sought to challenge the hegemonic authority of the metropolitan hospital and corporate elites. As we shall see, within this context, the pain and suffering of patients could, when presented as the corollary of incompetence and corruption, form a powerful critique of a nepotistic and monopolistic surgical oligarchy.

SURGICAL PERFORMANCE: ART AND ARTIFICE

Surgery had long been regarded as an art that required considerable manual dexterity. Unfortunately, contemporary sources are rarely as clear or as detailed as they might be on the embodied skills deemed necessary for the practice of operative surgery, as these skills were generally inculcated through other, more praxial, forms of education. Nevertheless, nineteenth-century textbooks would often offer advice as to the correct way of handling the knife

and of making basic incisions as well as on procedures such as suturing. It was generally accepted that practice with the knife was essential but that practice alone could never make perfect. As one correspondent to *The Lancet* put it, the public, thinking surgery a

mere mechanical operation ... conclude that frequent practice, with a proper knowledge of anatomy, must make them perfect performers but this is not the case; daily practice upon a musical instrument will never make some people good players ... nor will [surgical practice] make a good operator of the man who has neither the eye ... nor the dexterity of finger which are the necessary prerequisites for such a performer.²⁷

For medical students, practice was usually undertaken upon cadavers so that the operator might at least familiarise himself with the anatomy of the body and the physical resistance provided by flesh and bone. However, all agreed that, no matter how many bodies one cut up, it was never enough to prepare one for the experience of a living, breathing, writhing patient and, as opportunities to perform actual operations, especially capital procedures such as amputations or lithotomies, were relatively limited, it was possible for a student to qualify as a surgeon without ever having done so. He might have participated in numerous such operations as an assistant or 'dresser', but it is unlikely that he would have taken charge of such a procedure himself.

In her ethnographic study of contemporary American surgical education, Rachel Prentice states that 'Surgeons must teach both skills and meaning'. Most of the surgeons she worked with spoke of technical skill as constituting a mere 20% of surgical education, 'falling lower in importance than difficult-to-quantify qualities of wisdom, judgement and experience'.²⁸ Such was also case for the nineteenth century. Indeed, confronted by the prospect of a sentient patient in extraordinary pain, such considerations were arguably even more important. Surgical lecturers often found that, if the skills of the hand could at least be taught, then those of the mind and nerves were not so easily imparted. Addressing his students in 1823, the foremost surgical operator of the day, Sir Astley Cooper, claimed that 'the quality which is considered of the highest order in surgical operations, is self-possession; the head must always direct the hand, otherwise the operator is unfit to discover an effectual remedy for unforeseen accidents that may occur in his practice'.²⁹ Over thirty years later, Frederic Skey's advice was similar: 'He should possess great firmness of purpose ... to be acquired only by previous thought and preparation, and a self-possession which no accident, however unlooked for, can disturb or alienate'.³⁰ In theory, then, self-confidence and self-possession were the natural consequence of thorough study and training. But for an inexperienced practitioner, the prospect of major surgery could be a deeply intimidating one, not least when even senior practitioners admitted to anxiety in advance of a procedure or showed themselves to be less than assured during one.

The stakes were especially high for the fact that early nineteenth-century surgery could be a highly public spectacle. Certainly a large number of

operations, probably more than we generally recognise, were undertaken in private residences, but at most hospitals, especially the large London teaching hospitals and, as the century wore on, in many smaller provincial hospitals too, operations were undertaken in front of sometimes large audiences of students and practitioners. In such an arena the surgeon's every gesture could be subject to intense scrutiny. Generally, the exquisite repertoire of surgical performance demanded focused precision. Surgeons were actively discouraged from talking to their assistants unless strictly necessary. Any dressers or others present around the operating table should be briefed in advance and their actions in theatre directed with nothing more conspicuous than a discreet glance or motion of the hand. Surgeons were similarly discouraged from addressing the audience or offering instruction. Needless to say, the absolute worst thing one could do was panic. Many did, however, especially when confronted by every surgeon's worst nightmare, haemorrhage.³¹ The discharge of great quantities of blood from a patient was liable to test the nerves of even the most capable practitioner. This was especially true if the bleeding was of an indeterminate origin, the surgeon desperately struggling to find the source of the haemorrhage as the patient turned pale and their pulse began to weaken. In the early 1820s, therefore, Cooper's students were regaled with a cautionary tale in which an inexperienced young dresser persuaded a member of staff at Guy's Hospital to allow him to amputate his leg so that he might gain the necessary experience. Rather than the Hospital's theatre, however, the operation took place surreptitiously in the student's own residence and, on initiating his incision, he was met with 'a great discharge of blood'. "Screw the tourniquet tighter", he urged his assistant but, in so doing, the screw broke and, losing 'all presence of mind ... he jumped about the room, then ran to the sufferer and endeavoured to stop the effusion of blood by compressing the wound with his hand; his sleeve became filled with blood and [the] poor [patient] would have died ... had not a pupil ... had the presence of mind to apply the key of the door to the femoral artery'.³²

However, while physical performance and operative dexterity remained important, the first half of the nineteenth century saw an increasing scepticism directed toward the idea that it constituted the sole, or even the primary component of a surgeon's identity. In articles, lectures and textbooks, surgeons repeatedly cautioned against being seduced by the knife. In part this scepticism entailed a distrust of performance itself, a sense that bravura display might conceal as much as it revealed. This is what James Wardrop had to say to his students at the Aldersgate Street medical school in the early 1830s:

Some of you may have heard of instances where surgeons, in other respects deservedly eminent, forgetting the duties of civilized life, have attempted a kind of theatrical effect in performing operations, for no other purpose than to give bystanders a false impression of their dexterity, coolness, and presence of mind ... that affectation of dexterity, or doing operations quickly, is but a pitiful ambition in those who use it ... but you will invariably observe that none except

those who are deficient in moral courage ... find it necessary to resort to such conduct; and that a man who feels himself equal to the task he undertakes proceeds deliberately and calmly, steadily bearing in mind the grand object—relief to the patient.³³

More generally, this scepticism derived from a set of broader intellectual trends that combined to bring about the decline of the heroic age of operative surgery and usher in a new era of relative procedural conservatism.³⁴ One of these trends, and one that received much notice from contemporary surgical lecturers apt to conceive of the history of their speciality in teleological terms, was the advances in surgical science that had characterised the latter decades of the eighteenth century. Numerous lecturers claimed that surgeons of an earlier generation were likely to cut precisely because they were ignorant of the body's true forms and functions. However, because of the pioneering work of John Hunter, a man hardly noted for his operative skill, surgeons were now more knowledgeable and, hence, more cautious, or so they argued. Similarly, as in certain quarters of the medical world where the Parisian clinical revolution of the turn of the century had engendered a certain therapeutic nihilism, many early nineteenth-century surgeons seemed equally loath to intervene and inclined to trust to the curative powers of nature.

EMOTION AND INTERSUBJECTIVITY

Just as importantly, however, these early nineteenth-century surgical texts are also suggestive of a deeper cultural and emotional transformation. In the lectures of men like Wardrop, neophyte surgeons were encouraged almost to resent the knife and to place selfless compassion for the patient above any consideration of personal interest. 'It is difficult perhaps to be explained', he claimed, 'but it is not on that account the less true that some individuals seem absolutely to have a predilection for performing surgical operations: whereas we should naturally suppose that nothing would be more repulsive to our nature than the infliction of pain on our fellow beings'. Quoting John Bell, a man to whom we shall return, he maintained that 'Those qualities which relate to operations and other public exhibitions of skill are of a very doubtful kind, *while the duties of humanity and diligence are far more to be prized*'.³⁵

The ideal surgeon of the early nineteenth century was, therefore, to be a man of feeling, a man who, because of what Frederic Skey acknowledged to be the 'grand' yet 'terrible' power they possessed, should be capable of the most profound emotional transportation: 'A man is disqualified [from the duties of surgery]', Skey explained to his readers, 'who cannot divest his mind of the sense of all personal advantage accruing to him from the performance of an operation, who cannot *in imagination* place himself in the position of the patient, and reflect on the case in all its bearings and calculate the result as though his own personal health were directly involved'.³⁶

The essential tension of surgical decision making, to cut or not to cut, was summed up thus by Astley Cooper earlier in the century:

Sorry indeed should I be, to sport with the life of a fellow-creature who might repose a confidence either in my surgical knowledge or in my humanity; and I should be equally disposed to consider myself culpable, if I did not make every possible effort to save a person whose death was rendered inevitable, if a disease were suffered to continue which it was possible for surgery to relieve ... In the performance of our duty one feeling should direct us; the case we should consider as our own and we should ask ourselves, whether, placed under similar circumstances, we should submit to the pain and danger we are about to inflict.³⁷

When one is alert to its presence, it is remarkable quite how prominent this mode of emotional intersubjectivity was within the cultures of early nineteenth-century operative surgery. It does not form whole chapters of surgical textbooks, though occasionally lecturers such as Wardrop or authors like Skey might make such moral considerations the subject of their preliminary remarks. In general, however, it is widely diffused among case reports, letters and articles, a sentence here or a phrase there which, when taken together as a discursive collage, is suggestive of something much more pervasive and important.

There are a number of reasons why the early nineteenth century provided a particularly fruitful ground for the development of a discourse of surgical compassion. In addition to the factors to which I have already alluded, namely an increasingly conservative approach to surgical intervention, the early nineteenth century also saw the continued development of a culture of sentiment, sympathy and sensibility whose origins lay in the Enlightenment work of John Locke, David Hume and Adam Smith and through which the capacity to feel the pain of others and to moderate our actions accordingly became perhaps the highest expression of human nature.³⁸ In addition, while the development of anaesthesia in the 1840s and 1850s tended to diminish the patient's presence, making them a relatively passive object of surgical technique the early nineteenth-century patient exerted a very vocal and physical agency which needed to be both managed and harnessed. Within this context, a certain emotional sensibility was essential to gauge the state of mind of the patient in advance of an operation. In his lectures, for example, James Wardrop advised against operating on persons of nervous temperament unless strictly necessary. This was especially important, he suggested, because the mind could exercise such a profound influence over the body that any amount of 'moral depression' could cause a patient to sink and die even after relatively minor surgery. In general, he suggested, it was important to ascertain whether the patient's fear derived 'from the dread of the temporary pain of the operation' or whether they were convinced that the operation itself would kill them. The former, he maintained, could be managed, while the latter was invariably a self-fulfilling prophecy.³⁹

Such considerations were so vital to the successful outcome of an operation that they served to structure the most precise of details. Like Sir Astley Cooper and numerous other contemporary surgeons, Wardrop advised that any instruments necessary for an operation should be covered over until the surgeon was ready to proceed. Likewise, there was ‘nothing the surgeon should so much avoid, as by his dress, to impress [the patient] with an idea that the operation will be attended by much bloodshed’.⁴⁰ A dark set of trousers and a shirt were infinitely preferable to a full-length apron.

In its highest form, this emotional and psychological intersubjectivity did not simply require a surgeon to be compassionate or considerate: it demanded the exercise of a profound moral authority over one’s patients. As Benjamin Brodie told his audience in Windmill Street in the 1820s:

You must ever recollect, Gentlemen, that those beings on whom you are destined to practise are endowed with a percipient, thinking mind, and that that mind will become in the highest degree irritable from a variety of causes such as long confinement, sleepless nights, painful days; now it will prove greatly to your advantage and success if you should be capable of regulating your patient morally and well as physically. But it may be asked here, Who can regulate the minds of others, if they are incapable of commanding their own? and I therefore address to you the expressive words of the poet ... ‘Man, know thyself’ ... I do not hesitate to say that he who can look with indifference on the agonies of a fellow creature is not the person to practise surgery.⁴¹

What Brodie is advancing here is the idea that the moral authority of the surgeon had to derive from an emotional, intellectual and psychological self-mastery. In order to command his patient, the surgeon first needed to understand himself, including both his capacities and his limitations. Indeed, operators in this period were frequently cautioned not to overreach themselves in the quest for reputation but to operate with an informed and modest restraint. More importantly perhaps, he is suggesting that the ideal surgeon was a kind of emotional savant, a man so finely attuned to his own affective self that he was receptive to even the most subtle or complex emotional signs emitted by his patients and was able to exert a calming and reassuring influence through mere confidence and composure.

Brodie’s comments, and those of other surgeons, suggest that pre-anaesthetic surgery constituted a collaborative endeavour in which both patient and practitioner had to play an active and sustained part. In some cases the two forged an effective (and indeed affective) partnership in the most trying of circumstances. In January 1824, for example, Astley Cooper was called upon to perform one of the most challenging of all procedures, namely the amputation of the leg at the hip joint, on a forty-year-old man who was suffering serious complications from a previous amputation at the knee. The operation lasted twenty minutes and was beset with complications but nonetheless, ‘the patient bore the operation with extraordinary fortitude and after

all was finished he said to Sir Astley, “that was the hardest day’s work he had ever gone through”, to which Sir Astley replied “that it was almost the hardest he ever had”.⁴² In other cases, however, the patient’s physical and mental distress could further complicate the procedure, even to the extent of offering unconscious resistance to the will of the surgeon. Thus another amputation at the hip joint, this one undertaken at the Middlesex Hospital, was met with

some difficulty, in consequence of the extreme irritability of the stump ... and partly from the obstreperous conduct of the patient ... That fortitude which induced him to solicit an operation, and which supported him when placed on the table, forsook him in an instant, on the first touch of the knife. His motions, which were almost convulsive at this period, seriously endangered the fingers of the operator.⁴³

THE POLITICS OF PAIN AND THE REFORM OF EMOTIONS

There is a danger, of course, of advancing an overly essentialist or ontological reading of surgical emotion. After all, these expressions of feeling and sentiment were often rhetorical, contained in lectures or textbooks that sought to present an idealised image of surgical practice. This does not mean that we should restrict ourselves to an ‘emotionological’ reading of surgical history, however. It is entirely possible that surgeons of this period developed this complex emotional and psychological repertoire and there is no doubt that the cultures of sensibility and sentimentality had a profound effect on the felt experience of emotion. Nonetheless, what it does suggest is that we should consider the politics of the emotions in relation to surgery and to consider what role sympathy and sensibility played in the shaping of surgical culture and identity.

The origins of this particular transformation in surgical identities are complex and have yet to be fully elucidated. Nevertheless, one suggestive case study concerns John Bell and the cultures of medicine and surgery in turn-of-the-century Edinburgh. John Bell (1763–1820) is perhaps best known as the older brother of Charles Bell (1774–1842), the celebrated Scottish anatomist and physiologist.⁴⁴ However, John was also a noted surgeon, anatomist and author in his own right and in 1800 he became embroiled in a heated and protracted dispute with James Gregory (1753–1821), Professor of the Practice of Physic at Edinburgh University. James Gregory, who was born into Scottish medical aristocracy as the son of the celebrated John Gregory (1724–1823), had inherited positions at the University, first from this father and subsequently from William Cullen (1710–1790). It was perhaps the security provided by such privilege that gave Gregory the confidence to indulge in feuds with his colleagues, something which he did with apparent regularity. In 1800 he published a pamphlet entitled *Memorial to the Managers of the Royal Infirmary* in which he attacked the system by which the medical and surgical posts at the hospital were filled by a monthly rotation of mostly junior members of the college of physicians and

college of surgeons. Gregory's intervention effectively put an end to this practice and established a system of permanent appointments. In so doing, however, he earned the ire of Bell who, as the self-appointed spokesperson for the junior members of the Royal College of Surgeons, was not only upset about losing a personal privilege but who maintained that the whole structure of practical education for surgeons had been critically undermined.

So far, so parochial; but what is particularly interesting about the voluminous body of deeply ill-tempered scree that this dispute produced is the manner in which Bell outlined a strikingly novel defence of surgical character. Bell was particularly offended at Gregory's characterisation of junior surgeons as lacking experience and ability. 'He mocks at all dignity' he claimed, 'at all semblance of science, at all professional skill, faith, honesty, or honour; and we and our cruelties are his constant theme'.⁴⁵ Rejecting such egregious accusations, he alleged that:

To become skilled [as a surgeon], a man must live among the sick: he must have lively feelings, and a sympathizing nature; his mind and senses must be deeply impressed with the character of every kind of suffering; he must have that inward sympathy with the distresses of his fellow-creature[s], which fills the mind with sincere and affectionate interest ... In our profession, young men should have instilled into their minds that sympathy with the sufferings of their patient, and that keen spirit of investigation should be roused in them, which refines every sense, and quickens the intellect.⁴⁶

Such emotional sincerity, Bell alleged, was in contrast to Gregory himself, whose role as a physician insulated him from the affective intensity of the operating theatre:

Has his mind been thus keenly touched, almost disordered, at the miseries of his fellow creatures? No, no! his strong sensibilities we hold but lightly: He never passed a sleepless night, reflecting what was to be done on the morrow; never witnessed the severities of the surgeon; never strained hard his breath, nor involuntarily clenched his hands at the sight of another's agony; nor blanched with fear, nor felt the palpitations of anxiety, in the midst of an eventful operation?⁴⁷

What Bell is suggesting here was that surgeons were not merely avoiding unnecessary cruelty, they were in actual fact far superior to physicians in their capacity for emotional engagement. However, in making this claim, Bell was doing more than simply attaching surgery to a culturally resonant ideal, he was actively locating this particular dispute within a wider discourse of sensibility and its discontents.

By the latter decades of the eighteenth century, the culture of sentiment, which had formed a vital part of Enlightenment gentility, was being called into question by some who saw it as little more than a fashionable artifice, exposing the foppery and effeminacy of polite society.⁴⁸ Perhaps the most celebrated example of this is the Scottish author Henry Mackenzie's 1771 novel

The Man of Feeling which, a mere few years after its publication, was roundly mocked for its excessive lacrimation.⁴⁹ However, rather than devaluing sensibility per se, such debates suggested a distinction between artificial performance on the one hand and honest emotion on the other. Bell alluded on a number of occasions to Gregory's position in fashionable Edinburgh society and his inheritance of privilege and position. Asking what qualities defined men like Gregory, he responded:

suavity of manners, a specious carriage, an agreeable person, a pleasing address, a facetious conversation, a thorough knowledge of the politics and courtliness of high life. A splendid establishment, a gaudy carriage, family connections, and the solicitation of friends, [these] are [the] chief distinctions in [the physician's] profession.

He then proceeded to contrast such affectations with the plain, earnest sensibility of socially inferior surgeons like himself, stating:

We hope, for the credit of bare unsophisticated nature, that the honest and feeling heart, the thinking head, and the steady hand! the open liberal hand, which drops its alms while it is assuaging pain! is not more frequent in the gilded chariot, than in the humble walks of life; where men drag along the burden of their duties.⁵⁰

Within the context of turn-of-the-century Edinburgh, then, emotion and sympathy played a powerful political role in surgeon's claims to social and professional recognition in the face of opposition from establishment physicians like James Gregory. It should perhaps come as no surprise that it was Edinburgh that played host to one of the earliest articulations of this surgical ideal. As the erstwhile residence of David Hume and Adam Smith it was, after all, the spiritual and intellectual home of sensibility.⁵¹

Emotion and sympathy played a similarly political role in the movement for medical and surgical reform that characterised the 1820s, 1830s and 1840s. This chapter opened with a letter to *The Lancet* from 1824 and I suggested that there were many such reports of bungled operations reported in that journal in early decades of its existence. The author of this letter was clearly aware of the precedent that had already been established and opened by stating that:

As the principal object of the LANCET is to improve the medical and chirurgi- cal practice, and, of course, to ameliorate the condition, and to diminish the distress of the subjects of its operation; you may not, perhaps, think the following observations unworthy of insertion.⁵²

Perhaps the most famous of these cases involved the Guy's Hospital surgeon and nephew of Astley Cooper, Brandsby Cooper. In 1828, Cooper performed a lithotomy on a patient named Stephen Pollard. However, rather than the ten minutes that the operation should ideally have taken, Cooper actually took the best part of an hour. During that time Pollard, who later died,

experienced excruciating pain and Cooper appeared flustered, apparently incapable of locating the stone, calling on his attendants for assistance and repeatedly explaining himself to the audience. Indeed, in many ways Cooper's operation was a textbook example of how not to conduct oneself under such circumstances and *The Lancet* was merciless in its coverage, publishing an excoriating account of the operation as a dramatic tragedy in three acts. As a result of this, Cooper took *The Lancet's* editor and founder, Thomas Wakley, to court for libel, a case which he won, albeit with significantly reduced damages.⁵³

One of the most remarkable things about this case is the ways in which, during both the trial itself and in its coverage in *The Lancet*, Wakley presented the pain and suffering of Stephen Pollard as a function of Cooper's incompetence. Cooper, he alleged, was a perfectly pleasant and respectable gentleman but a manifestly imperfect surgeon who had attained his position at Guy's not through merit or hard work but through the nepotistic influence of his uncle. In defending his practice of publishing accounts of botched and incompetently performed operations, Wakley alleged that many of the arguments advanced against such reports 'consist, almost entirely of appeals to the passions, and pecuniary interests of the surgeon':

[A] young surgeon's professional prospects may be ruined, it is said, if his failures are blazoned forth to the public. All we have to say in answer to this objection is, that if a young man is elected to fill the office of surgeon to a public hospital, the public have a right to know in what manner he performs his duty.

He continued:

If it be taken as an appeal to our compassion, then we reply that there is a compassion due to patients as well as to surgeons, and that if the reputation or finances of the latter plead for suppression, the safety of the former calls imperiously for publicity.

Moreover, Wakley characterised the objections of what he called these 'Hole and Corner' surgeons as indicative of their callous indifference to the well-being of those under their care:

The suffering and destruction of the patient go for nothing, and it is only the mortification endured by the Surgeon, from the consciousness of his own ignorance which excites their sympathy and commiseration.⁵⁴

As with John Bell, then, Wakley and the London-based radical medical reformers of the 1820s and 1830s harnessed the ideals of sympathy and compassion as part of a powerful political critique of the corporate elites. However, unlike in the case of turn of the century Edinburgh where it was established physicians who were the objects of scorn, Wakley's targets were what he called surgical 'Bats'. Many of those exposed in *The Lancet's* accounts

were, like Cooper, identified as surgeons who owed their positions to patronage and influence rather than talent and ability. As such, the pain and suffering of the patients under their hands was not simply the result of individual incompetence, it was the inevitable product of a corrupt and tyrannical system predicated on nepotism and oligarchy. Only by thoroughgoing reform, it was alleged, reform which would place competent and compassionate surgeons in positions of public responsibility, could the sufferings of patients be alleviated and the safety of the public guaranteed. And it should come as no surprise if these competent and compassionate surgeons of the reforming imagination bore a remarkable resemblance to the marginal surgeon-apothecaries who comprised a significant proportion of *The Lancet's* most avid readership.

CONCLUSION AND LEGACY

In this chapter I have endeavoured to demonstrate the ways in which an approach that takes the emotions seriously might nuance and complicate our understandings of the history of pre-anaesthetic surgery. In general, historians have tended to focus on the operations of surgical dispassion, or what we might now term clinical detachment. What this research suggests, however, is that compassion and emotional expression played a surprisingly important role in shaping the cultures of early nineteenth-century operative surgery as well as the identities of its practitioners. In the decades immediately preceding the advent of anaesthesia, pain became a central concern of surgical discourse and the response to this concern was shaped by the cultures of sentiment and sensibility. However, this culture of compassion was no 'natural' reaction to a self-evident problem. Rather, it was a culturally and historically contingent phenomenon which could be harnessed to the ideologies and ambitions of medical reform. In the hands of men like John Bell and Thomas Wakley, the image of the surgeon as a man of refined and honest sentiment was linked to a critique of the medical and surgical *ancien regime*, providing an idealised representation of a more expert, meritocratic and altruistic profession.

Needless to say, the advent of anaesthesia in the 1840s had a profound impact on surgery. The introduction of ether and chloroform was not simply a technical development; it served to reshape the social, political and emotional relations of the operating theatre. Though by no means straightforward or unproblematic, the use of chloroform effectively silenced the patient and, in the admittedly self-interested words of Frederick Treves, transformed the operating theatre 'from a shambles to a chamber of sleep'.⁵⁵ Surgeons could now take longer and, with the risk of shock significantly reduced, could reach far deeper into the body. In many ways, the surgical operation now resembled the anatomical dissections that were central to surgical education and acculturation.⁵⁶ The extent to which this helped to reshape the emotional cultures of surgery is, however, as yet unclear. One might assume that, with the patient now less of an immediate concern, surgeons did not need to be quite as emotionally astute or

attuned as they had been when the patient's temperament could have a material effect on the outcome of a procedure. One might also assume that, with the demise of a Romantic sensibility, and the rise of a more ruggedly masculine Victorian archetype, surgeons became less emotionally expressive. And yet evidence suggests that surgeons continued to describe their work in emotional terms. Treves, for example, in the same speech of 1900 stated that the surgeon had 'gained much in the direction of the sympathetic handling of the patient and in the culture of gentleness'.⁵⁷

Indeed, even today, in an age of painless, sterile and increasingly minimally invasive surgery, surgeons remain unclear about the place of emotions in their work and their identity as emotional beings. In her work on modern surgical education in the USA, for example, Rachel Prentice relates how some of her surgical subjects struggled to adequately define their emotional relationship with patients, coming up with generally inadequate labels such as 'detached compassion' and 'compassionate objectivity'. In this case it was not clear either who or what was being protected by this apparent emotional distance. Was it rational, clinical judgement or the surgeons themselves, who might otherwise be emotionally contaminated by so much pain and suffering.⁵⁸ These are questions that remain to be explored, but what is clear is that the emotions continue to play a powerful, if generally overlooked, role in the practise of surgery.

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Surgery and Popular Culture: Situating the Surgeon and the Surgical Experience in Popular Media

Susan E. Lederer

In 1927 US humorist Will Rogers embarked on a national tour to raise money for victims of the cataclysmic Mississippi flood. On the tour, the cowboy-comedian and political commentator developed severe pain in his abdomen, which required gallstone surgery. From his hospital bed, Rogers issued daily bulletins about his surgical experiences and convalescence. Reports of his hospital stay, including the get-well telegram he received from President Calvin Coolidge, appeared on the front pages of newspapers across the USA. Milking the comic potential of his surgery, Rogers told his nurses that his only concern was that the scar from his operation ‘won’t be as large as some he has heard about.’ Several months after his recovery, Rogers described his hospital experience in a two-part series for the popular US weekly, *Saturday Evening Post*. Two years later G. P. Putnam’s Sons published his account as a book entitled *Ether and Me, or ‘Just Relax’*.¹

The publishers knew that the book would be popular. *Ether and Me* was a great success, selling especially well in hospital gift shops. Not only did it come from the pen of one of the US’s best-loved humorists, it was also one in a genre of early twentieth-century popular writing about a surgical experience. As Rogers acknowledged, his book followed the course set out by journalist Irvin Cobb, whose *Speaking of Operations* proved a runaway success in 1915. ‘Now Irvin Cobb—bless his ugly old frontispiece—only gave us many

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a laugh with his classical *Operation Book* but he showed us the practical side of humor by making an operation pay its way.² Cobb worked as a journalist for Joseph Pulitzer's *New York World* and the *Saturday Evening Post*, where the initial story of his surgical procedure appeared in 1915. This article proved so popular with readers that the New York publisher rushed *Speaking of Operations* into print. With illustrations by Tony Sarg, the slim book sold more than 100,000 copies in 1916. By the time of Cobb's death in 1944, the book, which had been translated into eight other languages, including Braille, had sold more than one million copies.

Surprisingly, these books and others like them have received virtually no attention in the historiography of surgery. Yet as surgery increasingly relocated from the home to the hospital and into highly specialized spaces within hospitals, it paradoxically loomed larger in popular culture. As historian Bert Hansen has pointed out, the middle decades of the twentieth century—long regarded as a 'golden age' for medicine—were also a 'golden age' for popular representations of medicine. 'Through countless renditions of medical history circulating in popular culture,' Hansen noted, 'not only those with college educations but also so-called general readers, their children, and their less-educated fellow citizens acquired a familiarity with medical figures of the past.'³ This was also true for surgery. In the mid-twentieth century, surgeons became popular celebrities, and narratives of surgical experiences became the fodder for such best-selling books as *Speaking of Operations*.

In the twenty-first century, celebrity culture is, as ethicist Timothy Caulfield notes, becoming increasingly relevant to the ways individuals think and talk about their health. Although it is easy to disparage celebrity culture as irrelevant and frivolous, it nonetheless forms part of a complex process whereby people see, select, and interpret information about health. Caulfield encourages people to take celebrity culture more seriously insofar as it affects vaccination rates, behaviors (tanning, detox regimens, smoking), as well as requests for surgical enhancements (cosmetic surgery), and prophylactic surgery (the so-called Angelina effect, named for actress Angelina Jolie who underwent prophylactic mastectomy on the heels of genetic testing for breast cancer).⁴

Another rationale for more popular culture study of surgery is that it enlarges and complexifies the 'archive of available evidence.' As sociologist George Lipsitz observes, historians approach the study of popular culture because the kinds of information available in conventional historical materials is generally quite circumscribed. 'Exploring the history of popular culture helps democratize the past by complicating dominant narratives with evidence that emerges from unconventional archives replete with hidden histories created by unacknowledged actors.'⁵ Attention to the popular culture of surgeons, surgical experiences, and imaginaries democratizes the historical study of surgery, bringing the patient into the picture and her experiences with practices and attitudes that are seldom addressed in more conventional approaches. This chapter explores the ways in which surgeons (and surgical sub-specialists, especially neurosurgeons) appeared in magazines,

newspapers, Hollywood films, novels, and comic books. This material, which has typically not appeared in histories of surgery, offers the opportunity to enrich and enhance different features of surgical culture, for such representations not only shaped popular expectations about surgeons and the surgical experience, but also reinforced professional assumptions about how surgeons should act and interact with both their fellow surgeons and their patients.

BEFORE ETHER

In the first half of the nineteenth century, as English scholar Stephanie Browner describes it, the fictional representations of the surgeon in US literature, especially in the work of New Englander Herman Melville, emphasized an oblivion to pain and a profound disregard for the patient's experience. In Melville's *White Jacket* (1850), the naval surgeon is a brutal butcher, who blithely ignores the death of a seaman following the apparently unnecessary amputation of his leg. Cadwallader Cuticle, MD, in Melville's description is not only 'a gentleman of remarkable science' and 'the foremost Surgeon in the Navy,' he is also physically decrepit.⁶ The ugliness of his physical body, Browner suggests, sharply contrasts with the brilliance of his mind. In the novel, Cuticle is a man of parts, a patchwork of pieces (wig) and devices (artificial eye), that mirrors the surgeon's dependence on practices of dissection and anatomy to gain expertise over the living body. Presiding over scenes of brutal punishment and punishing surgical invasions of the body, he possesses a disturbing equanimity and a lost humanity:

Surrounded by shrieks and moans, by features distorted with anguish inflicted by himself, he maintained a countenance almost supernaturally calm; and unless the intense interest of the operation flushed his wan face with a momentary tinge of professional enthusiasm, he toiled away, untouched by the keenest misery coming under the fleet surgeon's eye. Indeed, the long habituation to the dissecting-room and the amputation-table had made him seemingly impervious to the ordinary emotions of humanity.⁷

This representation of the surgeon resonated with portrayals of the surgeon's dispassion and cruelty in the UK in the eighteenth century.⁸

The portrait of the dispassionate and brutal character of the surgeon continued in the second half of the nineteenth century in the works penned by anti-vivisectionists. On both sides of the Atlantic, proponents of animal welfare used fictional portrayals of reckless experimenters and brutal surgeons to advance their cause. As historian Keir Waddington elegantly observes, *St. Bernard's: The Romance of a Medical Student* (1887) was but one of a number of books that recombined elements of the Gothic with the horrors of vivisection in the teaching hospital. *St. Bernard's*, Waddington argues, embodied a nightmarish view of the materialism of the medical school, where 'the microscope, the test-tube, and the scalpel' reduced patient welfare and surgical

experience solely to science and ‘rare and interesting cases.’⁹ In the USA, as scholar Lori Duin Kelly demonstrates, such popular female novelists as Elizabeth Stuart Phelps advanced the cause of anti-vivisection by fictional portrayals of brutish surgeons. In novels such as *Trixy* (1904), Phelps, a prolific author, represented the surgeon (the obviously named Doctor Olin Steele) as literally demoralized by his surgical experiments.¹⁰

In one of the most powerful depictions of a surgeon in late nineteenth-century literature, English author H. G. Wells created a Gothic vivisector exiled to his own island in the South Pacific because of his penchant for surgical experiments on living animals. The author of *The Time Machine* (1895), Wells published his most controversial novel *The Island of Doctor Moreau* the following year. On his island, Moreau creates unnatural interspecies hybrids in the building known as the House of Pain. In the book, the surgeon Moreau educates a shipwrecked visitor to the island about the marvels of surgical technique: ‘You have heard, perhaps, of a common surgical operation resorted to in cases where the nose has been destroyed; a flap of skin is cut from the forehead, turned down on the nose, and heals in the new position. This is a kind of grafting in a new position of a part of an animal upon itself.’¹¹ Condemned by the *Daily Telegraph* as a ‘morbid aberration of scientific curiosity,’ the novel received harsh criticism from a number of scientists, including zoologist Chalmers Mitchell who blasted Wells for depicting Moreau as ‘a cliché from the pages of an anti-vivisection pamphlet.’ Even worse, Mitchell complained that Wells had Moreau operate without anesthesia on the animal and human hybrids he created in his ‘House of Pain.’ Mr. Wells, wrote Mitchell, ‘must know that the delicate, prolonged operations of modern surgery became possible only after the introduction of anesthesia.’¹² Despite such criticism, the novel attracted the attention of film makers; the first filmed version appeared in 1932 as *The Island of Lost Souls*, with actor Charles Laughton playing the surgeon Moreau. Other cinematic versions appeared in 1977 and 1996, suggesting a durable interest in chimeric surgery.¹³

SURGICAL CELEBRITIES

Some contemporary surgeons found the character of Doctor Moreau compelling. French surgeon Alexis Carrel, perhaps the most famous surgeon in the USA in the early twentieth century, shared the novel with his surgical colleagues, and then arranged meetings to discuss what he labeled ‘a quaint and curious tale.’ Carrel was keenly interested in surgical grafting and the transplantation of tissues from one animal to another. In his position at the Rockefeller Institute for Medical Research, Carrel pursued such work that became fodder for the New York press and other newspapers. Even before he received the Nobel Prize in Physiology or Medicine in 1912 for developing techniques for vascular suturing, Carrel appeared frequently in the US press, which featured such surgical exploits as grafting the head of one dog onto the body of another animal. After he received the Nobel Prize, his fame reached dizzying

heights. Lionized in the press as a ‘magician,’ a ‘mender of men,’ and even the Wizard of Oz (L. Frank Baum’s novel was first published in 1900), Carrel was celebrated in magazines, newspapers, and newsreels. For his part, the French surgeon cultivated his image as a miracle worker. With a flair for self-aggrandizement, Carrel claimed to follow in the footsteps of medieval saints Cosmas and Damian, whose ‘miracle of the black leg’ had been a favored subject of Renaissance painters. As historian Thomas Schlich has shown, the penchant for claiming ‘gods and saints’ continues to be found in the writings of transplant surgeons.¹⁴

In the 1930s, Carrel’s fame increased. In 1935 he published *Man the Unknown*, which improbably rose to become the best-selling non-fiction book of 1935 for US readers. In the book, Carrel outlined his vision for the dawn of a scientific enlightenment led by an intellectual elite who would spare humans disease and suffering.¹⁵ In the same decade, Carrel collaborated with the well-known aviator Charles Lindbergh to create a perfusion pump, which would allow organs and tissues to be removed from the body and maintained until they be transplanted into another body. The perfusion pump, dubbed the ‘glass heart’ or ‘robot heart’ by the popular press, excited tremendous interest and prompted absurd speculations. For the second time in five years Carrel appeared on the cover of *Time* magazine. In June 1938, he shared the cover with Charles Lindbergh and the perfusion pump. One newspaper reported that Lindbergh was going to have his own heart removed, and replaced with an indestructible one from Carrel’s laboratory. Amid speculation that he was trying to create an ‘artificial human being’ in his laboratory, Carrel felt compelled to assert that he was not trying to create such a being.¹⁶

However, Carrel could not control his own appearance in popular culture. Authors frequently invoked the transplant pioneer to lend verisimilitude to their fictions. In his 1928 novel *Sing Sing Nights*, author Harry Stephen Keeler created a plot that turned on the surgical transfer of a living human brain from the body of a paralyzed man to the body of a gorilla. In the book, Keeler attributed this potential surgery to the exploits of French surgeon Carrel who performed such famous (and fictitious) limb transplants as surgically grafting the arm of a French soldier to the stump belonging to a French general.¹⁷

Four decades later, in December 1967 South African surgeon Christiaan Barnard became an international celebrity when he performed the first human to human heart transplant. Although his first patient, Louis Washkansky, lived only 18 days with the harvested heart taken from Denise Darvall, ‘the miracle in Cape Town’ captured the world’s imagination. In the USA, Barnard appeared on the covers of such prominent magazines as *Time* and *Life*, on popular television programs, and before the US Congress. As Ayesha Nathoo has argued, the media played a crucial role in transforming Barnard and subsequent surgeons and their patients into celebrities. Nathoo focuses on the media maelstrom that enveloped Barnard and the three heart transplants that were performed in the UK, usefully observing that Barnard’s celebrity should

be viewed in the context of the lionization of music, sport, and other entertainment personalities. Entirely complicit in his transformation from obscure surgeon to world celebrity (he hired his own public relations agent), Barnard was photographed with US president Lyndon Johnson, the Pope, actresses Gina Lollobrigida and Sophia Loren, among others.¹⁸ In the face of the enormous mortality and medical uncertainty associated with these early heart transplants, transplant surgeons announced a moratorium until the late 1970s when the clinical problems could be better managed. But Barnard remained a celebrity until his death in 2001.

PATIENTS' PROGRESS

In the early twentieth century, as surgeries increasing moved from homes to hospitals, patients—especially surgical patients—began describing their own experiences. But the surgical patient has seldom been the object of historiographical inquiry. As historian Roger Cooter has noted, before the 1970s the patient was not generally considered a topic for explicit discussion and analysis. The advent of the new social history of medicine brought unprecedented attention to the patient experience in medicine, if not in surgery.¹⁹ There is much to be gained from greater attention to this new genre of surgical experience and the enormous popularity of such books. The first such book to attract popular attention was Irvin Cobb's *Speaking of Operations* in 1916. A prominent New York newspaperman, Cobb dedicated his book to two classes of persons: 'those who have been operated on and those who have yet to be operated on.'²⁰ His narrative touched on various aspects of diagnosis, meeting with his surgeon, and entry into the hospital. Although Cobb did not explicitly indicate the nature of his surgical procedure (hernia repair), he did discuss getting undressed, being shaved 'twice over his most prominent plane surfaces,' as well as his fear of adhesive tape and the fading color of his stitches. He explained that he had been asked to sign a document in which he 'assumed all responsibility for what was to take place,' how he was wheeled into the operating room, the appearance of his surgeons, their tools on display, the application of the anesthetic, and his recovery.

Cobb went on to a very successful career in Hollywood. The director John Ford made two films based on Cobb's popular Judge Priest characters, but *Speaking of Operations* remained his most popular book. Its popularity reflected how much it resonated with many US readers, who experienced similar befuddlement in the face of new surgical technologies and new social conditions. As Thomas Masson, editor of the popular weekly magazine, *Life*, observed in 1922,

Speaking of Operations is funny, because in reality—although it may seem quite the opposite—it is impersonal. I remember when it first came out in the *Saturday Evening Post*. A number of people spoke to me about it. "Have you seen that thing of Irvin Cobb's? It's immense." And so on. You see, they were all

taking about themselves. They thought it had happened to them. And that, I take it, is one of the tests of real humor.²¹

Cobb's book also resonated with US surgeons. *Speaking of Operations* was reviewed in a number of medical and surgical journals. The reviewer for the *Chicago Medical Journal* praised Cobb's 'view of the catastrophe of surgical need' and urged every physician and surgeon to read the book, 'because under all the fun of it there is abundant suggestion for a recognition of the human side of the patient that sometimes escapes those who are daily doing work in the surgical field.'²² In addition to such reviews, Cobb's book inspired some surgeons to challenge the expectations of their patients and their assumptions about surgery. In 1919, Virginia surgeon Samuel Lile authored an article on surgical failures in which he cited Cobb's observation that a surgical operation was an accepted topic of conversation and among women, an opportunity to brag about the numbers of surgical scars. For Lile, multiple surgical scars on a patient's abdomen represented a failure for surgeons, even if it served as a mark of distinction among patients: 'Irvin Cobb speaks as though it were a general topic of conversation, particularly among females, to brag of the number of scars now visible. Recently I had a patient who boasted to me that she had five scars on her abdomen, the result of five operations.'²³ So provoked by the reception to Cobb's little book, California surgeon John F. Barnhill published a book-length response to Cobb. Unimaginatively entitled *Not Speaking of Operations*, Barnhill offered his own version of the hospital and surgical experience. The book did not prove popular with audiences.²⁴

As mentioned in the introduction, Will Rogers followed Cobb's example in writing about his gallstone surgery. Like the Southern writer, Rogers emphasized the enormous gap between patient experience and surgical expertise, the vocabulary of the surgeon, and his fees. He also made much of his surgical scar. Indeed, when he first published the account of his surgery in *Saturday Evening Post*, he wanted the title of the piece to be 'Scarbelly,' but the editors rejected it as inappropriate. After the operation, Rogers sent a public telegram to aviator Charles Lindbergh inviting him to visit him in his Beverly Hills hospital. And he added a postscript, 'P.S. Just saw the scar. If they charge by the inch, the operation must be a serious one.'²⁵ *Ether and Me* sold extremely well. The publisher reprinted the book 12 times, and by 1956, almost 80,000 copies of the book had been purchased.

Another prominent US humorist to locate comedy in surgery was Rube Goldberg. Although Goldberg is remembered today less as a cartoonist and humorist than in references to Rube Goldberg machines, he was also very popular with the US public. In December 1928 Goldberg published a short story in the Hearst magazine *Cosmopolitan*, entitled 'I, Rube Goldberg, Hereby Plead for Ether for Husbands, Too.' In this short story, Goldberg recounted the 'case of the unsung husband who endures a sympathetic pain

for every one of his wife's agonies and alone suffers the full burden of the terrific blow that comes with the doctor's final bill.' Surgery, Goldberg explains, brings renown to women. It begins when they enter the hospital and confers a life-time privilege of being able to recount one's travails. (Indeed, the gendered dimensions of surgical experience is also worthy of additional study. The trope of women sharing their 'operation stories' was firmly ensconced in popular fiction and the illustrations of get well cards in mid-century USA.)²⁶ Fashionable women who undergo the surgeon's knife, Goldberg insisted, acquired a spiritual glow 'that enshrined them in a niche alongside Joan of Arc, Edith Cavell, and Carrie Nation.' Women achieved the status of these female icons of bravery and courage, Goldberg suggested, in the face of a hospital stay and near-death experience despite the fact that surgery was no longer the ordeal it once was in the nineteenth century.

One year later, in 1929 Goldberg published an enlarged and illustrated account of why doctors should give ether to husbands whose wives were undergoing surgery, entitled *Is there a Doctor in the House?* The book described the haste surrounding his wife's surgery, the appearance of the hospital staff, and the difficulty in getting a clear explanation of what her surgery would entail. Goldberg explained the surgeon drew a sketch for him on the back of an envelope of some of the details—anatomical, medical, economical. He quoted the surgeon:

Your wife really had a remarkable condition. The magoozlum valves were all crowded around the appendix, causing adhesions which affected the screeves duct and completely shut off the woff. This pressed up against the immik gland and twisted the gadget around forty-five degrees, filling the goofle with carbon and causing a slight infection of the yonkle. It was a clear case of ovis poli.²⁷

Goldberg's language here mines the surgeon's anatomical jargon and the technical details of the procedure as a source of humor. He makes the point that the layman's access to surgical knowledge—the location of the surgery and its physiological implications—was not enhanced by access to the surgeon, who fails to enlighten the worried husband. Goldberg's account suggests that he is more mystified about what his wife experienced during her surgery *after* her doctor's explanation than before it. The language also implies that the surgeons are similar in this respect to auto mechanics who offered explanations about automobile performance that most US drivers found unintelligible and took on faith.

Goldberg also makes clear that the surgeon was completely unmysterious about the charges for his surgical prowess. He relates how within five minutes of returning home from the hospital with his wife, the postman delivers the extraordinarily large bill. Like Cobb and Rogers, Goldberg presents a selected account of the surgical encounter from the husband's vantage point. It finds

humor in the strange ways of the hospital (from the distinctive garb of the hospital staff to their arcane, if orderly, rituals). It seeks to demystify the entry into the hospital and the details of the pre-operative and post-operative experiences in a comic way to which many other US readers can relate to their own experiences.

There are many other examples of books in this genre. Writer Kenneth Roberts offered much greater anatomic detail in his 1936 narrative *It Must Be Your Tonsils*. After visiting three specialists in the UK, Roberts relates how he returned to the USA where he undergoes a tonsillectomy. He receives ‘twilight sleep’ as an anesthetic, although he complains that it was not sufficiently powerful to keep him unaware of what the surgeons were doing to him. Like Goldberg, his account challenges the technical jargon of the surgical description of the procedure. He describes being ‘stabbed in the back of the throat with a hypodermic needle,’ and compares the sensation of having the tonsil removed to ‘scraping a cluster of wax drippings from a coast sleeve with a knife blade’ and also likens the removal as ‘vaguely reminiscent of pulling a baseball out of a pocket both tight and wet.’ These folksy, as opposed to technical, comparisons were accompanied by his explanation that the surgeon proceeded to tie the ends of ‘all the newly exposed blood vessels to prevent bleeding.’ After nearly twenty minutes, Roberts was presented with his newly ‘ectomized’ and still quivering tonsils.²⁸

Such books deserve greater attention from historians of surgery. In addition to patient narratives, much more attention should be directed to the representations of surgeons in pulp fiction. Surgeons were a major focus, for example, in the work of Frank G. Slaughter, the pseudonym of C. V. Terry, a US physician whose books sold more than 60 million copies. Between his first book *That None Should Die* (1941) and his last book *Transplant* (1987), he published more than 20 novels about surgeons. Another area meriting more scrutiny is the representation of surgeons in popular romance fiction. Jessica Miller has analyzed concepts of medical professionalism (and surgical professionalism) in much more recent fiction, explaining the durable appeal of the hospital world, its drama, and excitement.²⁹ Finally, medical and surgical thrillers, a mainstay of popular fiction since the 1970s, might also be explored for the depictions of surgeons and other health care providers.³⁰ Robin Cook, an ophthalmic surgeon, published his best-selling novel *Coma* in 1977, in which a young female surgical resident becomes embroiled in the shadowy world of organ trafficking. Made into a popular film, *Coma* was one of many novels and films that intended to entertain and educate popular audiences. ‘I think of my novels as “factions,”’ Robin Cook explained in an author’s note in 2003, factions being ‘a coined word meaning that the facts and fictions are so mixed that the dividing line between the two is often hard to discern.’³¹

POPULAR CULTURE AND SPECIFIC SURGICAL INTERVENTIONS

One interesting exception to the general dearth of historical attention to surgeons and surgery in popular culture are specific surgical interventions, which developed their own trajectory into the popular arena. Two broad areas of surgical attention—the brain and the sex organs—seem to have generated the most intense interest.

Historian Delia Gavrus has analyzed the professional identity formation of US and Canadian neurosurgeons in the first half of the twentieth century, including the ways in which brain surgery and brain surgeons were represented in US and Canadian popular culture.³² By the mid-1940s, Gavrus argues, surgery involving the brain ‘had acquired a powerful resonance in popular culture, shoring up the authority of medicine, embodying its ultimate masculinity, and becoming a cultural commodity trading on feminist aspirations.’³³ In addition to analyzing the neurosurgical imaginary in the popular press, women’s magazines, plays, and movies, Gavrus examines the newspaper reportage of brain surgery, the transformation of the rhetorical representation of surgery on the brain as ‘delicate’ to ‘everyday miracles’ of modern surgery. She describes how such early films as *The Love Doctor* (1917), which included transplanting cells of one lovesick woman to another, reinforced the neurosurgical potential and laid the groundwork for the cult of the neurosurgeon. The early elite neurosurgeons in the USA and Canada were not only masters of the most exquisite organ and able to effect extraordinarily difficult procedures, but they were represented as remarkably handsome. As she notes, this association of physical attraction and extraordinary expertise carried over into Hollywood films, especially the 1939 film *Dark Victory*, which featured Bette Davis as a doomed heiress with a brain tumor.³⁴

Gavrus follows others in identifying neurosurgeon Harvey Cushing as central to the devotion brain surgeons inspired. In a 1991 paper, neurosurgeon Samuel Greenblatt traced Cushing’s first significant popular exposure to 1925 when he received a Pulitzer Prize for his biography of William Osler. ‘The process of lionizing Cushing by creating an overdrawn caricature reached its apotheosis in *Time* magazine in 1939,’ wrote Greenblatt. ‘The *Time* article was actually a report of Cushing’s 70th birthday party. It expounded all of the descriptors that are now associated with “brain surgeon.”’³⁵ According to the article, Cushing was brave, single-minded, and single-handedly transforming surgery on the brain. He was described as aloof, cold, reticent, and a man who ‘lived for medicine.’ Historian Gary Laderman has also analyzed the popular rhetoric that framed neurosurgeon Harvey Cushing in the first half of the twentieth century. Charting the religious language that infused the letters Cushing received from his adoring patients, Laderman, a religious studies scholar, advances the claim that the celebrations of Cushing’s life and death not only inspired patients and the public, but that the neurosurgeon’s life ‘is embedded in a much larger and more significant religious movement driving the cultural

success and power of biomedical science: the cult of doctors.³⁶ A cultural historian who has written two important books on death in the USA, Laderman does not dissect disciplinary differences in the ‘cult of doctors’ he describes.³⁷

One of the strengths, and there are many, of Gavrus’s analysis of professional identity in neurosurgery is her attention to the slippage in popular culture between medical and surgical approaches to diseases like glioblastoma that fells Bette Davis’s character, who dies bravely (and beautifully) on screen.³⁸ She is one of the few historians to analyze, for example, the extraordinary popularity of the novels of Lloyd C. Douglas, including his 1929 book *Magnificent Obsession*, which was released as a film in 1935 and remade in 1952.³⁹ *Magnificent Obsession*, Gavrus notes, displayed a ‘striking theme of redemption’; in the film, the selfish young man, whose life was spared by a selfless surgeon, falls in love with the surgeon’s widow, becomes a brain surgeon, and saves the widow’s eyesight lost as a result of brain damage. Nonetheless, as Gavrus reminds readers, such sensationalized vehicles and celebratory treatments also fostered ‘less celebratory counter-narratives that reveal important moments of resistance and social anxiety about brain surgery.’⁴⁰

Even greater resistance and greater social anxiety developed in the 1950s as lobotomy’s career as an effective treatment for mental illness increasingly faltered. Hailed initially as a transformative approach to intractable disease, which included a Nobel Prize in Physiology or Medicine to Portuguese neurologist Egas Moniz in 1949 for the procedure, the popular cultural representations of lobotomy reduced the operation to a brutal surgical assault into the brains of helpless patients and the surgeon to a sadistic abuser. As historian Jack Pressman noted, ‘a chorus of dissenting voices was emerging in popular books, plays, and movies that derided the image of the psychiatrist as benevolent healer.’ Like others who have written about lobotomy’s fall from grace, Pressman identified such works as Tennessee Williams’s *Suddenly Last Summer* (1958), Ken Kesey’s *One Flew Over the Cuckoo’s Nest* (1962), Elliott Baker’s *A Fine Madness* (1964), and *Planet of the Apes* (1964) as works that ‘further poisoned the idea that any good might be associated with lobotomy.’⁴¹ As scholars of Tennessee Williams have observed, the foregrounding of lobotomy in *Suddenly Last Summer* resulted from Williams’ personal experience with lobotomy. In 1943 his sister Rose, hospitalized with a diagnosis of schizophrenia in the State Asylum in Farmington, Missouri, underwent a bilateral prefrontal lobotomy. Williams, notes Tanfer Emin Tunc, experienced firsthand ‘the tyranny of the medical model of disability’ and believed ‘that the invasive surgery had stolen Rose’s chance for a normal life.’⁴²

Each of the three books and the one play generated greater public attention when they received Hollywood treatment. Released in 1960, *Suddenly Last Summer* featured an all-star cast including Katharine Hepburn, Elizabeth Taylor, and Montgomery Clift, who played the role of Doctor Cukrowicz, the brain surgeon who is offered a million dollars for his clinic if he performs a lobotomy on a young woman. Produced by Warner Brothers, *A Fine Madness* (1966) included the on-screen lobotomy of a non-conforming poet. The

first of the *Planet of the Apes* films, released in 1968, included the depiction of a US astronaut subjected to a frontal lobotomy by his ape captors. Perhaps the most compelling screen lobotomy was featured in the 1975 film version of *One Flew Over the Cuckoo's Nest*. Directed by Milos Forman, the film starred Jack Nicholson as a troubled man who is rendered compliant following electro-convulsive shock therapy and a lobotomy.⁴³ In 1983, psychologist George Domino conducted a field study of 146 college students about the impact of the film on their attitudes toward mental illness. Domino concluded that the students who saw the film exhibited less positive attitudes in several areas, including their assessment of mental health professionals (unfortunately not explicitly about surgeons and the representation of psychosurgery).⁴⁴ That such screen portrayals are considered powerful in creating or sustaining inaccurate ideas about therapy and the stigmatization of the mentally ill is illustrated by the calls for more informed portrayals for psychiatry, mental illness, and psychosurgery.⁴⁵

Disability studies scholar Jenell Johnson, who analyzed the rhetoric associated with lobotomy in both the professional and popular press, has argued that the negative cultural associations with lobotomy have intensified in the last few decades.⁴⁶ In a number of horror movies, Johnson explains, film makers 'have resurrected the lobotomist as a blood-thirsty monster who haunts abandoned asylums, armed in one film with a two-foot leucotome in each hand (*Asylum*). In the public imagination, the terms "lobotomy" and "psychosurgery" evoke frightful images of sadistic doctors, zombie patients, mind control, and institutional brutality.' Johnson argues that many medical professionals also have negative associations with lobotomy. Physicians, she explains, associate the terms 'lobotomy' and 'psychosurgery' with an earlier era in medical research, in which there were no institutional review boards, controlled clinical trials, and regulations for human experimentation.⁴⁷

In addition to the brain as a site of surgical intervention, surgery on the sex organs has received considerable attention in popular culture. In the 1920s, the pursuit of rejuvenation through vasectomy and the grafting of foreign testicular material (usually animal but in some cases, human material) prompted intense popular interest. French-Russian surgeon Serge Voronoff, who advocated human to human transplants or non-human primate to human grafts, and 'goat-gland doctor' John R. Brinkley generated massive newspaper coverage and inspired a host of jokes, novels, and films about the nature and implications of such surgical procedures. As I have argued elsewhere, the ape-human boundary was especially appealing to artists and audiences in popular culture of the 1920s and 1930s. Films as diverse as *A Blind Bargain* (1922), featuring Lon Chaney as a mad doctor obsessed with ape gland experiments, and *Darwin was Right* (1924), involving chimpanzees and the elixir of life, explored the permeability of the ape-human border.⁴⁸ More recently, Michael Pettit has explored popular endocrinology and mass culture, including some of the early scares over 'gland larceny,' the theft of human gonads, typically presented as medical students waylaying working

men at the behest of wealthy patrons, and in an exceptional circumstance, involving the two young men (Leopold and Loeb) who murdered a young boy. Pettit argues for the importance of mass culture in expanding the actors in the history of endocrinology. ‘In addition to clinicians and laboratory scientists, publishers, journalists, authors, and most importantly readers were central to the multiple looping effects that helped to build a culture around the glands of internal secretion.’⁴⁹ Among the surgeons who helped to instantiate this culture were G. Frank Lydston and Max Thorek, who each wrote popular works in addition to their writings for professional audiences.

Another set of surgical procedures that received considerable attention in popular media was the advent of the so-called sex change operation. Beginning in 1952, the announcement that an ex-G.I. had undergone a sex change in Denmark created a media sensation. Christine Jorgenson, as historian Joanne Meyerowitz demonstrates, was more than a media sensation, but the opportunity to engage in sustained debate over the both the mutability and the visibility of human sexuality. Popular media outlets—newspapers, magazines, television, and film—covered Jorgenson and the surgery that made the change possible. Meyerowitz notes that, unlike television, which was more concerned with family audiences, other producers of mass media proved much less restrained. In the mid-1950s, both Christine Jorgenson and Ray Bourbon, a gay female impersonator, released record albums that capitalized on the sex change operation. Bourbon’s 1956 album even exploited what had become a familiar trope in the popular culture of surgery, *Let Me Tell You about My Operation!* (Here *the* operation foreshadows the labelling of the birth control medication as *the* pill.)

Meyerowitz recounts the entry of the ‘sex change’ surgery into so-called B movies. In 1953, director Ed Wood, Jr. filmed *Glen or Glenda?* A low budget motion picture, the film now regarded as a cult classic, included Bela Lugosi as ‘an all-powerful science-God figure’ who played up the lurid and sensational aspects of the operation in a room decorated with skulls and skeletons. In addition to B movies, the sex change surgery began to appear in cheap paperback editions. As Meyerowitz emphasizes, amid the massive publicity, it remains difficult to know the public’s response. Still, Christine Jorgenson recalled in her autobiography, another cultural commodity, that she received some 20,000 letters in just the first few months of the publicity. So well known, she received letters simply addressed to C. Jorgenson, United States of America.⁵⁰

SURFACE TENSIONS

The popular cultural representations of cosmetic surgery deserve some special attention.⁵¹ As historian Elizabeth Haiken noted in her influential book, *Venus Envy: A History of Cosmetic Surgery* the US public has long been fascinated by the surgical ability to reshape one’s face, eyes, nose, breasts, and so on. By the mid-twentieth century, cosmetic surgery, Haiken notes, was a

staple topic of women's magazines and newspapers around the country. Stories about movie stars and ordinary members of the US public who underwent surgery to change their appearance also appeared on movie screens, and, by the 1950s, television screens. Haiken examines the impact of a particular episode of Rod Serling's long-running television show, *The Twilight Zone*. First televised for US audiences in November 1960, 'The Eye of the Beholder' explored a world where the state compelled its citizens to undergo surgical procedures to achieve a level of acceptable appearance. 'By 1960,' Haiken explained, when the episode first aired, 'cosmetic surgery had become the lens through which Americans examined and thought about issues of beauty and ugliness.'⁵² This accomplishment was facilitated by the penetration of representations of cosmetic surgery in mass media.

Since 1997, when Haiken's book first appeared, the scholarly literature on cosmetic surgery and popular culture has grown enormously. From analyses of such television series as *Nip/Tuck* (which ran in the USA from 2003 through 2010) and *The Swan* (2004), viewers could see not only the emotional implications of cosmetic surgery but also graphic images of the plastic procedures being performed for the episode. The series *Nip/Tuck*, for example, featured many graphic surgical images of such popular procedures as breast augmentation and the more 'exotic' procedures, including vaginal rejuvenation.⁵³ On *The Swan*, which ran for only one year, women judged to be ugly underwent 'extreme makeovers' that included several forms of cosmetic surgery. (The title is a reference to the fairy tale of 'the ugly duckling,' who is transformed into a beautiful swan.)⁵⁴ The advent of bariatric surgery, gastric banding, and other procedures to bring out about weight loss has also generated considerable attention in popular media. Associated with such 'reality television programs' involving bariatric and cosmetic surgery is the use of other media platforms such as Twitter. Some research suggests that cosmetic plastic surgeons who advertise on reality television programs and Twitter have benefitted from the positive attitudes and 'realism' associated with such programming.⁵⁵

As science studies scholar David Serlin makes clear, however, it would be a mistake to view these as new developments. Performing live surgeries on television began as early as 1945. Serlin analyzed the early televisual potential of surgery. In April 1954, for example, a live cancer operation was performed on so-called Patient X and televised from a station in Cincinnati. This broadcast drew an estimated 700,000 viewers and an additional million viewers from the station's affiliates in Dayton and Columbus.⁵⁶ In 1958 a television station in Syracuse, New York, broadcast an episode of a morning program for women (*Ladies Day*) devoted to cancer. The hour-long program followed the progress of a female patient from her diagnosis to 'actual filmed footage of the removal of her cancer at Syracuse General Hospital.'⁵⁷

By the 1960s, Serlin explains, the performing of live surgery on television declined for two reasons. First, there was more programming available and less need to fill empty blocks of time. Second, live surgical spectacles gave

way to what Serlin describes as ‘stethoscope operas.’ These included such popular television series as *Ben Casey, M.D.*, a drama that featured Vince Edwards as the titular character, a young, intense and idealistic neurosurgeon at County General Hospital. The series, which ran on US network television from 1961 to 1966, prompted an explosion of consumer-related products. The public could purchase Ben Casey surgical blouses, sweaters, jewelry (with a dangling miniature scalpel), a game based on the character, comic strips, and comic books. According to historian Joseph Turow, Ben Casey’s popularity led one hospital to change the curfew for its student nurses. At St. Vincent’s Hospital in New York, the usual curfew for the students was 10:30 p.m., except for the night Ben Casey was televised—the nurses could stay up late to watch. Turow also reported that when surgeons expressed their tempers or became exasperated, people would describe such behavior as ‘pulling a Ben Casey.’⁵⁸

New media platforms offered the public additional access to *real* surgery. In 1999 singer Carnie Wilson became the first person to allow video cameras to live-stream her laparoscopic gastric bypass surgery on the internet. Serlin noted that ‘the confessional quality of Carnie Wilson’s Internet broadcast, rhetorically constructed as a celebrity feature story about the triumph of the will over adversity, was designed to serve as a powerful incentive for those considering the procedure.’⁵⁹ In addition to gastric bypass surgery, internet sites have streamed brain surgery and a host of plastic surgical operations.

This chapter has explored some of the ways surgeons and surgical procedures have been portrayed in magazines, newspapers, Hollywood films, and novels. This material, which has typically not appeared in histories of surgery, provides a thicker description of some elements of surgical culture that generally receive less attention, especially the patient’s perspective. These depictions are important because such representations not only shaped popular expectations about surgeons and the surgical experience, but also reinforced professional assumptions about how surgeons should act and interact with both their fellow surgeons and their patients. There are abundant avenues and media platforms for exploration.

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Surgery, Imperial Rule and Colonial Societies (1800–1930): Technical, Institutional and Social Histories

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The following chapter is concerned with the ways in which political, social and cultural contexts shape the performance and perceptions of surgery, especially under nineteenth-century colonial empires. This central focus is introduced by an examination of the following case.

The twenty-year-old labourer was admitted to hospital at approximately 1.30 pm on 18 August 1887, suffering from a compound fracture of the upper right fibula, and a dislocation of the right knee. His injuries had been caused a few minutes before by a confluence of his knee having been caught in the railings of a bridge across the city's river and subsequently being struck by a heavily laden vehicle passing in the opposite direction.

The surgeons charged with treating him acted, it seemed, immediately. They stemmed the haemorrhage from a wound caused by the protrusion of his fibula using an 'Esmarch's bandage'. Then, after supplying him with a quarter gram of morphia through hypodermic injection to ease his pain, they placed him under the influence of chloroform ahead of surgery. The wound created by his fibula was enlarged with the intention of sawing off the sharpened end of the broken bone using a 'Butcher's Saw'. The records of the case then state that the surgeons removed 'the condyles, the upper portion of the heads of the tibia and the patella.' They concluded the operation by bringing the edges of the wound together using 'goose sutures' and dressing it with

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'oilsilk, oakum and bandages.' Their final act was to place the leg in bracketed back and side splints, before placing it in a 'Salter's Swing'.¹

The description of the case could be an element of a particular sort of history of surgery, namely the history of surgery as a history of surgical technologies; all of the implements documented within the case have fascinating histories in and of themselves. For example, the use of a 'Butcher's saw' was not, as might be expected, a colloquial name for the implement used in contemporary surgery. It was, instead, a specific type of saw, named after the surgeon who invented it: the Irishman Richard G. H. Butcher (1819–1891). Butcher specialized in the excision of the patella and its surrounding physiological structures. He became so specialized in this particular surgical practice that he devised a saw that would aid in his work to a greater degree than any other then in use.²

Similarly, we could highlight the reference to 'Esmarch's bandage', an invention made by Johannes Friedrich August von Esmarch (1823–1908) in 1877, which was designed to decrease the risk of haemorrhage in operations on the extremities by forcing all of the blood out of a limb through an elastic bandage.³ Finally, our technical history of the surgeons' practice would have to contextualize the use of 'Salter's Swing', named after Sir James A. Salter, who devised it over the course of 1849–1850, because he believed that 'the plan of swinging broken legs in their treatment is attended with great benefit and immense comfort to the patient.'⁴

However, the history of surgery is not just about the material aspects of technology, their invention and their implementation; it is, too, about the social, cultural and institutional contexts that shape them, the people who use them and the people they are used on. In short, we must also understand surgery in terms of the historical specifics of time and space.

How does knowing that the young man in our case study was named Venkatachellum, a Hindu resident of Madras, India (present-day Chennai) change our understanding of the case's history? Madras was at the time the capital of the Presidency of the same name, which was in turn a key constituent division, along with Bengal and Bombay Presidencies, of Britain's Indian Empire. How did Venkatachellum's ethnicity shape his treatment? What verbal or written exchanges took place between himself and the surgeons who treated him, and how well did he understand these interactions? Then, about the surgeons themselves: how did they come to be in Madras, practicing at the city's General Hospital (MGH)? Many of the surgeons who practiced in the MGH at that time had been educated across the UK and grown into medicine surrounded by ideals and institutional reforms that promoted a coherent set of professional ideals. How congruent with or divergent from these new ideals were the imperatives of imperial rule?

These are the sorts of questions I want to pursue in this chapter. In order to answer them appropriately, the work presented must draw on various strands of scholarship (social history of medicine, global history of

medicine, imperial and colonial history) that all make relevant contributions to the topic. In the field of imperial and colonial history, for example, Frederick Cooper, Ann Laura Stoler and Antoinette Burton have argued convincingly for viewing modern empires and their colonies as sites of complex interaction, rather than hosting simple, binary relationships between ‘colonizer’ and ‘colonized’.⁵ Similarly, contributions to the history of global health and its institutions have questioned discrete divisions between ‘Western’ and ‘non-Western’ categories of medicine. Hormoz Ebrahimnejad and others have shown that the creation of these categories was a function of anti- and post-colonial politics dating from the mid-twentieth century, rather than providing an accurate framework for representing historical realities in the foregoing century-and-a-half.⁶ Indeed, Biswamoy Pati and Mark Harrison have questioned whether or not phrases such as ‘colonial medicine’, that is a medicine that is distinctly western, European and different from its surroundings, have any real meaning.⁷ Finally, if we wish to know more about the actions of colonial surgeons such as those who treated Venkatachellum, what do we need to know about the institutions that produced and managed them? John MacKenzie and a host of contributors to Blackwell-Wiley’s gargantuan *Encyclopedia of Empire* defined an empire as ‘an expansionist polity which seeks to establish various forms of sovereignty over people or peoples of an ethnicity different from ... its own.’ However, the expansionism of these polities is also accompanied by their creation of ‘over-extended structures which can be readily weakened by failures of central rule ... cracks in its administrative and bureaucratic systems, or through the resistance of provinces, of the incorporated peoples or of adjacent empires.’⁸ How did these sorts of institutional dynamics inflect upon the potential for and nature of practice conducted by colonial surgeons?

In order to knit these various literatures together coherently, my analysis is arranged in terms of a ‘funneled’ history of surgery and empire, beginning with broad insights into the relationship between imperial governments and surgeons in the nineteenth and early twentieth centuries. I then move into the more intimate, practical spaces of surgical wards and patients’ houses to examine what surgical practice represented culturally, socially and economically, and the effects that colonial societies had upon it. Although the chapter’s content is informed to mostly by my own research on Irish surgeons practicing in the Indian Medical Service (IMS) between 1850 and 1930, it also points to the possibilities of related research on other periods and locations, whether imperial-colonial or otherwise.

SURGEONS, EMPIRE AND PROFESSIONAL INSTITUTIONS

MacKenzie’s definition of empire, provided above, is a sensible place to start this section. What if we think about the contents of this definition in specific relation to surgeons who plied their profession through imperial

employment? The period between 1800 and the end of World War I was marked by the geographic expansion and consolidation of European empires abroad, and of modern professions at home. The expansion of empires, which occurred across the world in a multitude of ways, has been the subject of numerous volumes of scholarly literature. Britain consolidated the administration of its Indian Empire; fought a succession of frontier wars on the northwestern and northeastern frontiers of the subcontinent against various tribal groups and (by proxy) the Russian Empire; a range of European powers scrambled for Africa; and archaeologists, farmers, land prospectors and commercial companies instituted invasive changes in Canada, Australia, New Zealand and the African continent, imposing new communities and epistemologies in the process.⁹

The expansion of modern professions has been described as a process of evolving ideas from within certain occupations that induced changes in the nature of bureaucratic and educational institutions, both in metropolitan nation-states, but also across European colonies.¹⁰ As Christopher Lawrence once noted for central ideas about surgical professionalism in Britain, ‘in accord with the “spirit of the times”, surgeons were heroes, models of the Victorian cult of manliness’.¹¹ Lawrence’s emphasis on the muscularity of surgeons in the popular imagination harmonizes with a recurrent theme in the history of the professions more broadly. In his 1989 book on ‘professional society’ in England from c. 1880 to 1980, Harold Perkin defined the ‘professional ideal’ in terms of a masculine Christianity, but, in tandem, illustrated how it was ‘based on the primacy of expert selection by merit, measured no longer by aristocratic opinion, the competition of the market or popular vote but by the judgment of the qualified expert.’¹² Professionalism was a function, then, of deeply held, aspirational ideals and consequent changes in administrative and educational processes.

There have been few works that examine where the expansion of empire and professions met one another, which is surprising given the amount of primary sources indicative of these interactions. The calendars of contemporary universities in the UK were often replete with the entrance requirements for rapidly professionalizing services, such as the various public services in India, although their prevalence varied depending on changing political and social attitudes towards empire at a local level.¹³ Elsewhere, the pages of school magazines and popular pamphlets that were aimed at adolescents hosted insights from purportedly successful professionals already in situ in the colonies.¹⁴ These are examples of ways in which social processes, institutional change and cultural values across the boundaries of nation-states supported professionalization within the particular context of surgery. Although Thomas Bonner’s work has touched on variations in educational culture across the Anglo-European world, further research in the same transnational vein could turn up novel insights into how cultures and ideals of professionalization occurred and interacted with one another in different ways.

The most notable volume to date that focused specifically on the British empire and its exporting institutions, methods and values of medical professionalization is Lawrence Brockliss, Michael Moss, Kate Retford and John Stevenson's detailed study, *Advancing with the Army Medicine, the Professions, and Social Mobility in the British Isles, 1790–1850*. The authors focused on the Army Medical Department (AMD), and showed how the administrators of military medicine were 'early adopters' in terms of instituting selection by merit rather than aristocratic patronage.

Brockliss et al. showed that, although not uniformly successful, at the start of our period the AMD instituted new regulations that defined a minimum set of professional competencies for entrance to the service, and appointed James MacGrigor to the position of Surgeon-General. MacGrigor implemented 'the practice of keeping detailed individual career records by demanding that existing medical officers and new recruits completed a pro-forma curriculum vitae which could then be periodically updated.'¹⁵ In comparison, the IMS did not begin to systematically implement expected professional standards for the surgeons it employed until the mid-1860s. Interestingly, its Bengal branch provided an institutional blueprint for the establishment, in 1820, of a civil medical service in Java, Indonesia under the governorship of Thomas Stanford Raffles, an early example of how models of professionalization spread across colonial locations.¹⁶

According to MacKenzie, empires are not polities that inexorably expand, exporting ideas, goods and people in an uninterrupted deluge. Rather, imperial history is also a history of internal contradiction and conflicting priorities. So, how does the history of the surgical profession relate to this second aspect of MacKenzie's definition? In the case of the IMS, by mid-century imperial administrators and their colonial counterparts were well aware of the need for imperial and colonial medical services to attract highly trained, broadly educated medical professionals. This broad awareness was focused more specifically during Sir Charles Wood's tenure as Under-Secretary of State for India between 1859 and 1864. During this time, the IMS moved towards expected standards of professional competency akin to those first implemented at the start of the century in the AMD.¹⁷

But the State's recognition of a need for more professional surgeons and physicians to populate their medical services was not accompanied by a rationalization of attitudes or policies towards medical work. For example, throughout the 1860s, 1870s, and 1880s, recurrent debates took place concerning whether two separate medical administrations treating European and native troops, as had been the case up until that point, were necessary. The fact that these debates endured reflected the unwillingness of the IMS's governing institutions to recognize the professional credentials of the surgeons employed by the Service, an uneasy state of affairs that would linger through to the 1940s.¹⁸

Medicine and surgery under the Government of India was arranged in such a way that the AMD supported ethnically British troops, whilst the IMS was expected to provide medical support to the native soldiers of the Indian Army, as well as performing civilian duties as civil surgeons, dispensary officers and public health officials. Some voices in India, such as the administrator Sir William Muir (1819–1905),¹⁹ believed that ‘the first and most flagrant ... waste of power and money ... is that of European Medical Officers now attached to Native Regiments’. These officers were deemed to have ‘little or nothing to do’ because of the ‘trifling sickness occurring in native corps’.²⁰ If allowed to continue, Muir thought, ‘without adequate professional employment’, these surgeons would inevitably rust and deteriorate in ‘their value as Government servants’.²¹

The racial stereotyping of native soldiers as ‘of’ the climate, and therefore not in need of as much medical attention as their European counterparts, was part of the racial politics of military policy in India.²² In a more pragmatic vein, Muir’s report also related to the divisiveness of racial segregation in determining the nature of the practice that medical officers and surgeons could carry out as well as the value that was placed on their professional practice by their employers. One Irish surgeon, Winthrop Benjamin (W. B.) Browning was temporarily deployed as the surgeon in charge of a regiment of the British, rather than the Indian, Army in Madras Presidency from December 1882 to March 1883. As a result, he found himself locked into a battle with representatives of the local government over the amount of pay he was entitled to, because an IMS surgeon treating white rather than Indian troops would receive less pay than under his usual professional remit.

The regulations cited by local administrators still shaped policy making, but they were antiquated and conflicted with recent changes to the service conditions of IMS surgeons on duty. Browning’s plea for financial recognition of time spent with the British Army was made on the grounds of a sense of professional ‘justice’, in order to circumvent these antiquated regulations, but was rejected by the local government. Eventually, his case was brought before Earl Kimberley, the Secretary of State at the India Office, in October 1883. While Kimberley and others were sympathetic to Browning’s claim, there is no extant evidence left to ascertain whether his pleas for professional recognition were ever met.²³

Browning’s case was notable for a number of reasons. First, it highlights the manner in which the racial ideologies of the British state could prevent a surgeon from being paid for professional services rendered. Browning’s practice was not being determined by his intellectual abilities or practical skill, but by the assumption that treating native troops automatically reduced the quality of a surgeons’ work. Second, the fact that what was a relatively simple matter concerning pay and conditions could not be resolved at a local level reflects an instance of administrative incompetence.

That the India Office's Secretary of State in London, thousands of miles away, heard Browning's plea was quite remarkable.

In another case from later in the century, one of Browning's compatriots, George Hewitt (G. H.) Frost, could not claim his full amount of pay because he had not sat the compulsory 'Lower Standard Examination in Hindustani', which would provide a formal reflection of his ability to communicate with native soldiers. Given the lack of definition provided in archival material on the subject, 'Hindustani' should be assumed to have a literal meaning as one of a trio of languages, the others being Urdu and Hindi, that had overlapping jurisdictions and political significances at the time.²⁴ Frost was one of a number of surgeons who aired grievances to the Government of India about the docking of their pay on these grounds. The reason they had not passed the exam, they stated, was a result of 'the many changes of station and duties required' which made it 'almost impossible ... to carry on that steady and consecutive study which is necessary to pass'.²⁵

Frost's case was particularly interesting because it drew on a further aspect of imperial rule in India relating to surgeons and their practice: geographic space. The expectations placed on a surgeon in the employ of the Government of India to be geographically flexible were acute. This often meant being stationed, either in military or civilian duty, for very short periods of time, and then travelling large distances around the sub-continent for redeployment. In his first nine months of service in India, Frost changed roles nine times and consequently travelled 3100 kilometers around the then unruly North-Western Frontier Provinces (present-day Pakistan, north-western India and Afghanistan).²⁶

Constructing a spatial history of surgical careers can be an important part of future research on the history of surgery, although it is not entirely novel. In their prosopographical study of Joseph Lister's students, Anne Crowther and Marguerite Dupree followed individual biographies of a whole generation of surgical practitioners and noted the significance of colonial careers for the group of surgeons they focused upon.²⁷ This prosopographical approach should be utilized in tandem with quantitative methods, rooted in computer science, which would then allow for the recreation of career paths through various institutions, both colonial and otherwise.

Colonial India is a good case study for such work, as there are a number of sources that allow for the recreation of career trajectories, not least the Indian Army lists. The lists were annual, published records of every public servant under the employment of the Government of India, and a relatively full set of the volumes currently reside at the British Library.²⁸ Therefore, the documents provide information about where those employees were based geographically, what duties they performed in that year, and what rank they possessed. The collection thus represents a stable time-series, which can be used to track the career progression and geographic stability of a surgeon's career, as well as the professional activities they carried out. Over the past

three years, a project has been underway, piloted by the author and members of the support staff at IT Services, Oxford. While the focus of that project has been wide-ranging, career trajectories have formed an important part.

Such data reveal a number of characteristics of life as a surgeon in the employment of the Raj. In particular, is it possible to establish whether or not an ability to resist early and frequent relocation, such as in Frost's case, had an impact on building a stable professional practice and success later? Similar sources for later periods, c. 1900–1950, would allow for comparisons of the careers of IMS surgeons as the racial composition of the Service changed radically.²⁹ Tracing these institutional changes through collective career paths across European empires would allow for a broader perspective in the historical study of professional career making in a global context.

In summary, these insights into medical institutions, their inter-relationship with the dynamics of imperial and colonial governance, as well as the effects of those inter-relationships on the careers of surgeons, invite us to think more generally about the historical relationships between change in political institutions and the modern professionalization of surgery. Future work should apply similar methods and work with similar sources across modern empires. The resulting work would be able to establish whether tensions between a modernizing profession and the imperatives of imperial or colonial governance presented themselves in other contexts, too. This approach is also applicable to non-colonial contexts, such as the nineteenth- and twentieth-centuries' other dominant forms of political organization. Did burgeoning democracies influence the medical and surgical professions in the same way as described above?³⁰ Were similar relationships evident under fascism in Italy, or Nazism in Germany, or under Soviet Communism?

Such institutional perspectives on surgeons and their practice should, in addition, induce a reflection on the way in which racial politics functioned in imperial regimes. The prevalence of race as a determining factor of the pragmatic nature of military and medical institutions in India certainly speaks to an acute awareness of difference, broadly defined. In one sense, race operated in an 'outward-facing' manner, ensuring that imperial administrators and military personnel, even when the Government of India and the British Government in London employed them, knew whom the 'others' were. However, racial politics also operated internally, making the day-to-day functioning of imperial institutions more difficult. These internal products of racial politics also relay much to us about the ways in which governance was acted out, and professional practice curtailed.

A SOCIAL HISTORY OF SURGERY AND COLONIALISM

Thus far, our survey of surgery, empire and colonialism has remained at a wide aperture, focused on institutional dynamics generated across British imperial and colonial regimes, and on the changing meaning and transmission

of ideas about professionalization and its uses. From this point onwards, that aperture will narrow and focus more closely on historical records that allow us to conceptualize how surgical practice was socially constituted under colonialism, that is: by interactions between different types of people and their competing interests.

Recently there has been a body of work produced in the general history of surgery that investigates the social dynamics surrounding surgical practice, both between practitioners while operating and practitioners and their patients before and after procedures.³¹ In related sub-fields of the history of medicine, such as the history of medical ethics, the social history of obstetrics and abortion, and the history of psychiatry, these themes have been referenced too.³² A comprehensive social history of surgery under colonialism has yet to be written but, for our purposes here, Sokhieng Au's work on the relationship between medicine, French colonialism and indigenous Cambodian communities is a useful starting point. Clarifying her book's position on relations between these interests, Au wrote that, '[t]he comparison being made is not between French and Cambodian medicine; it is between concepts of the body, of politics, and of social relations along the fault line of French medical interventions'.³³ Au's multi-faceted approach is useful. She conceptualizes Western medicine as a constituent part of a broader historical social setting and, as a result, she takes into account a number of histories (French, colonial, culture among Cambodia's indigenous peoples) that played a role in forming how surgery was practiced at that place and time. We can use her work as a model to analyse how, in her own words, the 'fault line' of British medical interventions in India played out socially, especially in reference to previously unknown archival material.

Let's start by looking at the competing epistemologies of health in colonial Madras. The material for this investigation consists of a record of the work of fifty medical practitioners based almost exclusively at the Madras General Hospital (MGH) between 1873 and 1887. Their work was recorded in six casebooks that were later deposited at the Royal College of Physicians Ireland (RCPI), by the sisters of one of their number: Charles Sibthorpe, who was born in Dublin in 1847. After training at the city's College of Surgeons and College of Physicians, he embarked on a career in India, which saw him rise to the position of Director-General of the IMS in Madras. The six volumes of casebooks within the collection document the treatment of 312 patients from the Presidency's capital, but also its rural hinterland (*mofussil*). Venkatachellum, the patient referenced in the introduction, was one of these patients.

Although case records, as other sources too, need to be used critically,³⁴ this collection of sources provides an opportunity to analyse the way in which colonial surgeons negotiated their relations with patients, who could be offered treatment options derived from a number of epistemic origins. In the only case that took place outside the MGH, a number of colonial surgeons travelled to one of the city's palatial properties, Doveton House, in

the Summer of 1882. They were travelling to treat an infamous figure in the recent history of Anglo-Maratha relations: Malhar Rao (1835–1882), the former Gaekwar of Baroda.³⁵ The circumstances of Rao's deposition came to define his historical significance, but his appearance in the Sibthorpe collection provides new insight into the cultural battlefield that the body, its ailments and possible solutions to those ailments could be.

Sibthorpe, Cockerill, Branfoot and Wylie's treatment of the ex-Gaekwar was carried out from 30 June to 23 July, when he died 'of physical exhaustion brought on by his inability to take food due to monomania'.³⁶ They initially found Rao suffering from a case of acute dysentery, and the way in which the surgeons described their competition with Islamic *hakims* to treat the ex-Gaekwar is of most interest to us here. The case notes recorded that:

great difficulty was found by them in getting him to carry out the treatment. He threw them up for a time and resorted to the treatment of a Mahomedan Hakim who amongst other things gave him powdered peanuts and a powder of a species of marble ... Before they left they met in consultation and recorded that the disease had become chronic on the 29th June.³⁷

Further down the same folio, the surgeons detailed that they later prescribed thirty grams of *Soda Bicarbonatis*, along with ninety grams of an illegible substance, to be divided into 'six powders' and ingested twice a day. Whether or not this was the prescription that was competing with the *hakim's* recommendation remained unclear.

The passage above is interesting for a number of reasons. For example, it shows how different cultures were layered over one another during these health encounters: we have the former ruler of a Maratha-Hindu dynasty negotiation interactions in a cultural battle between Anglo-European, allopathic practitioners, and practitioners of Islamic *Unani-Tibb*. Second, it exhibits how the professional remit of a surgeon could be stretched and changed depending on the specific demands of a particular case. Although Sibthorpe, for example, trained in surgery, he was asked to act in this instance more as an apothecary and physician.

Furthermore, the surgeons were not only frustrated by the presence of the *hakim* but, in addition, by the arbitrary and truculent behavior of their patient, and their inability to convincingly show that their *pharmacopeia* was any more effective than the alternatives being offered. Whether or not being able to give the ex-Gaekwar a succinct appraisal of the pathological origins of his illness would have made any difference in influencing his eventual decision is impossible to say. However, it would appear that Rao's perception of his various options were relativistic; for him, there was nothing to distinguish between the efficacy of powdered peanut or bicarbonate of soda in the treatment of acute dysentery. Interestingly, we must also take into account the importance of individual personalities in mediating the shape of these encounters. Further on in the case notes, the surgeons noted that Rao

only believed in the skill and knowledge of one particular IMS surgeon, Mr Simpson. Sibthorpe noted, ‘he did not wish to place himself under my care and expressed a wish that Mr Simpson[,] in whom he had great confidence[,] might be allowed to treat him. Mr Simpson has done so under my orders[,] the ExG[ackwar] believed that the treatment was that of Mr. Simpson’.³⁸ So, although these encounters *were* battles between medical cultures that represented very different conceptions of healing solutions, they were also mediated by arbitrary factors such as which practitioner a patient was more likely to place their trust in. If similar sources could be found for other colonial locations, one wonders if the same sort of dynamics would present themselves in the practice of colonial surgeons there, too.

Within the collection as a whole, the treatment of the ex-Gaekwar was atypical, in a number of senses. He was a member of the social elite to a greater extent than the vast majority of patients treated; 21% of patients recorded elsewhere in the casebooks were described as various types of ‘coolie’, who worked in cotton mills, or on landed estates (*zamindari*) or farms. Furthermore, as mentioned above, he was the only patient treated outside the confines of the hospital, which was a regression to an earlier set of professional circumstances where surgeons would travel outside the institutions they were attached to in order to pursue lucrative work treating wealthy clients.³⁹ However, Rao’s case was similar to the other cases within the collection in that the relationship he had with the surgeons who treated him was conditioned by a number of cultural, ethical and epistemological factors.

The surgeons’ framing of Rao’s case was representative of the theoretical and philosophical reflections about the nature of practitioner-patient relations that became more common over the course of the nineteenth and twentieth centuries. Across our period, there was a growing consensus among practitioners trained and practicing in the Anglo-European world and its colonies that the contours of these relationships were important enough to be explicitly conceptualized. For example, the period represented the birth of a formalized conception of medical ethics; Thomas Percival explicated on the concept in his eponymous volume of 1803. Historians Robert Baker and Laurence McCullough think that Percival’s invocation of the term was the formal beginning of its historical usage, and go as far to claim that ‘anyone who wishes to extend the concept of medical ethics to eras earlier than 1803 needs to demonstrate that this extension makes sense’.⁴⁰

Over the course of the nineteenth century, and into the twentieth, an ethical sensibility grew among practitioners in line with the currents of professionalization previously described, as well as a proliferation of increasingly specialized technologies that changed the nature of medical practice from ‘individual practice in a competitive private market to [the] integrated general and specialist provision of healthcare’.⁴¹ These broad changes induced a proliferation of public discourses, both in terms of print media and political institutions, around the ethical circumstances of medical practice.⁴²

Where do colonial surgeons, and the patients they practiced upon, sit within this broad, evolving context over the course of our period? Bridie Andrews and Andrew Cunningham stated in 1997 that practitioner–patient relationships in imperial and colonial regimes were defined by patients’ submissiveness and their exclusion from ‘the diagnostic or curative processes.’⁴³ However, this static framework leaves no room for discussing archival material which documents practitioner–patient relationships as being mediated by ethical constructs such as ‘consent’, which in turn were rooted in kinship networks and economic obligations beyond the confines of the hospital.

Let’s look at another example. Between 23 November 1886 and 1 February 1887, the surgeons of the MGH treated Veeraswamy, a Hindu coachman aged 50 who was suffering from a fracture of the leg. After an initial operation, he was offered another operation, although the reasons for this offer remain unclear. Veeraswamy declined, stating that ‘his master had given him a pension and he was satisfied with the result of the operation’.⁴⁴ The surgeons were content to act in accordance with his wishes, yet again did not note why. They provided him with crutches and a leather kneecap, before discharging him on 1 February.

We can also return to Venkatachellum’s case in this regard. The first operation described above failed and, two months afterwards, the staff of the MGH expressed surprise that ‘no fusion’ had occurred between the bones in his right leg. Therefore, the surgeons believed the best course of action was to amputate the limb, as they believed it would be of no practical use to him, and would be liable to further injury. In much the same manner as Veeraswamy’s case, the surgeons recorded entering into a process of negotiation with Venkatachellum that determined the nature and outcome of his treatment. They wrote, ‘taking all these things into consideration, an operation was decided on, and he was quite willing to consent to it if his relatives had no objection. He therefore went on leave to consult his relatives and returned on the 24th November to have the right limb taken off.’⁴⁵

Both of these cases show how complex the relationships between surgeons and patients in colonial locations could be at the end of the nineteenth century, and that these complexities operated in a number of ways. We cannot, for example, reduce the practitioner–patient relationship to the practitioner and the patient. Certainly, in the immediate setting of a hospital’s ward those two agents were important in determining the nature of the practice carried out, but socio-economic relations beyond the hospital’s boundaries also determined the nature of that practice across space and time. Sally Wilde has also noted the significance of family and contractual obligations in mediating practitioner–patient relationships for other contexts.⁴⁶

Furthermore, the invocation of ‘consent’ in these exchanges is interesting, if amorphous. The way in which it was deployed in the case books denoted

that some form of verbal exchange had taken place between the surgeons and their patient concerning the best course of action to take. However, it is not clear what consenting to an operation actually meant. Did patients understand what was being proposed? Although IMS surgeons were required to be basically proficient in Hindustani, we already know that obtaining such proficiency was not a straightforward task. In addition, how did the surgeons phrase these conversations? Did they use technical language, colloquial English, or search for phrases from native languages to convey the meaning of the procedure? Was there an equivalent formal or informal socio-linguistic concept for regulating the administration of healing processes within the communities of which they were a part?⁴⁷ These challenges might have been more pertinent in a colonial location, defined by cultural and ethnic difference, than in a context that shared a viable *lingua franca*, as in Wilde's examples. These are all factors contingent on the idea of consent in medicine, but they are very hard to recapture from clinical sources such as the Sibthorpe collection, as there is little context provided for what the word meant. Consent is now a central mediating concept within medical ethics and practice, but we know virtually nothing about its historical origins.⁴⁸

SUMMARY—COOPERATIONS, COLLABORATIONS AND METHODOLOGICAL LENSES

The history of surgery, imperial rule and colonial life is rife for investigation, but must be examined through a number of different lenses. Research needs to be conducted comparatively across colonies and empires, as well as other types of polity, in order to be fully convincing. First, we must take into account the institutional contexts that formed surgeons and their practices. The currency of professionalization in the nineteenth century, for example, was not worth the same in colonial locations as it was in metropolitan locations, and often had to be modified in order to sit congruently with the military, political and economic demands of imperial and colonial governance. These large institutional forces had direct consequences for the ways in which surgeons could practice, and where they practiced. Therefore, the historical linkages between institutional dynamics and the potential they created for practice should be high on any future research agenda.

Furthermore, scholars of different colonial locations and different empires must collaborate in thinking, writing and speaking about these issues. How common, for example, was the invocation of consent as a determinant of the ethics of surgery across empires and colonies at the end of the nineteenth century? If it was common, how did that commonality come about and, if it was not, why did 'consent' have more application in some locations rather than others? Furthermore, how did surgeons negotiate the linguistic difficulties in explaining the procedure that was about to take place,

and what did the concept of ‘consent’ mean to their patients? Answering these sorts of questions would throw into relief another type of relationship between representatives of imperial governance and those forcibly incorporated into the purview of their power.

Finally, a ‘colonial’ lens, predicated on a history of power mediated through race, is not the only way of analyzing colonial societies and the history of surgery within them. Although race was fundamentally important in determining how colonial governance and its institutions were structured and how they operated, it should not define our research agendas entirely. Might we compare, for instance, the experience of Sibthorpe in treating an Indian elite with a surgeon in Harley Street treating Britain’s provincial elites? Further down the social order, how did practice at the MGH compare to equivalent hospitals and their patients in the UK and the USA at the same time? Was consent invoked there and what did it mean? Answering these sorts of questions would necessitate an analysis not only in terms of race, but also in terms of class, which would be an equally fruitful avenue of inquiry. Only when we adopt these wide-ranging and ambitious research agendas will we be able to see the full institutional and social tapestries of imperial and colonial rule and analyse the specific conflicts and tensions that surgery and surgeons had to negotiate.

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Surgery and War: The Discussions About the Usefulness of War for Medical Progress

Leo van Bergen

On the subject of war and medicine in general,¹ and war and surgery in particular, a steady stream of academic works have been published since the late 1990s.² These publications focus on themes such as the life and accomplishments of individual surgeons, the organization of military medicine, the influence of medicine on society more generally, and on the changes that a particular part of medicine or surgery went through in a specific war. In most of these publications the benefits of war for the development of medicine, and of surgery in particular, is implicitly, but sometimes even explicitly, underlined, but rarely discussed in a critical manner.³ Moreover, even critical opinions have had only a limited impact on the generally positive view of both historians and physicians on this question. It is therefore worth taking up the thesis that ‘war is beneficial to medicine’ in more detail in the present chapter. I will look at its proponents and critics and their arguments, present the historical context and suggest reasons why this thesis has come up and stayed so popular. Thus, this chapter looks less at surgery in wartime as such, but explores in a reflexive manner the question of whether war did indeed lead to substantial improvements in medical knowledge and practice, especially for civilians in peacetime.

The war that has made the ‘goodness of war’ theme popular is without doubt World War I of 1914–1918. As early as 1922, the voluminous German *Handbook of Doctors’ Experiences during the World War*, which included two

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volumes on surgery,⁴ stressed the importance of war for medical advancement. Medical memoirs confirmed this interpretation. For instance, in his autobiography from the 1950s, the famous German surgeon Ferdinand Sauerbruch even called the war ‘my bloody teacher’.⁵ Sauerbruch was certainly not the only medical author looking at the 1914–1918 catastrophe this way. As medical historians like Wolfgang Eckart or Paul Lerner have shown, many doctors in 1914 thought that war would enhance soldiers’ mental health and physical strength. Even though many individuals would be maimed or killed in a war, the greater whole—the army, the people, the race—would benefit from the hardships endured. This notion did not disappear when the war turned out to be more destructive and protracted than first anticipated. From the perspective of authors like Sauerbruch, war was not the doctors’ adversary, but rather resembled a valued colleague.⁶ Similarly, in Britain and its Empire, official histories, often written in a tone of self-justification, largely supported the ‘war is good for medicine’ thesis throughout the interwar period. Along these lines, many subsequent historical accounts have focused on individual innovations and accomplishments of heroic war-surgeons, for example plastic surgeon Johannes Esser, who worked in the World War I hospitals of Budapest, Vienna and Berlin,⁷ or Harold Delf Gillies, chief at the maxilla-facial specialist hospital in World War I Britain. Such accounts have confirmed the opinion that, whatever the hardships of the Great War, it at least advanced medicine, especially surgery; and that, even more, knowledge and practice gained in war has benefited not only soldiers in a specific war but everybody, including numerous patients in times of peace as well as in possible future wars.

Subsequently the example of the Spanish Civil War⁸ and World War II further strengthened the idea of the goodness of war. Again, authors hailed its usefulness for medicine in general, and for surgery in particular. Even among historians, the critical discussion of medicine in World War II focused almost entirely on the abuse of medicine in the German concentration camps or by the Japanese occupiers in China, as typified by Robert Jay Lifton’s *The Nazi Doctors*, an attempt to psychologically explain the medical involvement in the Shoah.⁹ It was perhaps because of this focus on crimes against humanity that the idea of war’s benefit for medicine would survive even the bombings of Hiroshima and Nagasaki and be continued into the times of the Cold War. Baffling in its frankness, a NATO-handbook dating from the early 1960s stated that a nuclear war ‘might’ bring misery, but would certainly augment knowledge about radiation sickness.¹⁰

More recently, the Dutch emeritus professor of plastic and reconstructive surgery J. van der Meulen, stated that ‘the irony of war’ is that ‘where destruction is intended and attained, reconstruction is also inevitably the result’, echoing the sentiments of surgeons in World War I. Destruction, he ventured, ‘brings people face to face with their insignificance’ and challenges

their inventiveness: 'The more ingenious the methods of destruction, the more salutary are the restoring alternatives', he claimed.¹¹

Even in a pacifist book, published in 2002 under the title *War or Health?*, one of the contributors, Matti Ponteva, in his chapter on 'The Impact of Warfare on Medicine', provided a list of mostly surgical matters that owed much to warfare: 'the proper treatment of infected wounds', 'the external fixation of limb fractures and methods of treating special forms of gangrenes, trench foot, cold injuries and burns', 'brain and neurosurgery', 'reconstructive surgery', 'the understanding of stress reactions and disorders', 'quick support in critical situations', 'catastrophe or disaster medicine'. 'Many steps in surgical advancement and anaesthesiology during the twentieth century owe a debt to military medicine,' he pointed out. 'The impact of warfare [...] on medical research can be stimulating and demanding, leading sometimes to real achievements.'¹²

These references exemplify the reasoning behind the 'goodness of war for medicine' thesis: war causes an abundance of diseases and injuries, therefore new methods can and must be explored, and older ones abandoned. Such conditions, as the argument goes, furthermore benefit practical training. Especially in the case of surgery, young surgeons enter the war as laymen and emerge from it as highly trained experts, to the immediate benefit of civilians in times of peace and the potential benefit of soldiers in future conflicts. It seems to make sense, but does it?

QUESTIONS RAISED

Historians have raised a number of questions about the seemingly straightforward cause-and-effect relationship between war and medical progress in surgery. A first question concerns the often negative reactions of the medical personnel that were directly involved: If war is beneficial, then why have World Wars I and II given rise to a medical peace movement, as for instance Nick Lewer has shown?¹³ Apparently there were doctors (and nurses) who failed to see the advantages of war, or at least thought that the disadvantages for humankind, including the negative effects of war on civilian healthcare,¹⁴ far outweighed potential advantages.

Second, even in the cases where war has indeed given birth to medical innovations, such as the famous Esser-inlay in plastic surgery or the creation of new disease entities in psychiatry, these innovations were contingent on a multitude of experiments, which had little or no positive effect on those who were involved in them. We have, as Ana Carden-Coyne noted in her recent *The Politics of Wounds* on British medical care in World War I, focused on the successes shrouded in the progressive narrative of 'modern' surgery, while forgetting the often disastrous consequences for patients. As to diagnoses, many of them were, as Allan Young convincingly stated about Post Traumatic Stress Disorder (PTSD) in his *The Harmony of Illusions*, a consequence of political

and economic circumstances instead of objective medical research, and they often vanished again when conditions changed after the war.¹⁵

Third, the direct relationship between war and surgical advancement is severed, if these inventions could also have occurred in times of peace. We need to ask if the invention of new methods and techniques in surgery was really an effect of war. Were inventions and new knowledge inevitably rivetted together with war or would they have occurred without those wars as well? For instance, the mentioned Esser-inlay for preventing the necrosis of transplanted skin is usually seen as a direct consequence of the work that Esser performed in 1914–1918.¹⁶ It is true that the inlay was first tested on deformed war victims. But there is no reason to assume that it would never have been tried if Esser had not dealt with war casualties, but with, for instance, road victims. In other words, we need to ask if particular inventions have been connected to a particular war more by coincidence than by necessity.

The fourth question concerns definition. In the relationship between war and medicine the concept of ‘advancement’ should be problematized. While in peacetime the doctor is—or at least should be—the patient’s ally and aims at curing him or her from his or her ailments as best as possible, recovery in wartime, partly because of the military responsibility of the health officer, often means that the recovered patient is returned to the front. It is very questionable if this return was actually desired by the patients. This can be seen by the large number of self-inflicted injuries, exaggeration of symptoms, outright simulation of an illness or injury, and the popularity of the so-called Blighty, *Heimatschuss*, or *bonne blessure*—a wound severe enough to be sent home, but (seemingly) not severe enough to invalidate the soldier in the long run.¹⁷ From this perspective, a hospital stay is not a necessary evil, but a welcome liberation.

This discrepancy about the function of medicine in war points to the question of the doctor’s role more generally. To what extent does the war-related transformation of the usual medical-ethical rules affect the physician’s attitude in practising his job after the war has ended? Related to this is the emotional hardening of the medical personnel towards suffering and death in wartime, vividly described by World War I nurse Mary Borden in her fictionalized, autobiographical *The Forbidden Zone*. Will this de-sensitization result in unacceptable apathy in peacetime?¹⁸ In other words: even if a surgeon returns from the war as an accomplished technician, does this also mean that he has become a better doctor?

The last question is probably the most important one: Why is the sentence ‘war is good for medicine’ often heard, but the line ‘peace is good for medicine’ hardly ever? I will discuss this later.

CRITIQUE

Despite the prevalence of the claim that war is good for surgery, there have always been critical voices too. For instance, John Shaw Billings (1838–1913), who was not only a military surgeon but also the founder of the Surgeons' General Library in the USA, took the view that the experiences of eighteenth-century surgeons gained on the battlefield had contributed only little to the development of surgery. During World War I, military doctor Fielding H. Garrison (1870–1935), one of the pioneers of the history of medicine who established the *Index-Catalogue of the Library of the Surgeon General's Office*, remarked that the medical innovations the war had brought were 'clever and respectable', but 'by no means brilliant'. After World War II, the American journalist and historian Albert Deutsch (1905–1961) wrote that he did not understand what the fuss was all about. He himself was unable to mention a single example of a medical innovation of real importance to originate from that war, or any other, for that matter.¹⁹

Within professional history of medicine, Roger Cooter was one of the first historians to fundamentally criticize the 'war is good for medicine' thesis. In his 1993 *Surgery and Society in Peace and War*, an account of orthopaedics in Britain between 1880 and 1945, Cooter showed that the British reforms to the organization of orthopaedic care during World War I were of only temporary character. After the war, things returned to the pre-1914 conditions. Also, because during the war British students had been all but absent in the British training facilities, 'specialization remained largely confined to hospital consultants, and the principle of patient referral from (general practitioners) was kept intact'.²⁰ War, Cooter claimed, did not necessarily and universally lead to lasting change. If anything, it slowed or even stopped advances that had already been going on before the war. Cooter criticized historians of medicine for neglecting to thoroughly investigate the awkward object of the relationship between war and medicine, and for taking the goodness of war as a given instead.²¹

In the opening article of the collected volume *War, Medicine and Modernity* Cooter, as one of the co-editors, referred to the then current historiography, which had mainly been written by (military) surgeons like Sauerbruch, and in which the progress of medicine through war was a recurring theme. In his eyes, these authors had constructed naively positivist and inherently militaristic stories about war and medicine. Through their focus on simple technical skills and organizational advancement much more important questions on 'the impact of war on aims, concerns and social configurations of medicine' had been ignored.²² This view coincides with that of Carden-Coyne who pointed to the fact that 'in personal encounters many medics felt a schism between the body as a unit of military manpower and the body as a suffering individual'. Consequently, 'the history of military medicine cannot be written as a story of "progress" and "modernization", in which war facilitates

modernity and is “good” for medicine—streamlined into effectiveness by wartime bureaucracy and the state of emergency’.²³

In 2008 German historian Susanne Hahn, in an article on the development of cardiovascular surgery during World War I, stated that the war ‘greatly impeded medical developments, since it prevented the medical profession from fulfilling their potential’. Medical research in times of war, she explained, had focussed on the kind of health care that was valuable for the war effort, often at the expense of those branches of health care that were not war-relevant. So even if war was indeed beneficial for medicine, this applied only to some specific aspects of the trade.²⁴

And there were more critics. In his book on German healthcare during 1914–1918, *Medicine and War*, Wolfgang Eckart stated that although one could find some medical progress during World War I, for instance in terms of organization, medical equipment and expertise, there had been no true paradigm shift ensuring that medical care after 1918 was truly different, or, more importantly, of better quality than it had been before August 1914.²⁵ Similarly, Dutch historian Hans Binneveld, in his *From Shellshock to Combat Stress*, found that after the Russo-Japanese war (1904–1905), both World Wars and the Vietnam War, peacetime psychiatry had not profited from war psychiatry. The relationship was exactly the other way around. In general, Binneveld said, war psychiatry had not been innovative at all. Rather, war psychiatrists applied the knowledge gained in times of peace, merely adapting it to the changed circumstances.²⁶

Along these lines Karen Metz and Richard Gabriel in their voluminous *History of Military Medicine* stated that, ‘much of the medical knowledge to achieve (the salvation of manpower, which is the purpose of any military medical service) was in existence for a very long time prior to its actual, systematic use by the various military medical services of the world’. They also argued that, independent of whether wartime medicine is profitable for medical care in times of peace, the knowledge gained in one war is of little use to others. Diseases and injuries in times of war were always specific to the circumstances of conflict. They depended on, among other things, the weapons used, military strategy and tactics, geographical and climatic circumstances and preventive measures taken. It is this specificity that was expressed in the military medical saying: ‘Show me the wounds, and I will tell you the kind of war that was waged.’ The evolution of new weaponry and the advances in the conduct of war proceeded faster than those of the medical services. As a consequence, they ‘can never really catch up to where they can realistically provide the kind of survival assistance that the modern soldier has come to expect’.²⁷ It is an opinion already captured by World War I nurse Ellen N. La Motte, who, in her critical *The Backwash of War*, stated that ‘the science of healing stood baffled before the science of destruction’.²⁸

Carden-Coyne agreed that World War I had hindered rather than advanced the development of surgical hygiene, initiated in the nineteenth century by

men like Thomas Mütter and Joseph Lister. It is true, she conceded, that the abundance of injuries provided an opportunity for trying out new procedures and methods, albeit ones conducted not rarely on enemy soldiers. It was a kind of experimentation that was impossible to perform in civilian life. The results of such tests, certainly when conducted near the frontline, were hard, if not impossible to measure. This situation was reflected by the German psychiatrist Otto Binswanger who in the 1920s said that it was not because of a lack of data he hardly could say something worthwhile on war neurotics, but because there simply were too many.²⁹ Undoubtedly these remarks apply to surgery as well.

More often than not, Carden-Coyne explained, medical experiments in war were exactly that: experiments. If one drug did not help, if a certain anaesthetic did not make the patient go under, if one surgical trick did not lead to a cure, another one was used and then another one. If in the end one medicine or anaesthetic was discovered, one surgical technique developed that did the trick, it was not thanks to the war, but as a result of the sacrifice of all the men who in the process lost their lives or limbs.³⁰

Finally, in 2008 military surgeons Shawn Nessen, Dave Lounsbury and Stephen Hetz published a large volume for those deployed in the field, entitled *War Surgery in Iraq and Afghanistan: A series of cases 2003–2007*. Graphic colour plates of horrific wounds from improvised explosive devices and artillery taken on digital cameras by the surgeons accompanied detailed descriptions of operations conducted in combat theatres. Poignantly, the volume begins with a quotation from the eminent military surgeon Sir Charles Bell (1774–1842), in which he contrasted the heroic image produced of the battle of Waterloo with the ‘gloomy uncomfortable view’ and the almost incommunicable ‘picture of human misery’ from the perspective of wounded soldiers who pleaded for amputation. *War Surgery* emphasized the significant differences between combat and civilian trauma, questioning the efficacy of civilian treatments for combat wounds, and by doing so questioning the efficacy of war medicine for civilian medicine.³¹

CIRCUMSTANCES AND PRIORITIES

To decide if the idea of the specificity of the circumstances of war as presented in *War Surgery* is correct, we need to examine the claim that wartime knowledge and practice have been beneficial for peacetime medicine and patients as well. Such an examination shows that circumstances of medical practice in war and peace differ greatly. To start with, the patient population was completely different: Up until World War I, hospitals in wartime were dominated by sick and wounded men between age 18 and 50, thereafter to be joined more and more by injured civilians. In times of peace, by contrast, the vast majority of patients consists of sick children, pregnant women and elderly. The severely wounded and the mentioned population of young males,

are at best a minority. A further discrepancy concerns the nature of the injuries occurring in peacetime and wartime contexts. As Carden-Coyne found, World War I ‘brought the opportunity to increase experience and knowledge [...] in attending to injuries *not seen in civilian life* (Ital. Lvb)’.³² It is true that surgeons ‘gained greater experience of wounds and their management in the wars of the late eighteenth and early nineteenth centuries, especially the American War of Independence and the various Napoleonic campaigns’, but this experience would have been of little relevance for peacetime surgery.³³ Towards the start of World War I, consulting surgeon Anthony Bowlby (1855–1929), probably paraphrasing a famous line of Rudyard Kipling, made precisely this point, stating that ‘war is war, and the surgery of war is not the surgery of peace and never will be’.³⁴

In the battlefields of the Crimea (1853–1856), the American Civil War (1861–1865) as well as both World Wars, wound infection was hard to battle, even after asepsis and antisepsis had become known and generally accepted. The enormous number of wounded soldiers and the severity of their injuries, the unsanitary environments and lack of medical personnel and resources posed serious obstacles to effective surgery. Hygiene was lacking, not only in the field but in hospitals too. From the Napoleonic wars to World War II, the mud-covered wounded arrived hours or even days after sustaining their injuries. The constant moving around of the sick and wounded on carts or later on in motor-ambulances, over bumpy, mud-ridden roads was detrimental to the healing process. The wounded were then deposited at filth-ridden stations infested by rats, poorly equipped for surgery, where the surgeons nonetheless were expected to do an excellent job.

Furthermore, in wartime, military necessity is considered of higher importance than medical necessity. Speed and efficiency are prioritized above medical needs of time for rest and healing. Constant transport of the wounded and the sick was commonplace. After World War I, the Belgian physician Maurice Duwez, writing under the name of Max Deauville, stated that the difference between wartime and peacetime medicine is that the first is about transport and the second about healing.³⁵ He described clashes between military doctors and their civilian colleagues who, during war, came to their assistance and how their opposing ethical positions resulted in conflict and the resentment by civilians of military hierarchies. One additional problem was that the dictate of speed and efficiency put an additional burden on doctors and nurses, leading to mistakes which in other circumstances would not have been made, and causing deaths that could have been avoided if military necessity had not outweighed medical necessity. In addition, the sheer numbers of patients led doctors to perform bold and risky procedures—sometimes successfully, but far more often resulting in medical errors and diminished survival rates.³⁶

Consequent to the priority given to speed and efficiency, many injured soldiers lost limbs that would not have been amputated if pressure of time had been less severe. The advance of anaesthesia, an invention of peacetime,

changed this only in part. Although, as Metz and Gabriel point out, it certainly revolutionized war surgery,³⁷ its use has arguably even been slowed down by war, because wartime surgery was often more characterized by its absence or its failure than by its presence or success. This was undoubtedly part of the reason why many soldiers gave the nickname ‘butchers’ to the surgeons they came across.³⁸

In some cases—such as the use of X-rays to detect shell-splinters, the fabrication of ingenious prosthetics or the use of electricity to ‘heal’ war neurotics—the limitations, obstacles and demands of the war did indeed stimulate doctors’ inventiveness. However, many practitioners followed the opposite trajectory and chose the familiar above the unknown in their medical practice. This again means that the supposed openness of doctors to new and alternative practices, which is seen as one of the advantages of war, was the exception rather than the rule. Many surgeons looked, above all, for the fastest treatments for the most common injuries. There was no time to consider whether this actually was the best possible treatment. War surgery, generally speaking, and especially near the front, was essentially conservative and adverse to innovation.

Shortage of qualified practitioners and lack of time were problems that also applied to the practice of triage. Doctors (or nurses or even stretcher bearers) had to select patients for treatment, even if they lacked the knowledge or experience to make such life-and-death decisions in a responsible and ‘just’ manner. More importantly, from an ethical point of view wartime triage was contradictory to the principles of peacetime triage, which once more meant that the skills acquired in the war were not applicable to peacetime medicine.³⁹ Thus, in times of heavy fighting, the severely wounded were not prioritized, as they would have been under normal circumstances. Instead those of the wounded soldiers who seemed to be able to play their role in the theatre of war again were selected for medical treatment. ‘Do not bring me corpses’, a French doctor said to a stretcher-bearer during World War I after delivering a heavily wounded, but still living *poilu*.⁴⁰

Since war surgery is characterized by solving problems particular to wartime circumstances, the relevance of the knowledge of mastering them is limited in peacetime. An example, given by Cooter, is amputation. Practitioners’ lack of experience in this operation had been a major problem when World War I started.⁴¹ However, after the war, amputation became a relatively rare procedure again, so that the experience gained was largely irrelevant. Similarly, expertise in treating gas gangrene, a frequent complication in World War I, could not be transferred to times of peace either, because the condition occurred almost exclusively in the muddy, polluted and poisoned trenches of Ypres, Somme and Verdun.⁴² After the war the problem vanished, as it had not existed before 1914, and it was an (almost) unknown phenomenon in the war of movement 1939–1945, the jungle war of Vietnam or the so-called ‘clean wars’ after 1990.

The conditions of war are also highly detrimental for longer-term medical research. The research that was done in wartime was limited to war-related problems and many of the medical experiments carried out took place in abominable circumstances, unpropitious for scientific advancement. At times, injured patients would be used to test treatment methods, which would have met with ethical criticism in more peaceful times, so that, often, experiments that in peacetime would have been conducted on mice or rats, were in wartime performed on human subjects.⁴³ In an environment where death was a daily occurrence, the disastrous consequences for the individuals involved rarely prompted serious concerns. As a consequence of the differences in terms of ethics, a lot of wartime experiments were not reproducible in peacetime. This was an issue that, in a similar way, invalidated the outcomes of the experiments conducted in Nazi concentration camps too.⁴⁴

Furthermore, as we have seen, in war, priority is given to the strength of the nation and its combat forces. Success is measured by the patient's return to the front or the weapons factory, not by the individual's health or sanity. Moreover, as Donald Richter has made clear in his book on chemical weaponry, doctors not only played a role in prevention and healing, but also—and not insignificantly—in developing means of destruction,⁴⁵ an aspect of medical war interference seldom considered.

It is therefore quite obvious that conditions of peace—enough time and resources for conducting fundamental research, international trust and cooperation among scientists—are much more conducive to scientific progress than those of war. This insight affects the very heart of the statement that 'war benefits surgery, or medicine in general', which only applies if medicine and surgery advanced faster in times of war than in times of peace. If war and peace are equal in this regard, the phrase is pointless; and if peace is better for medical development than war, the phrase is erroneous. Even a cursory look at the history of medical progress can provide an answer to this question, since it is undeniable that the major breakthroughs in medicine since the middle of the nineteenth century—anaesthetics, antiseptics, bacteriology, the discovery of blood groups, penicillin, the unravelling of DNA, the first heart transplantation, to name but a few—have all been the results of peacetime research. Some of the inventions coming from them—for instance blood transfusion—may have been born in war or accelerated by it, but would most probably have seen the light of day without war as well.

THE MILITARY GOAL OF MEDICINE AND THE BIRTH OF A MYTH

If the proposition that war benefits surgery is questionable, how did it arise in the first place, and how has it attained its almost self-evident status among many physicians? The answer lies exactly in the special relationship between war and medicine, in which medicine's mission is not primarily to heal the individual, but to boost the nation's and soldiers' morale and keep up the

fighting-strength of its troops. ‘Medical care’ thus means something completely different in wartime than in peacetime (which in itself already challenges the opinion that war is good for medicine). As Jeffrey Reznick put it in his book on caregiving during World War I, *Healing the Nation*, medicine in wartime had more to do with disciplining body and mind than with healing body and mind.⁴⁶ Or, to put it in the words of medical officer James Dunn after World War I, the first duty of a regimental doctor is ‘to maintain the discipline and morale of his unit’. To do that, ‘the health of individuals may have to be sacrificed temporarily, even permanently’, as Dunn specified.⁴⁷ Similarly, the US *The Military Surgeon* told its readers in 1917: ‘The whole object of the medical service in war is to provide men for the fighting line, to keep them fit, and, if sick or wounded, to make them fit and ready for further fighting as soon as possible.’ The preservation of human life took second place to the preservation of combat strength, so that the army doctor was obliged to prioritize to the general good over the welfare of the individual.⁴⁸

Although individual physicians often claimed that their loyalty should remain with the patient, they also agreed that this was not always possible in wartime, and most of them accepted the idea that medicine had to play an important role in maintaining military manpower. Especially at times when healthy soldiers were in short supply, doctors felt they had to side with the army’s interests rather than the patient’s. Medicine was thus by no means ‘an island of peace within an ocean of violence’, as it has often but erroneously been represented since the middle of the nineteenth century. This applies even to the Red Cross, an organization which has often been presented as a heavenly refuge within hell, but whose national chapters are in most cases incorporated into the military health services of the fighting nations.⁴⁹ Medicine and surgery did (and do) not stand outside the war, they were (and are) an integral part of it.

Using the case of orthopaedics in World-War-I Germany, historian Heather Perry has looked at an additional phenomenon, the ‘militarization of the body’—a term that describes the almost unlimited use of individual lives for war purposes.⁵⁰ In her *Recycling the Disabled* she showed how orthopaedics became part of the war machine and made it possible that even bodies that were torn apart could be re-used to serve war purposes. Contrary to Cooter’s conclusions on the UK, she stated that the war definitely changed German orthopaedics and brought ‘significant accomplishments in medical technology and professionalization’. But she also found that all the medical good coming out of the war was an unintended by-product of the orthopaedists’ war activities—activities not meant to enhance medical care but to support the war-effort. In this they very much succeeded. So we can say that even if in some ways the war had been good for medicine, medicine certainly had been good for the war.⁵¹ With this judgment Perry has followed in the footsteps of Fielding Garrison, who ended his *Notes on the History of*

Military Medicine (1922) by stating that medicine was useful for warfare, and the more destructive the wars were, the more useful medicine became.⁵²

However, even if surgeons sympathized with their country's military objectives, they could not escape the brutality and the inhumanity of war. Carden-Coyne has demonstrated how practitioners continued to grapple with these questions in their memoirs, and how some of them fled into drugs and alcohol or suffered from depression. Most doctors, however, tried to attribute some higher meaning to all the savagery they experienced. Some of them found that meaning in the idea of the goodness of war for medicine. This claim represented a narrative mobilized to downplay and rationalize the assault on the Hippocratic oath that modern war presented.⁵³

Since much of the medical writings on our topic emerged under the conditions of censorship and pressure to support the moral of the war-faring nations,⁵⁴ it is worth turning to the neutral countries in order to find more evidence about the origins of the goodness of war thesis. Take for instance the Netherlands, a country from which in World War I several medical teams and individuals set out to the various fronts. It is remarkable that, during the war, most Dutch testimonies did not propose that war was good for medicine. Only one physician publicly expressed that view, orthopaedist P. H. van Eden, but he had not been active in the war.⁵⁵ Those who had been active took a different stand. In 1915, after having worked for a year in German military hospitals, Swiss born professor Otto Lanz was pleased to return to his clean Amsterdam university hospital and leave the 'surgical days of old' behind him.⁵⁶ He was seconded by A. van Tienhoven, who had worked in the Balkan wars, and during World War I in Serbia, France and Albania and was decorated several times for his activities. He wrote in an article of April 1918 that the fighting had resulted in hardly any benefit for medicine whatsoever. Technical skills, for instance, certainly had developed, but most surgeons only mastered techniques that were specific to the war and therefore of limited value in peacetime circumstances. Nevertheless, van Tienhoven continued, many young war surgeons had begun to think of themselves as master surgeons, and after the war would be unwilling to drop the scalpel despite the fact that peace-time medicine required other kinds of skills. Furthermore, Tienhoven argued, a lot of potentially valuable research on medical topics that were less war-related had come to a standstill during the war, while many techniques which had only come to the fore during the war were in themselves not new,⁵⁷ as discussed earlier with regard to war psychiatry.

However, even in the Netherlands we can also find other voices. Considering the fact that van Tienhoven was a prominent figure in the Netherlands after the war, it is surprising that in 1920 physician Hendrik Rath, who, like van Tienhoven, had worked at the French side of No-Man's Land, apparently had no knowledge of his views on war and medicine when defending his MD-thesis *War and Peace Surgery*. In this thesis, he praised the knowledge gained on wound hygiene and treatment on account of the war. Peace-surgery had

strongly profited, he suggested and would go on profiting from the experiences the war-years had given.⁵⁸ This positive view came to the fore again when, five years later, a medical professor accepted his appointment as vice-chancellor at the University of Amsterdam with a speech called 'The Profit of War for Surgery'. According to this speech, war had furthered science and technology. The war had had a major, positive impact on hygiene and skills, which could only be of benefit to peacetime patients with similar problems.⁵⁹ His name: Otto Lanz, the same surgeon who ten years before had been only too glad to leave the war behind. As Sauerbruch or other authors such as van der Meulen and Rath, Lanz made his case by generalizing particular experiences and neglecting any examples that would have contradicted his opinion. As a matter of fact, Rath in his text mentioned no literature whatsoever, and Lanz only referred to a lecture held by Sauerbruch in 1924, defending the goodness of war. Here we see a pronounced shift in opinion that correlates with the experience of war and its cessation. How can we understand this shift?

To begin with, it is interesting to consider that the majority of the Dutch medical war narratives (most of them written by nurses) did not dwell at all on the goodness of war for medicine. Not hindered by censorship or loyalty towards their country's army, they did, however, openly reflect on the hardships of war. Van Tienhoven in his *The Horrors of the War in Serbia* (1915) presented several horrific photographs that he himself had taken. They resemble the pictures printed in Ernst Friedrich's book *War against War* (1924) of maimed war-casualties before and after plastic surgery, indicating that it had not done them much good.⁶⁰ Similarly, in her 1917–1918 war diary, the nurse Charlotte Meuleman wrote graphically about a man with 'an open leg fracture only immobilized by two pieces of wood'. The emergency bandage was filled with pus 'caterpillars crawling. [...] One big package of white caterpillars, big and small.'⁶¹ Partly because of stories like these, doctors, nurses and pacifists in the Netherlands raised the question if medical care in wartime could meet Hippocratic standards at all. It is a conflict also visible in the British Army in World War I. The Army boasted an 80% return rate for sick and wounded soldiers (including both medical and surgical cases), but soldiers saw themselves as being caught up in a medical war machine that returned them mercilessly only to be wounded again (or killed). Many doctors perceived this as a deep challenge to their medical oath.⁶²

In neutral countries, these voices were not only heard but seriously discussed. As a consequence, in the beginning of 1918—20 years before Cambridge-professor John Ryle would do the same—a Dutch nurse suggested to end all medical work during war, and if this was impossible because doctors and nurses would not want to refuse helping suffering patients, certainly all preparation to medical assistance in wars yet to come had to stop. This would make war virtually impossible to wage and save more lives than medical work ever could—a plea repeated in

1924 by the magazine *Down with Arms*. This critical view upon war-time medicine was backed up in the Netherlands by the popularity of the paintings and writings of German veterans like Otto Dix, Georg Grosz, Erich-Maria Remarque and Oskar-Maria Graf.⁶³ It is not too far-fetched to assume that this type of criticism was not well received by those doctors who, with all their heart and might, had worked in the war hospitals, and who, in reaction, now tried even harder to make sense of their efforts. By pointing at ‘the goodness of war’ they strove to justify their work and simultaneously shore up the declining public support for the participation of medical professionals in war.

CONCLUSION

The presumed benefit of war for the development of medicine, and more specifically for surgery, is, of course, not the only topic worth exploring in this context. There are many other important aspects in the history of surgery and war that have not yet been investigated in an exhaustive manner. There is, for instance, a need for more critical biographies of war surgeons like Larrey or Sauerbruch. Research into the relationship between war surgery and society during the war as well as in subsequent days of peace is another potentially fruitful area, especially with regard to Eastern European or (former) colonial countries and to wars other than World War I. The patients’ point of view should be explored in more detail, as well as the experiences of all those engaged in surgical work apart from the surgeons themselves.⁶⁴

However, in this chapter I have focused on the idea of the usefulness of war for medicine, because it is still often seen as self-evident. I have shown how critical exploration of the issue makes it clear that this assumption is far from straightforward. There undoubtedly have been incidental inventions made in wartime that have benefited surgery outside the boundaries of that particular war, but there is little reason for agreeing with the general statement that ‘war is good for surgery’, or medicine as a whole, for that matter, unless the meaning of words like ‘goodness’, ‘benefit’ or ‘advancement’ is limited to ‘the improvement of technical skills of some of the surgeons on account of their war experience’. It can be concluded that during a war, surgery is primarily geared towards military fighting-strength of the troops instead of the individual recovery of wounded soldiers and that it is practised on wounds that are often so specific for the circumstances of war that the value of the treatments for other times can be easily overrated. In terms of scientific research, we have seen how almost every precondition that is generally assumed necessary for medical research is absent or at least limited: a tranquil working environment; time to consider one’s therapeutic strategies and decisions; the possibility of international discussion between doctors and scientists; the presence of control groups in clinical trials; the opportunity to investigate long-term

effects of treatments; and, not insignificantly, the chance of monitoring and repeating experimental interventions.

The relation between war and the advancement of medicine is therefore far from unequivocal. Instead, it is clear that surgical care in times of war is not particularly suitable to promote advancement of surgery in general. The proposition ‘war is beneficial for surgery’ can be criticized on many accounts. One can even consider reversing it twofold, by saying ‘peace is beneficial for medicine and medicine is beneficial for war’. I do not pretend to know if Edwin Starr’s words, sung in 1969, ‘War, what is it good for? Absolutely nothing’, have any universal and eternal truth, but certainly medicine cannot serve as proof to the contrary.

NOTES

1. I sincerely want to thank Ana Carden-Coyne and Nick Whitfield for their valuable comments on an earlier draft of this chapter. I also want to thank Thomas Schlich for his patience and understanding.
2. See, e.g. Bertrand Taithe, *Defeated Flesh. Medicine, Welfare and Warfare in the making of Modern France* (Manchester: Manchester University Press, 1999), Henri Ducoulombier, *Le baron Pierre-François Percy, chirurgien de la Grande Armée* (Paris: Librairie Historique Teissedre, 2004), Ira Rutkow, *Bleeding Blue and Gray: Civil War Surgery and the Evolution of American Medicine* (New York: Random House, 2005), Mark Harrison, *The Medical War* (Oxford: Oxford University Press, 2010) on the First, and *Medicine and Victory* (Oxford: Oxford University Press, 2004) on the Second World War, and Tom Scotland and Steven Heys, edited collection *War Surgery 1914–1918* (Solihull: Helion, 2014).
3. One of the first was medical historian Roger Cooter, in ‘Medicine and the Goodness of War’, *Canadian Bulletin of Medical History* 7 (1990): 147–159.
4. Otto von Schjerning, Erwin Payr and Carl Franz, eds., *Handbuch der Ärztlichen Erfahrungen im Weltkrieg. Band I-II: Chirurgie* (Leipzig: Johann Ambrosius Barth, 1922).
5. Ferdinand Sauerbruch, *Das war mein Leben* (Bad Wörishofen: Kindler & Schirmeyer, 1951): 224, 226.
6. Paul Lerner, *Hysterical Men. War, Psychiatry, and the Politics of Trauma in Germany, 1890–1930* (New York: Cornell, 2003), 41–52; Wolfgang U. Eckart, *Medizin und Krieg* (Paderborn: Ferdinand Schöningh, 2014); Wolfgang U. Eckart, Christoph Gradmann, eds., *Die Medizin und der Erste Weltkrieg* (Pfaffenweiler: Centaurus, 1996), 13; T.M. Ruprecht, C. Janssen, eds., *Äskulap oder Mars? Ärzte gegen den Krieg* (Bremen: Donat, 1991), 161.
7. Barend Haeseker, *Dr. J. F. S. Esser and his Influence on the Development of Plastic and Reconstructive Surgery* (Ph.D. Erasmus University, 1993).
8. Nicholas Coni, *Medicine and Warfare: Spain, 1936–1939* (London: Routledge, 2008).
9. Robert Jay Lifton, *The Nazi Doctors. Medical Killing and the Psychology of Genocide* (New York: Basic books, 1986); Paul Hoedeman, *Hitler or Hippocrates. Medical Experiments and Euthanasia in the Third Reich* (Sussex: The Book Guild, 1991); Wolfgang U. Eckart and Alexander Neumann, eds., *Medizin im Zweiten Weltkrieg. Militärmedizinische Praxis und Medizinische Wissenschaft im ‘Totalen Krieg’* (Paderborn: Ferdinand Schöningh, 2006); Roger Cooter,

- 'War and Modern Medicine', in: W. F. Bynum and R. Porter, eds., *Companion Encyclopedia of the History of Medicine* (London: Routledge, 1993), 1536–1573, see 1548.
10. *Die dringliche Kriegschirurgie*. *NATO-Handbuch* (ZDV 49/50), Nov. 1961, 87.
 11. Ton Neelissen, *Het Tomeloze Leven van Johannes Esser. Grondlegger van de Plastische Chirurgie* (Amsterdam: Balans, 2002), 91.
 12. Matti Ponteva, 'The Impact of Warfare on Medicine', in: Ilkka Taipale et al., eds., *War or Health? A Reader* (New York/London: Zed Books, 2002), 37–40.
 13. Nick Lewer, *Physicians and the Peace Movement. Prescriptions for Hope* (London: Frank Cass, 1992); Ruprecht, Jenssen, *Äskulap oder Mars?*; also: Leo van Bergen, "'Would It Not Be Better Just to Stop?'" Dutch Medical Aid in World War I and the Medical Anti-war Movement in the Interwar Years', in: *First World War Studies* 2 (2011): 165–194.
 14. Eckart, Gradmann, *Die Medizin*, 343–364; John M. Barry, *The Great Influenza. The Epic Story of the Deadliest Plague in history* (New York: Viking Books, 2004), 143.
 15. Ana Carden-Coyne, *The Politics of Wounds. Military Patients and Medical Power in the First World War* (Oxford: Oxford University Press, 2014), 25; Allan Young, *The Harmony of Illusions. Inventing Post-Traumatic Stress Disorder* (Princeton, New Jersey: Princeton University Press, 1995).
 16. See, e.g., Haeseker: *Dr. J. F. S. Esser*.
 17. Leo van Bergen, *Before my Helpless Sight. Suffering, Dying and Military Medicine on the Western Front 1914–1918* (Farnham: Ashgate, 2009), 202–204, 227–232.
 18. Mary Borden, 'The Forbidden Zone', in: Margaret R. Higonnet, ed., *Nurses at the Front. Writing the Wounds of the Great War* (Boston: Northeastern University Press, 2001), 79–161, see 92, 98, 102, 149–150; see also: Frederick W. Noyes, *Stretcher-bearers...at the Double* (Toronto: Hunter Rose, 1934), 90; Birgit Panke-Kochinke, Monika Schaidhammer-Placke, *Frontschwester und Friedensengel. Kriegskrankenpflege im Ersten und Zweiten Weltkrieg* (Frankfurt a/M: Mabuse-Verlag, 2002), 102, 112.
 19. Cooter, 'War and modern medicine', 1548.
 20. Roger Cooter, *Surgery and Society in Peace and War. Orthopaedics and the Organization of Modern Medicine, 1880–1945* (London: Macmillan, 1993), 130–132.
 21. Cooter, 'Medicine and the Goodness of War'; Cooter, 'War and Modern Medicine', 1541–1546.
 22. Roger Cooter, Steve Sturdy, 'Of War, Medicine and Modernity', in: Roger Cooter, Mark Harrison and Steve Sturdy, eds., *War, Medicine and Modernity* (Phoenix Mill: Sutton Publishing, 1998), 1–21, see 6.
 23. Carden-Coyne, *The Politics of Wounds*, 10–11.
 24. Susanne Hahn, 'How Varied the Image of the Heart Trauma has Become. The Development of Cardiovascular Surgery during the First World War', in: *War and Medicine* (London: IWM/Wellcome, 2008), 46–55, see 47.
 25. Eckart, *Medizin und Krieg*, 13.

26. Hans Binneveld, *Om de Geest van Jan Soldaat* (Rotterdam: Erasmus Publishing, 1995), 250.
27. Richard A. Gabriel, Karen S. Metz, *A History of Military Medicine* (Vol II: From the Renaissance through Modern Times) (New York/London: Greenwood Press, 1992), 278; V. Winters, *Staal tegen Staal. De Oorlogschirurgie van de Oudste Tijd tot Heden* (Utrecht: Het Spectrum, 1939).
28. Ellen N. La Motte, *The Backwash of War. The Human Wreckage of the Battlefield as Witnessed by an American Hospital Nurse* (New York/London: Putnam's sons, 1916), 55.
29. Doris Kaufmann, 'Science as Cultural Practice: Psychiatry in the First World War and Weimar Germany', *Journal of Contemporary History*, 34 (1999): 125–144, see 125.
30. Carden-Coyne, *The Politics of Wounds*, 118–134, 157, 175.
31. Shawn Christian Nessen, Dave Edmond Lounsbury and Stephen P. Hetz, eds., *War Surgery in Afghanistan and Iraq: a series of cases, 2003–2007* (Washington DC: Department of the Army, 2008): IV, XVI; Leo van Bergen, Frans J. Meijman, Heidi de Mare, 'From Goya to Afghanistan—an Essay on the Ratio and Ethics of Medical War Pictures', *Medicine, Conflict and Survival* 26 (2010), 124–144.
32. Carden-Coyne, *The Politics of Wounds*, 174.
33. See the chapter on wound infection by Michael Worboys in this handbook. Besides, when referring to the Napoleonic wars it should not be forgotten that circumstances for true progress were far from favourable. Medical care in itself was not seen as of much importance, certainly not by the French emperor himself. In spite of his personal admiration for his chief-surgeon Larrey, Napoleon considered surgery, not to mention other medical specialisms, an unimportant nuisance during warfare, considering the inexhaustible human resources delivered by the *levée en masse*, as he saw it. J.A. Verdoorn, *Arts en Oorlog* (part I) (Amsterdam: Lynx, 1972), 219–220, 241–242; also: Gabriel, Metz, *History Military of Medicine*, 155–164; Fielding H. Garrison, *Notes on the History of Military Medicine* (New York: Georg Olms, 1922): 163–164.
34. Quoted from: Carden-Coyne, *The Politics of Wounds*, 88.
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PART III

Areas and Technologies

Transplantation Surgery: Organ Replacement Between Reductionism and Systemic Approaches

Sibylle Obrecht

Organ transplantation as a treatment method applies a science- and technology-oriented approach to patients suffering from various end-stage organ diseases. However, transplantation medicine is more than just a recent sub-field of modern biomedicine: Since its inception in the late nineteenth century, the symbolic importance attached to human organ replacement by far exceeds its prevalence in terms of numbers.¹ Right to the present day, the transplant endeavour is often closely associated with complex issues extending beyond the practice itself: not only is it used to symbolize the achievements of leading-edge surgery, it is also emblematic for the immense hopes attached to modern biomedicine as well as for medicine's potential to destabilize prevalent cultural and social values.²

The therapy's polysemic qualities can only be understood against the background of its biomedical premises. By presuming that certain constituents of the body can be substituted, organ transplantation is based on a particular theory of the body and of disease. Recent historiography has shown that the practice was conceptualized in the late nineteenth century as a surgical

Many thanks to Thomas Schlich, Teresa Woods and Andreas Loesch for their very helpful comments on preliminary versions of this text.

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fix for complex internal diseases. It thus epitomized a very specific, reductionist type of medical logic, a ‘strategy of controlling life processes through an active intervention carried out by a highly specialized expert, targeting a circumscribed area of the body at a time, when the damage had already occurred’, as medical historian Thomas Schlich has pointed out.³ However, as it turned out, transplantation’s reductionist blueprint could not be put into practice as easily as it had seemed at its conception. Both from a social and cultural as well as from a biological point of view, it was unexpectedly difficult to dissociate body compounds from their original environment and permanently integrate them into a new context, especially when it came to the transfer of solid organs: despite great efforts to develop artificial organs and to make xenografts viable, the only reliable long-term and implantable substitutes for organs such as the heart or the kidney are transplants that had (and, with few exceptions, still have) to be procured from human living or cadaver donors.⁴ Consequently, organ transplantation has evolved into a complex procedure that depends on a whole range of special conditions and, as medical historian Ayesha Nathoo has pointed out, requires more than technological innovation, surgical capability, and a heroic attitude.⁵ To this day, the transplant endeavour is compounded by the fundamental dilemma of having to harm one body to save another. Transplantation thus not only challenges normative, culturally agreed-upon categories such as the demarcation between self and other, or the boundaries of life and death, but it is also confronted by obstacles concerning basic biological principles, such as the recipient body’s immune defence against transplanted tissues.

Because organ transplantation raises biological, social, and legal issues far beyond the reach of surgical problem-solving, its establishment as a therapeutic procedure depended on what we can call an assemblage of surgical proficiency, technical and pharmaceutical innovation, interdisciplinary cooperation, the production and application of basic scientific knowledge, as well as sociocultural and political shifts. Since the late nineteenth century, surgery has played an important, though ever-changing role in negotiating the various elements of this assemblage. These negotiation processes enable key insights into the historical development of surgery. In order to examine the history and historiography of transplant surgery, the present chapter will thus not single out individual transplant surgeons and their achievements. Instead, it will focus on the history of organ transplantation as an endeavour that stands out by its multiple interfaces with other biomedical subspecialties and scientific disciplines and by its close relationship to the laboratory as well as to the bedside. I will discuss the huge scholarly investments already made in the history of organ transplants, but I will also suggest that the topic’s potential has not yet been fully exploited, mainly because in previous historiography organ transplantation has been fragmented into individual aspects.⁶ Some scholars have focused on the therapeutic modalities, knowledge practices, and theoretical underpinnings of the transplant

endeavour. Others have directed their attention towards its public representations. I will look at the transplant endeavour as an especially rich site for exploring the complex interplay between biomedical knowledge and practices, the material body, and society and culture.⁷ This chapter will thus contradict views that associate the replacement of internal organs solely with a mechanistic body theory. According to the sociologist Nikolas Rose one of the key features of modern biology is the tension between a markedly reductionist approach to living organisms on the one hand and an awareness of complexity and emergence on the other.⁸ I will argue that this tension has not only shaped the basic sciences, but the transplant endeavour as well: rather than representing a purely reductionist and mechanistic approach, it has been closely intertwined with the rising realms of immunology and genetics and their powerful conceptualizations of the living organism as a complex and dynamic system. Against this background, organ transplantation emerges as a practice that has been co-produced with our current understandings of the organism's integrity.

THE HISTORIOGRAPHY OF ORGAN TRANSPLANTATION

Since the beginning of the twentieth century, the surgical substitution of body components (such as skin, limbs, as well as organs) has aroused the interest of journalists and authors of fictional literature.⁹ Except for scientists directly involved with the medical practice itself, however, academic researchers did not take up the topic before the second half of the twentieth century. The first substantial study, conducted by the sociologist Renée Fox and the biologist Judith Swazey, was published in 1974, a few years after the highly publicized first wave of cardiac transplantations.¹⁰ With the global expansion of organ transplantation in the last two decades of the twentieth century, social and medical historians, but also doctors and scientists with a professional background in the field directed their attention towards the history of organ transplantation. The diversity of their background corresponds with the remarkable heterogeneity of their lines of inquiry. Organ transplantation emerges as a multifaceted phenomenon. It can be examined as a cultural icon, a medical concept, a bundle of practices, a field of knowledge, an occupational subspecialty, a legal problem, as well as a surgical procedure with an important social, cultural, and political impact. Up to this day, only a few attempts have been made to integrate this wealth of research perspectives into a bigger picture. The existing histories mainly fall into two categories: the first consists in the work of mostly academic historians, who have focused on transplantation as a discursive phenomenon, dealing only peripherally with what happened at the bedside and the laboratory bench. Their accounts typically concentrate on the institutional, social, and cultural shifts associated with organ transplantation. They analyse discourses and practices that are bound up with controversial issues, such as the representation and negotiation

of the donation and procurement of organs and the implementation of the brain-death definition. Drawing upon a broad variety of sources such as media reports, the minutes of regulatory and legislative institutions, court records, programmatic texts of transplant workers, interviews with medical experts, and journalists as well as works of fiction, these researchers have, with a few exceptions, examined the time slot between the 1960s and the 1990s, which was the period when the procedure was being publicly negotiated and established.

Works that fall into the second category deal with the history of therapeutic practices, the creation of knowledge and the theoretical underpinnings of organ transplantation. The authors of these works are typically academic historians of medicine and science, journalists, and doctors and scientists with a practical background in transplantation. They have helped illuminate the conceptual and practical complexity of the emerging transplant endeavour, although not all of their accounts stand up to the current methodological standards of historical research, for example in that they frequently project their present-day concerns onto the past. As a consequence, the history of organ transplantation is represented as a linear, teleological development, painted either in dark or in bright colours. Those authors who follow a critical approach to transplantation have come up with what the historian Simon Hofmann calls 'narratives of decay'.¹¹ Such accounts typically associate the procedure's emergence with the authoritative implementation of a mechanistic world view and the exploitation of the human body by a supposedly omnipotent medico-industrial complex, involving dissecting rooms, execution sites, and concentration camps.¹² However, teleological narratives more often use glowing instead of gloomy colours. This is especially true for histories written by transplantation specialists that are frequently based on a triumphalist approach to medical progress. They represent the technology's past as a linear path tracked by innovative and daring individuals. These histories usually construct bold continuities by claiming that transplantation has always been in existence, at least as an ideal.¹³ Although such flawed interpretations have been widely reproduced, numerous scholars (academic historians as well as transplant specialists) have criticized such a de-historicization of the transplant endeavour. They have told a very different story by exploring the complex processes of knowledge production essential to a successful clinical implementation of organ transplantation and by highlighting the discontinuities, setbacks, and conflicts which for a long time dominated the clinical and experimental experiences of medical workers and their patients.

In this chapter it is not feasible to fully synthesize the vast knowledge that has been produced so far about the history of organ transplantation. Nor is it possible to integrate the divergent research perspectives into a single picture. I will, therefore, focus on the theoretical underpinnings and the conceptual shifts that have been constitutive to the transplant endeavour and show

in what ways this perspective can contribute to the history of surgery more generally.

ORGAN TRANSPLANTATION BEFORE THE SECOND WORLD WAR

Surgical practices, as medical historian Christopher Lawrence has pointed out, are never simply empirical procedures: ‘Even the most simple of them employ a theory of the body and disease, either explicit or implicit’.¹⁴ This is of course true for the surgical retrieval and replacement of human organs—but amazingly, scholars do not agree over the extent to which the theoretical underpinnings are constitutive for the transplant endeavour: is organ transplantation a concept whose invention can be linked to a specific, science-based theory of the body—or is it a fairly universal surgical practice, carried out in all kinds of different contexts at various times in history? Thomas Schlich and David Hamilton have different answers to this question, although both of them explicitly reject the idea of a linear history of progress and although both approaches are vital for a deepened understanding of the history of the transplant endeavour.¹⁵ Hamilton, who combines a practical background in transplant medicine with a profound interest in medical history, has chosen a narrative, chronological format for his encyclopaedic monograph, including the history of organ and tissue transplantation from mediaeval times to the present. Consequently, he emphasizes the significance of the surgical practice of transplanting body tissues for purposes of repair, which dates back to mediaeval times and further. Schlich, for his part, concentrates on a narrower timeframe, namely on the period between the 1880s and 1930s when the transplantation of internal organs to replace their function was first introduced. This restriction allows him to more radically and more precisely unravel how the processes of experimental and clinical knowledge production were entwined with their historical contexts.

According to Schlich, the organ replacement concept was not developed—or ‘invented’, as he terms it to underline its man-made character—until the 1880s. Because earlier attempts at replacing sick or damaged body parts were usually restricted to the surface of the body and did not aim at restoring organ function, according to this account, they were not direct precursors of organ transplantation.¹⁶ Doctors and scientists followed a new and specific rationale when they took an interest in organ transplantation in the last decades of the nineteenth century. Most importantly, they applied a new concept of the causation and treatment of diseases, namely the idea that complex health problems were amenable to solutions that focus on one causal element, whereas within the earlier framework of a more holistic environmental and humoral understanding of disease, ‘replacing an organ would not have made much sense,’ Schlich argues.¹⁷ Instead of relating the causation of a disease to multiple and equivalent factors, a new generation of surgeons strove to isolate the crucial element in a disease process. If there was a causal relationship

between the malfunction of a specific organ and the occurrence of a specific disease, this disease could be cured by replacing the deficient organ. Schlich locates the time and place when this concept was first realised to June 1883, when the Swiss surgeon Theodor Kocher (1841–1917) implanted fresh human thyroid tissue under the skin of a patient's neck. Subsequently, the thyroid became 'the paradigmatic organ' of transplant medicine, providing the model for various other organ transplants, including the kidney.¹⁸ In the following three decades, surgeons and physiologists transferred the new principle to other organs of internal secretion such as suprarenal glands, pancreases, ovaries, testicles as well as to the experimental transplantation of kidneys and hearts in laboratory animals. Since the researchers followed the objective of restoring the function and not the structure of the organ, they did not always re-implant the grafts in the morphologically correct position. When it came to the species boundaries and selection of donors, they were resourceful, too: switching between the laboratory and the operating room, they performed auto-, allo-, and xenografts, exchanging organs and tissue between experimental animals and humans.¹⁹ These practices provoked strong reactions on the part of "anti-vivisectionists," as medical historian Susan Lederer has shown.²⁰ Notwithstanding the protests, the organ replacement concept had become widely accepted by about 1900 and was soon regarded as self-evident. Surgeons, struggling for greater recognition in the context of university medicine, had found a laboratory-based strategy of controlling complex life processes through localized surgical manipulations. They could thus extend their domain, position their specialty within laboratory-oriented medicine, and compete with internal medicine. 'Organ transplantation was now considered an ideal therapy', Schlich sums up the evaluation by the surgeons. 'The only remaining hitch was in its practical application'.²¹

It is not unusual for grand dreams of control over the body to encounter obstacles and constraints.²² This was also the case with organ transplantation. The framework of the emerging research field was destabilized in the 1910s, at the very moment when it was considered worthy of two Nobel Prizes. The first went to Theodor Kocher in 1909 in recognition of his work on the thyroid gland, the second to the French-American scientist Alexis Carrel (1873–1944) in 1912 for his work on vascular suture and the transplantation of blood vessels and organs.²³ Carrel had played a leading role throughout the early development of the field. In his animal laboratories, he had developed a sophisticated surgical technique which centred on successfully linking the organs to the recipient's blood circulation through the anastomosis of blood vessels.²⁴ Paradoxically, the technical perfection achieved by Carrel and others was one of the main factors exposing the limits of transplantation surgery. Doctors and scientists had anticipated that the technical perfection would stabilize transplant surgery as a reliable practice at the bedside and in the laboratory. By the 1910s, however, most of the transplant workers concluded that they were losing control on a level that was

beyond the scope of surgical capability: neither leading-edge surgical skills nor advanced technologies of control such as anaesthesia, antisepsis, or the standardization of processes and instruments sufficed to ensure the long-term survival of the transplanted organs and tissues.²⁵ The transplants started degenerating a few weeks after their transfer at the very latest, a process that culminated in a necrosis followed by the final loss and resorption of the grafts. ‘The surgeons, normally self-sufficient in their endeavours and usually meeting the largely technical challenges of their work with their own novel solution, needed assistance’, is how Hamilton characterizes the situation.²⁶

TRANSPLANTATION BIOLOGY

Looking at the problems faced by the early transplant workers helps to understand the most important premises of organ transfer. Surgeons and scientists had conceptualized the body as an assembly of living elements that were exchangeable, at least within the limits of what was surgically and morphologically feasible. The organs and tissues of higher vertebrates were considered adaptable enough to connect to a new environment without losing their basic properties.²⁷ Though this interpretation corresponded to a highly mechanistic view of the body, the semantics of transplantation in fact related the surgical practices to horticulture rather than to engineering: the long-established terminology compared the transfer of organs and tissues to the transfer of plants (‘transplantation’) or to plant hybridization (‘graft’), implying that it was possible in principle to merge body compounds irrespective of their origin, the only limit being the lifespan of the host organism. Organs were thus not just conceptualized as mechanical entities, as ‘spare parts’, but rather as functional elements that could adapt to a new environment due to their plasticity.²⁸ This interpretation naturalized the practices of laboratory-oriented high-end medicine by comparing them to technically and culturally well-established methods of cultivation.²⁹

Due to the impressive plasticity ascribed to the body compounds, taxonomic categories such as sex, species, race, and variety were initially not considered insurmountable hurdles to transplantation, despite their prominent status in contemporary biology. However, when it became clear that transplants between individuals even of the same species, did usually not work out, taxonomy and, more generally speaking, biological difference gradually gained in importance on the agenda of the transplant workers. At first, in the late nineteenth century, systematic evidence accumulated that transplantations within the same organism usually worked well whereas transplants between species did not. Subsequently, in the first and second decade of the twentieth century, the biological differences within species were problematized as also having a negative impact on transplant outcomes.³⁰ But although factors such as close kinship or what was conceived of as ‘race’, were suspected of having an effect on the length of transplant survival, researchers found no reliable

biological indicators for predicting the success of an organ or tissue transfer. The only entity that could be used as a clear and safe basis, was the individual organism, because it was clear that autotransplants almost always succeeded. These findings were not considered to be of much value, however. In reductionist, laboratory-oriented approaches as they were followed in transplantation research, individuality per se was considered a dubious category. In the first decades of the twentieth century, differences on an individual level were conceptualized as coincidental and thus not worth pursuing in a systematic manner. They were perceived as noise and not as signals, as the science historian Ilana Löwy has described the contemporary interpretation.³¹

When it became established knowledge that organs transplanted between individuals did not show as much plasticity as expected, the original optimism of transplant workers turned into disillusionment. After numerous failures in animal experiments as well as in clinical transplants in patients, most doctors and scientists agreed by the early 1910s that transplants at an inter-individual level were impeded by a biological problem referred to as a ‘biochemical difference’. At this point, this rather loose concept was not necessarily linked to an immunological explanation and there was no consensus about the mechanism that put the difference into effect.³² The organ replacement concept stood a poor chance of leading to viable treatment options, the more so because it turned out that all attempts to practically influence or bypass the biological factors were failing.³³

Alexis Carrel was among the first to publicly dampen the high expectations in organ replacement therapy and to abandon the field. In his Nobel Prize speech in 1912 he passed the problem of graft loss on to those scientists who studied the biological relationship between living tissues.³⁴ He must have known perfectly well that he was not putting forward a short-term project, but that he was setting the agenda for a long-term, interdisciplinary basic-research programme. A few basic researchers seem to have taken up Carrel’s suggestion, though most of them stopped pursuing this topic around 1920 at the latest.³⁵ There were exceptions to this pattern, though: the pathologist Leo Loeb (1869–1959) and the geneticist Clarence C. Little (1888–1971) showed more sustained interest in the basic principles of biological difference. Both scientists worked within the context of tumour research, where they used the transplantation of tissues and organ as a research technique for finding new ways of treating cancer, but also for exploring biological individuality and the properties of inbred mice and rat strains. The publications on their experimental findings and research tools between 1918 and the 1940s had an impact particularly on the epistemic and technical framework of the emerging field of immunogenetics.³⁶ Apart from these exceptions, basic science researchers and clinicians largely abandoned the field, which had not led to the rapid implementation of a novel therapy as they had expected. In addition, the First World War kept those European clinicians who had made crucial contributions to the research field occupied

with other concerns.³⁷ After a short revival of clinical skin and testicle transplants, transplantation as a substitutive practice fell into disrepute at the very latest by the end of the 1920s, with the exception of the transplantation of the cornea.³⁸ In hindsight, this development is remarkable as the body of knowledge produced in the context of early transplantation research was quite substantial. 'In the period before 1930 most of the laws of graft rejection were defined and practically every method of overcoming rejection was put to the test,' Schlich claims. 'Nevertheless, the discoveries fell into oblivion and had to be rediscovered after World War II.'³⁹

A NEW PARADIGM: ORGAN TRANSPLANTATION IN THE POST-WAR DECADES

After a long period of stagnation both at the bedside and in the laboratory, organ transplantation was revitalized from the late 1940s onwards as a research issue and as a therapeutic method for end-stage organ failure. The kidney now became the new paradigmatic organ of transplantation medicine,⁴⁰ though in the 1960s, there were also clinical attempts to transfer other organs. Most of the existing historical accounts of organ transplantation explore this revival after 1945. They address a broad array of academic and lay audiences, their authors' involvement with transplantation medicine ranging from an intense personal engagement to a detached critical stance. Accordingly, the issue is treated in a wide variety of formats: the spectrum includes monographs,⁴¹ anthologies, book chapters, and articles⁴² authored by transplant professionals; books written by journalists to highlight the more spectacular aspects of the field's past,⁴³ and a great number of witness reports,⁴⁴ as well as autobiographies by transplant workers.⁴⁵ Academic historians typically restrict themselves to the analysis of the history of subfields, or to accounts of related issues such as the representations of organ transplantation in the media and in medical press,⁴⁶ transplantation immunology,⁴⁷ or the brain-death concept.⁴⁸

Notwithstanding these huge investments in the historiography of post-war organ transplantation, scholars have not succeeded in isolating a single factor that might explain why organ transplantation came back on the surgical agenda of a small circle of specialist groups. There was nothing like a 'magic bullet' that might have dramatically improved the outcomes in the laboratory and at the bedside. 'In fact, for a long time, the clinical outcomes of attempted transplants after 1945 continued to be as poor as before 1930', Schlich sums up the situation.⁴⁹ Tilney puts it more bluntly: 'For nearly a decade (...) mortality was virtually complete', he describes the discouraging results of the first series of kidney transplantation between the late 1940s and the late 1950s.⁵⁰ Organ transplantation was considered a risky and dubious procedure, not the prestigious flagship of medical progress it later became.

In the absence of either clinical success or high prestige, other factors must have contributed to the resumption of transplantation in the late 1940s. The list includes the introduction of haemodialysis in highly specialized centres, the growth of financial investment in clinical medical research, the clinical introduction of new pharmaceutical agents (such as newly synthesized steroids) as well as the reorganization of medical centres, which provided new opportunities for interdisciplinary approaches.⁵¹ Historians and social scientists largely agree that this line-up of heterogeneous incentives was accompanied by a fundamental renegotiation of the conceptual as well as the organizational basis of the transplant quest. In the two decades following the Second World War, organ transfer was thus established within a framework that combined a reductionist approach to the organism with novel systemic perspectives. On the reductionist side of the equation, transplantation was again characterized by what Fox and Swazey describe as ‘spare parts pragmatism’, namely the dissociation between body organs and the donor’s person and their subsequent conversion into therapeutic tools.⁵² However, because this reductionist approach had been shown to collide with basic biological principles, organ transfer was complemented by a new, systemic rationale. Whereas in the first half of the twentieth century the fundamental biological problems had been ascribed to a rather nebulous ‘biochemical difference’, they were now reframed within the emerging fields of immunology and genetics. According to what one can call the new cybernetic interpretation of body and disease, immune reactions were no longer interpreted merely as simple and selective responses to external stimuli. Instead they were understood as the expression of a more comprehensive mechanism that established the organisms’ integrity in a dynamic and continuous process. By continuously differentiating between ‘self’ and ‘non-self’, the immune mechanisms, thus the idea, eliminated any foreign element entering the body, whether a microorganism or a donor organ.⁵³ Unlike in the first decades of the twentieth century, the biological differences between individuals were thus no longer perceived as noise, but as signals which had a genetic basis and were thus open to exploration at the laboratory bench.⁵⁴

The immunological interpretation of graft loss soon served as a unifying focal point, transforming the formerly incoherent field of activity into an interdisciplinary and institutionalized specialty. Consequently, it was not a surgeon, but the immunologist Peter Medawar (1915–1987) who served as the figurehead of the rising transplant endeavour. The British scholar and later Nobel laureate was credited with stabilizing the immunogenetic basis of organ and tissue rejection in the late 1940s. In the years that followed, he proved that it was possible to induce tolerance in immunologically immature rodents. When he was asked by a student whether he could define any practical applications of his research findings, he reportedly answered that there were ‘*absolutely none*’.⁵⁵ But even though Medawar did not provide any concrete instructions about how to overcome the rejection process, his

work had a high impact on clinical transplantation. He noted retrospectively, ‘the importance of the discovery of tolerance was essentially a moral one: it showed for the first time that the barriers that normally prohibit the transplantation of tissues from one individual to another can be broken down—there was indeed no natural embargo upon the act of transplantation’.⁵⁶ The first successful transplantation of a kidney between identical twins, performed 1954 at the Peter Bent Brigham Hospital in Boston, had a similar function: even though the long-term success of the surgical intervention was contingent on a very rare constellation, namely the fact that the donor and the recipient were genetically nearly identical, many clinicians interpreted the success as an encouraging signal.

CLINICAL APPLICATION

The elegance of the new theoretical underpinnings of organ transplantation and the surgeons’ optimism that the biological problems might be solved in the foreseeable future were somewhat at variance with the clinical reality of the late 1950s, mainly because the immunogenetic explanation did not provide directly applicable solutions. The induction of immunological tolerance, which had turned into the leitmotif of the basic researchers, was only feasible in the laboratory, but not at the bedside. Notwithstanding these shortcomings, several interdisciplinary teams—the most dynamic in Paris and Boston—embarked on human kidney transplantation not only by swapping organs between identical twins, but also between related as well as unrelated donors and recipients.⁵⁷ Accounts of these interventions unanimously point to the fact that the procedure was initially fraught with an enormous risk, as the transplant teams had to take comparably crude measures to prevent graft loss, in particular whole body irradiation, originally in very high doses and accompanied by bone marrow infusions. In 1959, two patients with dizygotic twin donors retained the transplanted kidneys. In the following years surgeons increased their experience with procurement and implant techniques as well as organ preservation, which led to better prospects for future transplants. Of much greater clinical significance, though, was the discovery that 6-mercaptopurine, a new cytostatic drug developed in the context of cancer treatment, had a noteworthy immunosuppressive effect. In the first half of the 1960s, irradiation was thus complemented by a medication consisting of antimetabolites and steroids.⁵⁸ The new pharmaceutical tools soon impacted on the clinicians’ interpretation of the immune mechanism: in contrast to earlier assumptions in the 1950s, the rejection process was not an all-or-nothing phenomenon, but a gradual process that could be reversed if diagnosed early enough and treated appropriately.⁵⁹ The diagnosis of rejection was complex, though, and the treatment turned out to be a double-edged sword. The clinicians moved along a fine line between the rejection of the organ and the side-effects of the massive suppression of the recipients’ immune mechanisms,

and they did not always manage to balance the two poles. ‘I believe patients die more often of overtreatment than of graft rejection’, the British transplant surgeon and clinical researcher Michael Woodruff suspected in 1963 at the Human Kidney Transplant Conference in Washington.⁶⁰ The replacement of an organ thus required an intense and continuous assessment of the patient’s immune mechanisms, or, to put it other than in technical terms, with his or her biological individuality and its inability to tolerate the implant’s signature of a foreign ‘self’.

Throughout the 1960s, the rejection and mortality rates remained very high. In addition, it soon turned out that the original disease could eventually recur in the transplanted organ. Furthermore, the immunosuppressive treatment increased the patients’ susceptibility to malignant tumours in the future. Notwithstanding these setbacks, the interdisciplinary transplant enterprise became established in an institutionalized setting consisting of congresses, a journal and, in 1967, a professional society.⁶¹ Clinical transplantation proceeded at an ever-faster pace, not least because it had become apparent that the kidney transplants had the capacity of dramatically and promptly improving patients’ condition. Because they anticipated the problem of rejection would be quickly solved through clinical and basic research, many clinicians now invested both time and career resources in the transplant endeavour.⁶² ‘It seemed everyone wanted a piece of the action, and the attendees—mostly young, aggressive, and ambitious doctors—jockeyed for prominent positions in the field’, the transplant surgeon and Nobel Prize winner Joseph Murray said, recalling the competitive atmosphere at a transplant conference in 1963.⁶³ A growing number of teams performed clinical transplant surgeries, transferring not only kidneys, but also livers, lungs, pancreases and small bowels.⁶⁴ During the same period, surgeons also performed dubious xenografts of ape organs into human patients, hoping that they might be more successful at the bedside than their colleagues in the laboratory who had consistently failed with such procedures.⁶⁵ It was not xenotransplantation, however, but the first human-to-human heart transplantation that catapulted the transplant endeavour into unprecedented prominence. Performed in 1967 by a team headed by the South African surgeon Christiaan Barnard, the intervention was the starting signal for a wave of 166 heart transplantations in clinics all around the world.⁶⁶ Until about 1970, when most of the heart transplant programs were stopped due to an international moratorium prompted by the catastrophic clinical results of the procedure, heart transplants were omnipresent in the media.⁶⁷ Journalists reported not only on the private lives of the recipients, surgeons, deceased donors and their families, but also on more thorny issues such as the social and ethical implications of the medical innovation. This extensive media coverage has provided fruitful source material for historians interested in the public representation of the transplant endeavour.⁶⁸ Scholars have analysed how media coverage transformed transplantation into the very embodiment of hopes associated with high-tech medicine.⁶⁹ Furthermore,

they have also described how its public representation resonated with the simultaneous construction of concepts about biological similarity and difference.⁷⁰ Both on a political and societal level as well as in the discourses and practices of immunology, categories such as race, sex, and individuality were undergoing fundamental shifts. Cardiac transplantation and its representations defined a nexus for the complicated array of questions that came with these shifts—Was it biologically as well as socially feasible to transplant the heart of a young woman into the chest of an older man? Would the immune mechanisms of a white recipient reject the heart of a black donor? Cardiac transplantation thus not only played a crucial role in translating the emergent concept of the immune mechanisms to the public sphere, but also in negotiating how human diversity related to the biological, social, and political issues involved.

INSTITUTIONALIZATION AND EXPANSION

As we have seen, the immunological and thus systemic perspective on the organism was deeply embedded in the theoretical underpinnings of post-war organ transplantation. The new paradigm not only resonated with the procedure's public representations, but it also impacted on transplantation's institutional, disciplinary, and social framework. Substituting a healthy organ for a sick or damaged one evolved into a complex, interdisciplinary endeavour. Surgery still played a very prominent role, both in medical practice and in knowledge production. However the subspecialty was integrated into a complex framework that not only crosslinked biomedicine and the wider public, clinical application with basic research, but also a wide range of medical specialties and professions such as physicians, laboratory technicians and intensive care specialists whose proficiency in caring for the fragile, immunosuppressed patients played a decisive part in the success of the therapy.⁷¹ The dynamics marking the relations within this framework were ground-breaking for other interdisciplinary approaches within biomedicine. At the same time, however, they were complex and far from being perfectly balanced. Whereas many conflicts (for example between internists and surgeons) were settled mainly on a local level,⁷² the divergences between clinicians and basic scientists, such as immunologists and immunogeneticists, had repercussions on an international scale. The conflict centred on diverging views of the quickest and most sustainable path to clinical application, and it touched on more fundamental issues in the process of knowledge production: surgical empiricism at the bedside was somewhat in contrast to the basic researchers' aspirations to produce knowledge in the laboratory that would significantly improve the patients' prospects. Whereas the basic researchers relied largely on animal studies, the clinicians criticized what they conceived of as 'test-tube reductionism', expressing doubts as to whether the experimental research findings could be extrapolated to humans. For their part, many basic scientists pointed

out how little secure knowledge existed, thus annoying the clinicians by urging them to slow down the pace of performing new transplants.⁷³ The fact that the most important impulse, the chemical suppression of the patient's immune system, had not come from the basic scientists' laboratories, and that the practical implementation of immunological tolerance seemed to be a long way off, did not increase the laboratory scientists' authority. Yet their admonitions did not go completely unheard, not least because the more circumspect among the clinicians realized that organ transplantation might fall into disrepute if more and more inexperienced teams jumped on the bandwagon without adequate immunological knowledge. They responded by establishing novel, cooperative, and international forms of knowledge production and quality control, which, to some degree, mitigated the fierce competition between individual physicians and transplant programs. Thus, they sought to improve the surveillance of the growing field by establishing the 'Registry in Human Kidney Transplantation' in 1963. This data collection project aimed at comparing the clinical results of all teams performing clinical transplants and became a major tool in assessing the state of the art in renal transplantation.⁷⁴ About the time when the registry was established, many transplant teams turned towards cadaver donors or kidneys from therapeutic nephrectomies. This happened not only for ethical reasons, as claimed by some of the clinicians, but obviously also because of the anticipated imbalance between the demand and supply of organs.⁷⁵ It was in this period that clinicians began to consider hopelessly comatose patients as organ donors, a practice that was regulated in 1968 by the multidisciplinary Harvard Ad Hoc Committee. To what extent the transplant interest was decisive for the redefinition of death as 'brain death' is a complex though very interesting issue and one which has been subject to a debate among scholars of different backgrounds.⁷⁶

To improve the clinical results of kidney transplantation, some clinicians and basic scientists also set up joint projects, for example for the purpose of tissue typing. By pre-operatively choosing organ donors to match the recipients according to immunogenetic criteria, transplant specialists hoped to circumvent or at least mitigate the thorny issue of antirejection treatment. In a project starting in 1964, transplant physicians and basic researchers developed the tools to identify cadaver and living kidney donors and recipients whose tissue types were compatible. On these grounds, in the late 1960s several extended organ exchange networks were established which enabled, but also forced, the transplant teams to collaborate on a national or even supranational level.⁷⁷ Though it proved to be vital to bone marrow transplantation, the method of tissue typing did not turn out to be a magic bullet for solid organ transplantation.

Due to the persistent lack of alternatives, the strategy of chemical immunosuppression as it had been developed in the first half of the 1960s remained the most important measure against organ rejection. The development of more sophisticated methods to diagnose and monitor the rejection process

in the 1970s contributed to the improvement of the organ recipients' prospects, especially in kidney transplantation.⁷⁸ Yet it was the clinical introduction of the new immunosuppressant substance Ciclosporine in the 1980s that dramatically improved organ survival rates, even if life-long medication often came at the price of severe side effects.⁷⁹ From a medical point of view, many forms of organ grafting became more or less routine, and at the end of the twentieth century the transplant endeavour expanded on a global scale.⁸⁰ This expansion has saved and improved many patients' lives, though it has its controversial sides, too: anthropologists, sociologists, and ethicists, but also transplant specialists have pointed out that organ transplantation has developed into a profitable area for investment for the pharmaceutical industry. They have also drawn attention to the social and global asymmetries which are at work, especially in the realm of living donation, with donors from poor and recipients from rich countries.⁸¹ The expansion of organ transplantation soon led to an increasing gap between the supply and demand of transplantable body parts. This problem, conceptualized as 'organ shortage', brought the surgical practice back into the headlines, generating 'an unusual combination of curiosity, celebration, and anxiety', as the anthropologist Lesley Sharp has put it.⁸²

CONCLUSION

This chapter has traced the negotiations around the guiding conceptual framework of organ transplantation since the late nineteenth century. It has shown that substituting a healthy organ for a sick or damaged one was much more than a surgical endeavour epitomizing a reductionist approach to the organism. Due to the emergence of biological obstacles soon after the basic concept of organ replacement had been widely accepted, the reductionist perspective was complemented by a more systemic approach to understanding the function of the human organism, represented by the rising field of immunology. In the mid-twentieth century, clinicians and basic scientists began to conceptualize the patient's organism as possessing a system which was able to detect and destroy foreign components entering into the body. As this interpretation had far reaching implications not only in biomedicine, but also in society and culture, organ transplantation can be interpreted as being at the same time indicative and constitutive of the reconceptualization of the organism's biological integrity in the twentieth century. How this new view relates to our current social and cultural conceptualization of sameness and difference might be a rewarding perspective for future historical projects integrating both transplantation as a biomedical and as a cultural-social phenomenon.⁸³

NOTES

1. Thomas Schlich, *The Origins of Organ Transplantation. Surgery and Laboratory Science 1880-1930* (Rochester: University of Rochester Press, 2010), 4. For early representations of organ and tissue transplantation, see also Susan E. Lederer, *Flesh and Blood: Organ Transplantation and Blood Transfusion in Twentieth-Century America* (Oxford: Oxford University Press, 2008).
2. Megan Crowley-Matoka, *Domesticating Organ Transplant. Familial Sacrifice and National Aspiration in Mexico* (Durham and London: Duke University Press, 2016), 3.
3. Schlich, *Origins*, 10. As for the concept of the surgical fix, see Thomas Schlich, 'The Technological Fix and the Modern Body: Surgery as a Paradigmatic Case', in *A Cultural History of the Human Body in the Modern Age*, 71–92, ed. Ivan Crozier (Oxford: Berg 2010).
4. As my focus is on the transplantation of solid organs of human origin, I will not include blood transfusion, bone marrow transplantations nor xenotransplantation and artificial organs.
5. Ayesha Nathoo, *Hearts Exposed: Transplants and the Media in 1960s Britain* (New York: Palgrave Macmillan, 2009), 7.
6. See Schlich, *Origins*, 8, who remarks that a comprehensive history of organ transplantation is lacking.
7. See for this interplay, related to biomedicine as a whole, Margaret Lock and Vinh-Kim Nguyen, ed., *An Anthropology of Biomedicine* (Malden: Wiley-Blackwell 2010).
8. Nikolas Rose, 'The Human Sciences in a Biological Age', *Theory, Culture and Society* 30 (2013): 3–34, p. 5.
9. See Lederer, *Flesh and Blood*, and, for literary representations, Irmela Krüger-Fürhoff, *Verpflanzungsgebiete. Wissenskulturen und Poetik der Transplantation* (München: Wilhelm Fink Verlag, 2012).
10. Renée C. Fox and Judith P. Swazey. *The Courage to Fail: A Social View of Organ Transplants and Dialysis* (Chicago: The University of Chicago Press, 1974).
11. In the German original *Verfallsgeschichte*. For a critique of such narratives of progress and decay, see the analysis by Simon Hofmann. *Umstrittene Körperteile: Eine Geschichte der Organspende in der Schweiz* (Bielefeld: Transcript Verlag, 2016), 31–33.
12. Without minimizing the crimes against humanity committed in the concentration camps, it is important to point out that the ethical and discursive significance of the infamous transplant experiments carried out in this context goes beyond their impact on biomedical knowledge production. Linda Hogle provides insights into the post-war impact of the atrocities committed under National Socialism. See Linda Hogle, *Recovering the Nation's Body: Cultural Memory, Medicine and the Politics of Redemption* (New Brunswick: Rutgers University Press, 1999).
13. Thomas Schlich, 'How Gods and Saints Became Transplant Surgeons: The Scientific Article as a Model for the Writing of History', *History of Science* 33 (1995): 311–331. See for a very distinct example René Küss and Pierre Bourget, *An Illustrated History of Organ Transplantation: The Great Adventure of the Century* (Rueil-Malmaison: Sandoz 1992).

14. Christopher Lawrence, 'Democratic, Divine and Heroic: The History and Historiography of Surgery', in *Medical Theory and Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence (London: Routledge 1992), 15.
15. David Hamilton, *A History of Organ Transplantation: Ancient Legends to Modern Practice* (Pittsburgh: University of Pittsburgh Press, 2012), and Schlich, *Origins*. For a comparison of the two approaches, see Shelley McKellar, 'Comparative Book Review', *Canadian Bulletin of Medical History* 31 (2014): 240–243.
16. For thorough accounts focusing on early attempts at transferring tissue and organs, see (in addition to the already cited work of Hamilton, *History*): Ruth Richardson, 'Human Dissection and Organ Donation: A Historical and Social Background,' *Mortality* 11 (2006): 151–165, as well as the literary review by Michael Woodruff, *The Transplantation of Tissues and Organs* (Springfield: Charles C. Thomas, 1960).
17. Schlich, *Technological Fix*, 83. For older models of disease causation, see also Schlich, *Origins*, 72.
18. Schlich, *Origins*, 23.
19. Schlich, *Origins*; Lederer, *Flesh and Blood*, 3–31; Hamilton, *History*, 65–125.
20. Lederer, Susan E., 'Animal Parts/Human Bodies. Organic Transplantation in Early Twentieth-Century America'. In *The Animal-Human Boundary*, ed. by Angela N.H. Creager and William Chester Jordan, 305–329. Rochester NY: University of Rochester Press, 2002, pp. 310–318; see also Schlich, *Origins*, 133–134.
21. Schlich, *Origins*, 183.
22. Rose, 'The Human Sciences', 8.
23. The fact that Kocher was the first surgeon to become a Nobel Laureate underscored the significance which was attributed to surgical therapy. See Schlich, *Origins*, 160.
24. Schlich, *Origins*, 227. For more information about Alexis Carrel, see David Hamilton, *The First Transplant Surgeon: The Flawed Genius of Nobel Prize Winner, Alexis Carrel* (New Jersey: World Scientific, 2017).
25. As for the term 'technologies of control', see Thomas Schlich, 'Surgery, Science and Modernity: Operating Rooms and Laboratories as Spaces of Control', *History of Science* 45 (2007): 231–256.
26. Hamilton, *History*, XV.
27. Anne-Marie Moulin, *Le dernier langage de la médecine. Histoire de l'immunologie de Pasteur au Sida* (Paris: Presses Universitaires de France, 1991), 183; Schlich, *Origins*, 309.
28. Moulin, *Dernier langage*, 183.
29. Krüger-Fürhoff, *Verpflanzungsgebiete*; Richardson, 'Human Dissection and Organ Donation', 157–158; Uwe Wirth, ed. *Impfen, Pfropfen, Transplantieren* (Berlin: Kulturverlag Kadmos 2011). See also Hamilton, *History*, 427.
30. Anne-Marie Moulin and Ilana Löwy, 'La double nature de l'immunologie: histoire de la transplantation rénale', *Fundamenta Scientiae* 4 (1983): 201–218, pp. 204–205, as well as Schlich, *Origins*, 207ff.
31. Ilana Löwy, 'On Guinea Pigs, Dogs and Men: Anaphylaxis and the Study of Biological Individuality, 1902–1939', *Studies in History and Philosophy of Biological and Biomedical Sciences* 34 (2003): 399–423. As for the more recent scholarly interest into the history of individuality, see Thomas Pradeu, *The*

- Limits of the Self: Immunology and Biological Identity* (Oxford: Oxford University Press, 2012) as well as Warwick Anderson and Ian R. Mackay. *Intolerant Bodies: A Short History of Autoimmunity* (Baltimore: Johns Hopkins University Press, 2014).
32. See Schlich, *Origins*, 13.
 33. The array of methods included parabiosis, the administration of biological material from the donor, attempts to avert the immune reaction of the host by chemical agents as well as the careful selection of hosts and donors, for example by means of blood typing. See Schlich, *Origins*, 207–223, Hamilton, *History*, 117–124.
 34. Carrel Alexis, ‘Suture of blood-vessels and transplantation of organs’, in *Nobel Lectures, Physiology or Medicine 1901–1921*, ed. The Nobel Foundation (Amsterdam: Elsevier Publishing Company, 1967).
 35. An overview of the promising research accomplished in the context of tumour research and in part already oriented towards an immunologic interpretation of graft rejection goes beyond the scope of this chapter. See Silverstein, *History of Immunology*, 278ff.; Schlich, *Origins*, 207–223 as well as Ilana Löwy, ‘Bio-medical Research and the Constraints of Medical Practice: James Bumgardner Murphy and the Early Discovery of the Role of Lymphocytes in Immune Reactions’, *Bulletin of the History of Medicine* 63 (1989): 356–391, for further information.
 36. Hamilton and Moulin have directed attention to the work of Leo Loeb, pointing out that his impact on the post-war revival of organ transplantation has been grossly underrated. Hamilton also focuses on the complex and conflict-ridden relation between Loeb and Little. See Hamilton, *History*, and Moulin, *Dernier Langage*. The work of Clarence C. Little, the foremost expert and promoter of inbred mouse lines, has been elucidated by Karen A. Rader, *Making Mice. Standardizing Animals for American Biomedical Research, 1900–1955* (Princeton: Princeton University Press, 2004).
 37. Hamilton, *History*, 124–125.
 38. As for the revival, see Hamilton, *History*, 130–140; Schlich, *Origins*, 102–115. Cornea transplantations succeeded because they were transferred to what is known today as an ‘immunologically privileged site.’ See Silverstein, *History of Immunology*, 277; Leslie Brent, *A History of Transplantation Immunology* (San Diego: Academic Press, 1997), 100–101.
 39. Schlich, *Origins*, 13.
 40. Schlich, *Origins*, 228.
 41. It is noteworthy that all existing monographs that focus on the post-war medical practice and knowledge production in the realm of transplantation have been written or co-authored by transplant surgeons and basic scientists: Besides the surgeon David Hamilton, author of the already cited, extensive monograph (Hamilton, *History*), the immunologist Leslie Brent (Brent, *A History of Transplantation Immunology*) as well as the surgeon Nicholas Tilney, Nicholas L. Tilney, *Transplant. From Myth to Reality* (New Haven: Yale University Press, 2003), have presented monographs. See also the less weighty monograph Kuess and Bourget, *An Illustrated History of Organ Transplantation*.

42. For an anthology providing a chapter focusing on the transplantation of specific organs as well as immunological and ethical issues see Vassilios E. Papalois, Nadey S. Hakim and John S. Najarian, 'The History of Kidney Transplantation', in *History of Organ and Cell Transplantation*, 76–99, ed. by Nadey S. Hakim and Vassilios E. Papalois, Vassilios (London: Imperial College Press, 2003). Arthur Silverstein has written a chapter on transplantation immunology in his standard work, Arthur M. Silverstein, *A History of Immunology* (San Diego: Academic Press, 1989), 275–300. For chapters and articles focusing on organ transplantation, see also Ronald D. Guttman, 'Technology, Clinical Studies, and Control in the Field of Organ Transplantation', *Journal of the History of Biology* 30 (1997): 367–379 and Steven J. Peitzman, *Dropsy, Dialysis, Transplant: A Short History of Failing Kidneys* (Baltimore: The Johns Hopkins University Press, 2007).
43. Donald McRae, *Every Second Counts: The Race to Transplant the First Human Heart* (New York: G.P. Putnam's Sons, 2006), and Tony Stark, *Knife to the Heart: The Story of Transplant Surgery* (London: Macmillan, 1996).
44. See E. M. Tansey and L.A. Reynolds, ed. *Early Heart Transplant Surgery in the UK: Witness Seminar Transcript*. (London: Wellcome Trust 1999) as well as the collected witness reports in Paul I. Terasaki, ed., *History of Transplantation: Thirty-Five Recollections* (Los Angeles: UCLA Tissue Typing Laboratory, 1991), and Paul I. Terasaki, ed., *History of HLA: Ten Recollections* (Los Angeles: UCLA Tissue Typing Laboratory, 1990).
45. Such accounts are typically written from a selective perspective, and though they provide invaluable evidence and assessment from an insider viewpoint, they also often fall into the trap of complacency. See e.g. Roy Calne, *The Ultimate Gift: The Story of Britain's Premier Transplant Surgeon* (London: Headline Book Publishing, 1998); Francis D. Moore, *A Miracle and a Privilege: Recounting a Half Century of Surgical Advance* (Washington: Joseph Henry Press, 1995); Joseph E. Murray, *Surgery of the Soul: Reflections on a Curious Career* (Boston: Science History Publications, 2001); Thomas E. Starzl, *The Puzzle People: Memoirs of a Transplant Surgeon* (Pittsburgh: University of Pittsburgh Press, 1992), just to mention a few autobiographies.
46. As for Great Britain, see Nathoo, *Hearts Exposed*, as well as the papers published by Helen McDonald: 'Guarding the Public Interest: England's Coroners and Organ Transplantation, 1960–1975', *Journal of British Studies* 54 (2015): 926–946; Helen MacDonald, 'Conscripting Organs: "Routine Salvaging" or Bequest? The Historical Debate in Britain, 1961–1975', *Journal of the History of Medicine and Allied Sciences* 70 (2015): 425–461. For Switzerland, see Hofmann, *Umstrittene Körperteile*, and Alexia Cochand. 'Diffusion d'un savoir et légitimation d'une pratique thérapeutique dans les revues médicales: l'exemple de la transplantation d'organes en Suisse entre 1950 et 1990', In *Amnis* 14; 2015. For an analysis of the US-context, see Lederer, *Flesh and Blood*, as well as Marie Jo Festle, 'Enemies or Allies? The Organ Transplant Medical Community, the Federal Government, and the Public in the United States, 1967–2000', *Journal of the History of Medicine and Allied Sciences* 65 (2009): 48–80.
47. See Ilana Löwy, 'The Impact of Medical Practice on Biomedical Research: The Case of Human Leucocyte Antigens Studies', *Minerva* XXV (1987): 171–200;

- Moulin and Loewy, *La double nature*; Anne-Marie Moulin, *Le dernier langage*, 179–226. For an analysis of the relation between transplantation and immunogenetics see also Søren Bak-Jensen, ‘To Share or not to Share? Institutional Exchange of Cadaver Kidneys in Denmark’, *Medical History* 52 (2008): 23–46.
48. Mita Giacomini, ‘A Change of Heart and a Change of Mind? Technology and the Redefinition of Death in 1968’, *Social Science & Medicine* 44 (1997): 1465–1482; Stuart J. Youngner, Robert M. Arnold and Renie Schapiro, ed., *The Definition of Death: Contemporary Controversies* (Baltimore: Johns Hopkins University Press, 1999); Silke Bellanger and Aline Steinbrecher, ‘Addressing Uncertainties: The Conceptualization of Brain Death in Switzerland 1960–2000’, in *The Risks of Medical Innovation: Risk Perception and Assessment in Historical Context*, ed. Thomas Schlich and Ulrich Troehler (London and New York: Routledge 2006), 129–144. For the debate in the UK, see Helen MacDonald, ‘Considering Death: The Third British Heart Transplant’, *Bulletin of the History of Medicine* 88 (2014): 493–525. For the German debate see Gesa Lindemann, *Beunruhigende Sicherheiten. Zur Genese des Hirntodkonzepts* (Konstanz: UVK Verlagsgesellschaft, 2003) and Thomas Schlich and Claudia Wiesemann, ed., *Hirntod: Zur Kulturgeschichte der Todesfeststellung* (Frankfurt: Suhrkamp 2001). For a comparative, anthropological perspective see Margaret Lock, *Twice Dead. Organ Transplants and the Reinvention of Death* (Berkeley: University of California Press, 2002).
 49. Schlich, *Origins*, 228.
 50. Tilney, *Transplant*, 71–72.
 51. For the history of haemodialysis in the context of transplantation, see Peitzman, *Dropsy, Dialysis, Transplant*; Hamilton, *History of Organ Transplantation*, 296–306, and Tilney, *Transplant*, 143ff. For other factors, see Moulin, *Dernier langage*, 211; Schlich, *Origins*, 228–229; Renée C. Fox, *Experiment Perilous. Physicians and Patients Facing the Unknown. With a New Epilogue by the Author* [New Brunswick; London, Transaction Publishers, 1998 (First edition Glencoe 1959)], 261–262.
 52. See Renée C. Fox and Judith P. Swazey, *Spare Parts: Organ Replacement in American Society* (New York: Oxford University Press, 1992). For an ethnographic account on how human organs are being converted into therapeutic tools, see Hogle, *Recovering the Nation’s Body*, 140–160.
 53. As for the differentiation between ‘self’ and ‘non-self’, see Warwick Anderson and Ian R. Mackay, ‘Fashioning the immunological self: the biological individuality of F. Macfarlane Burnet’, *Journal of the History of Biology* 47 (2014): 147–175.
 54. For the distinction between noise and signal, see Loewy, ‘On Guinea Pigs’. As for a more recent summary of the history of immunology, see Anderson and Mackay, *Intolerant Bodies*.
 55. Calne, *Ultimative Gift*; Brent, *History of Transplantation Immunology*, 425.
 56. Peter B. Medawar. *The Uniqueness of the Individual. Second, Revised Edition* (New York: Dover, 1981) (First edition: London 1957).
 57. For more detailed accounts of the pioneer work in Boston, see Nicholas L. Tilney, *A Perfectly Striking Departure. Surgeons and Surgery at the Peter*

- Bent Brigham Hospital 1912–1980* (Sagamore Beach: Science History Publications, 2006), 221–241, as well as Fox, *Experiment Perilous*.
58. Brent, *History of Transplant Immunology*, 310–325; Hamilton, *History*, 269–280. Tilney, *Transplant*, 127–128.
 59. Loewy, *Impact of Medical Practice*, 185.
 60. Michael Woodruff, ‘Human Kidney Transplant Conference.’ *Transplantation* 2 (1964): 581–600, p. 581. As for the side effects of the immunosuppressive treatment in the 1960s, see also Tilney, *Transplant*, 128–129.
 61. As for this institutionalization, see Nicholas L. Tilney. *The Transplantation Society. Four Decades of International Cooperation, Innovation, Growth and Progress, 1966–2006* (The Transplantation Society, 2006. Seen in Juli 2016 at ‘<http://www.tts.org>’; Brent, *History of Immunology*, 314.
 62. Loewy, *Impact of Medical Practice*, 197.
 63. Murray, *Surgery of the Soul*, 118. As for the highly competitive setting in cardiac surgery, see Nathoo, *Hearts Exposed*, and (from a journalist point of view) MacRae, *Every Second Counts*.
 64. See Tilney, *Transplant*, for a helpful timeline summarizing the procedures regarded as landmark events. For a more recent anthology focusing on the history of clinical transplantation of specific organs, see Hakim and Papalois, *History of Organ and Cell Transplantation* as well as Hamilton, *History*.
 65. Hamilton, *History*, 291–293.
 66. For the fierce competition which coined the realm of cardiac transplantation, see Donald McRae, *Every Second Counts: The Race to Transplant the First Human Heart* (New York: G.P. Putnam’s Sons, 2006). For the first heart transplantations, see also Nathoo, *Hearts Exposed*, and Steven L. Lansman, M. Arisan Ergin and Randall B. Griep. ‘History of Cardiac Transplantation.’ In *Heart and Heart-Lung Transplantation*, edited by John Wallwork (Philadelphia: W.B. Saunders Company, 1989), 3–19.
 67. The clinical application of cardiac transplantation was subsequently performed only in a few centres, whereas the transplantation of other, solid organ was continued. For more information about the moratorium, see Fox and Swazey, *Courage to Fail*, 122–148, as well as Hamilton, *History*, 355–356, and Nathoo, *Hearts Exposed*, 168ff.
 68. See Nathoo, *Hearts Exposed*; Hofmann, *Umstrittene Körperteile*; Lederer, *Flesh and Blood*, 165–184 as well as Sibylle Obrecht, ‘Toleranz oder Abstossung? Die frühe Transplantationsmedizin und der immunologische Diskurs’. In *Komplexe Welten. Kulturelle Ordnungssysteme als Orientierung*, edited by Silke Götttsch and Christel Köhle-Hezinger (Münster: Waxmann Verlag, 2003), 421–431, for a discussion of the media representations in the context of the first heart transplantations in the UK, North America and Switzerland.
 69. The British cultural historian Ayesha Nathoo convincingly argues that the huge media coverage played a significant role not only in endorsing or denouncing the innovation, but also in stabilizing or undermining the public’s trust in modern biomedicine. From this point of view, the media were involved as an integral and influential part of the history of organ transplantation. See Nathoo, *Hearts Exposed*, 2.

70. See Lederer, *Flesh and Blood*, 165–184; Nathoo, *Hearts Exposed*, 65ff. and Obrecht, *Toleranz oder Abstossung?*, for a discussion of the concept of race in the context of cardiac and skin transplantation. See also the popular science book by Donald McRae (McRae, *Every Second Counts*) for more information about the first heart transplantation and the apartheid regime.
71. Anne Hardy and E. M. Tansey. 'Medical enterprise and global response, 1945–2000', in *The Western Medical Tradition. 1800 to 2000*, ed. by W.F. Bynum et al., 405–533 (Cambridge: Cambridge University Press, 2006), 489.
72. The autobiographies of the transplant pioneers provide many examples of such conflicts on a local level.
73. For an analysis of the relations between surgeons and immunologists see Hamilton, *History*, 306–313; Guttmann, 'Technology, Clinical Studies, and Control,' and Brent, *History of Transplantation Immunology*, 425, as well as Fox and Swazey, *Courage to Fail*, 71ff.
74. Murray, *Surgery of the Soul*, 119; Fox, Swazey, *Courage to Fail*, 72; Hamilton, *History*, 281–282.
75. See Joseph E. Murray, 'Human Kidney Transplant Conference.' *Transplantation* 2 (1964): 147–155, pp. 148–149 for ethical objections against the use of living donors. As for the origin of the transplanted kidneys in early clinical attempts at transplantation, see Tilney, *Transplant*, 48–59; Papalois, 'History of Kidney Transplantation', 84–93 and Hamilton, *History*, 282–293. Whereas most of the organs stemmed from living, related donors or from therapeutic nephrectomies, some kidneys were procured from executed prisoners or from anencephalic children. The practice of procuring organs from heart-beating donors was established in the 1960s, i.e., several years before the official establishment of the brain death criteria.
76. See Giacomini, 'A Change of Heart'; Youngner, Arnold and Schapiro, *The Definition of Death*; Bellanger and Steinbrecher, 'Addressing Uncertainties'; Lindemann, *Beunruhigende Sicherheiten*; Schlich and Claudia Wiesemann, *Hirntod*.
77. For more information on the fascinating history of HLA (Human Leucocyte Antigen) typing see Brent, *History of Transplantation Immunology*, 131–181; Loewy, *Impact of Medical Practice*; Bak-Jensen, 'To Share or not to Share?'; Anderson and Mackay, *Intolerant Bodies*, 126–132 and the personal accounts collected in Terasaki, *History of HLA*.
78. Papalois and Hakim, 'History of Kidney Transplantation', 92; Tilney, *Transplant*; Hamilton, *History*, 359–397.
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Opening the Skull: Neurosurgery as a Case Study of Surgical Specialisation

Delia Gavrus

Few medical specialties receive the lavish symbolic capital that neurosurgery has enjoyed for nearly a century. A fascination with the organ that in modernity has become synonymous with the self,¹ coupled with remarkable successes (brain and spinal cord tumour removal, some cases of epilepsy) as well as troubling failures (lobotomy), has bolstered an enduring curiosity for the work of the surgeons who routinely open the human skull. Given neurosurgery's public visibility, it is surprising that it has received less attention from historians than one might imagine. But although it is a small field, the history of this surgical specialty demonstrates that a diversity of questions, approaches, and methodologies can make important contributions to the history of surgical specialisation. By virtue of its association to so many other important domains—from neuroscience to social policy—the history of neurosurgery illuminates key aspects of modernity, professional identity, and the relationship between science, medicine, and public imagination. In this chapter, I will review the literature, and I will briefly limn a few avenues for future scholarship that exemplify profitable ways in which the history of neurosurgery can contribute to the history of surgery. Looking at neurosurgery as practice, specialty, body of knowledge, as well as a source of public imagination, I emphasise key historiographical areas—from epistemic breaks, to conceptual continuities, to the role of instruments, to the relationship between the prevailing ethos of surgeons and their surgical practices, to

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the performative dimensions of identity both in professional settings and in broader cultural spaces.

NEUROSURGERY AS PRACTICE

To begin with, the history of intervention into the human skull invites a fundamental historiographical question about where to locate continuities and discontinuities in the construction of an appropriate narrative arc.² Many surgeons, as well as historians, have highlighted the stability of concepts and techniques. Others have articulated possible epistemic and technological breaks that characterise this surgical practice over the centuries.

While trephination (or trepanation) procedures to open the human skull by means of an instrument (surgical or otherwise) have ancient roots going back to the Neolithic Period,³ most historians consider brain surgery to be a significantly different practice originating in the last decades of the nineteenth century. Before the articulation of germ theory, which brought antiseptics and asepsis to the surgical theatre,⁴ and the discovery of anaesthetics,⁵ which made possible less painful interventions, surgeons tended to avoid drilling into the skull except in situations in which the patient had suffered a severe and visible injury—usually a depressed fracture.⁶ Although since Antiquity some doctors also recommended trephining in cases of seizures, it is not clear how often such surgeries were actually performed.⁷ Some of the late nineteenth century surgeons who pioneered brain surgery cast their work as a continuation of these much older practices, going as far as to argue, as the English surgeon Victor Horsley did, that even Neolithic individuals had been trephined for therapeutic reasons related specifically to illnesses such as Jacksonian epilepsy, a condition whose underlying mechanism was only described by the British neurologist Hughlings Jackson in the 1860s and 1870s.⁸ Such arguments were rooted in the particular professional preoccupation of the surgeon and, perhaps, in his attempt to legitimise a new surgical technique by embedding its rationale into a deeper medical tradition.⁹

Such a long genealogy, however, does not generally represent the way in which the first generations of neurosurgeons told the history of their field. Most of these men tended to trace the beginnings of neurosurgery to the time when anaesthesia and asepsis were introduced. Above all, they emphasised the localisation of brain functions by doctors and physiologists in the second half of the nineteenth century as the foundation of their practices.¹⁰ Attributing particular functions such as movement and language to particular parts of the cortex allowed surgeons to localise tumours, abscesses, or scars by clinical observation and examination. With this knowledge, they were able to perform operations without damaging essential areas of the brain and could avoid disastrous consequences for the patient. The loosely organised and heterogeneous community of localisation researchers at this time included the French physician Paul Broca, the German doctors Carl Wernicke, Eduard

Hitzig, and Gustav Fritsch, the English neurologist John Hughlings Jackson, and the Scottish neurologist David Ferrier. Localisation research involved experimental work with animals as well as clinical observations about patients who had sustained brain injuries. This research included, as well, deeply unethical experiments, some of which were strongly criticised as such at the time by individuals from both the popular anti-vivisectionist movement and the medical profession. For instance, in Cincinnati, Ohio, the US surgeon Roberts Bartholow, influenced by Ferrier's research, tested the electrical excitability of the human brain by experimenting on a female patient. The patient suffered greatly during these experiments and died. Bartholow claimed that the patient had consented to the procedure, but the American Medical Association challenged his claim and offered a sharp rebuke of his actions.¹¹

Like the first generations of neurosurgeons, many historians consider the origins of what was first called 'neurological surgery' and later 'neurosurgery' to be firmly embedded in the last two decades of the nineteenth century. For these historians, the localisation of function in particular serves as an important epistemic break that signals the rise of modern brain surgery.¹² For instance historian Malcolm Macmillan investigates whether the surgeon William Macewen relied on the principles of localisation of function when he performed surgical procedures starting in 1879. Having established that indeed this was the case, Macmillan awards priority for modern brain surgery to Macewen. In contention were also the London doctors Alexander Bennett and Rickman Godlee who, relying on neurological symptoms and localisationist principles, removed a brain tumour in a much-publicised 1884 case—but their feat came five years after Macewen's operation.¹³

A second important conceptual change that has been used to mark the beginning of neurosurgery originated with neurologists of the second half of the nineteenth century—John Hughlings Jackson among them—and concerns the understanding of the symptoms of brain tumour (vomiting, headaches, changes in vision). Similarly, the development of the ophthalmoscope has been interpreted as a significant milestone. The ophthalmoscope is a medical instrument that allowed doctors to look at the patient's retina and to check the state of the optic nerve, whose swelling indicated increased intracranial pressure potentially due to a brain tumour.¹⁴ Some early twentieth century surgeons passionately advocated for the use of this instrument and claimed that the ophthalmoscope, along with a second instrument—the spinal mercurial manometer, which could also establish elevated intracranial pressure—were essential tools that allowed the surgeon to make a decision about the necessity of performing surgery on the brain.¹⁵

Another important epistemic change that characterised the early period of modern brain surgery and on which early brain surgeons relied in a substantial fashion, as historian Thomas Schlich has shown, was the advent of 'physiological surgery'. Adherents of physiological surgery emphasised the fundamental role that physiological experimentation in the laboratory ought

to play in devising new and often ‘radical’ surgical procedures.¹⁶ George Crile’s work on shock, Theodor Kocher’s physiological experiments involving the thyroid gland (which led to the introduction of organ transplantation), and many other similar investigations originated in the laboratory and were later applied in the operating room. There was a deep connection between the laboratory and the surgical theatre in this time period, both in practical and in rhetorical terms; they were both ‘spaces of control’, mutually constitutive of each other, and they both reflected broader concerns that shaped modernity: efficiency, rationalisation, standardisation, control.¹⁷

On the heels of these medical and surgical developments in the latter part of the nineteenth century, a number of elite surgeons in several countries began to devote a more or less significant part of their work to the central nervous system. From the late 1870s, surgeons such as William MacEwen in Glasgow, Victor Horsley in London, Ernst von Bergmann in Berlin, Antoine Chipault in Paris, William W. Keen in Philadelphia attempted to open the human skull whenever they encountered neurological symptoms that suggested to them the potential involvement of the brain. These surgeries received much popular press and were often described in the newspapers as proof of the extraordinary advancement of surgery, although behind the scenes some neurologists doubted that surgical interference was in the best interest of the patient. For instance, while the neurologist Foster Kennedy who trained at London’s Queen Square Hospital supported surgery in some cases, praising, for example, Horsley for procedures performed ‘splendidly’,¹⁸ he also complained that the surgeon frequently got in ‘trouble’ because of his ‘optimism in operations’.¹⁹ In some cases he passionately disagreed with Horsley about whether an operation ought to be performed at all and lamented privately in a letter that ‘Horsley is of the heroic mould and *will* try to save [a 14-year-old suffering from a malignant tumour]—he’ll fail [...]’.²⁰ As Kennedy summed it up in another case with which he disagreed, he thought that ‘[Horsley’s] operation was mechanically exquisite, and most thoroughly unjustified after full consideration of all the facts’.²¹

This ‘heroic mould’ turned out to fit quite a number of the surgeons of the turn of the century, especially in the USA. Historians such as Gert Brieger have described an enthusiasm for ‘radical surgery’ at the time—that is, surgery which zeroed in on what was perceived to be the very root of the problem and which attempted a complete and permanent cure.²² Equally fashionable was a speediness in picking up the scalpel that alarmed a few more conservatively minded surgeons.²³ This ethos translated into a rush to operate when brain tumours were suspected.²⁴ Apart from being applied to brain tumours, blood clots, and abscesses, the radical approach soon encompassed other conditions of the brain. ‘Heroic surgical interference’ was recommended in those cases of head injury that came with the risk of causing ‘epileptic attacks’, ‘atrocious and incurable headaches’, and ‘aphasia’ in the long term.²⁵ A physician from Philadelphia recommended that the skull be

opened whenever there was a fracture, ‘however slight, and entirely irrespective of symptoms’.²⁶

In the context of the therapeutic optimism of the time and the prevailing interventionist ethos described above, one particular surgical procedure was subjected to extensive experimentation for a variety of conditions thought to involve the brain. Sometimes called a ‘decompression’ and based on older craniotomy techniques, this operation consisted in the permanent removal of a ‘button of bone’ from the skull in order to alleviate increased intracranial pressure (confirmed, suspected, or imagined). UK surgeons employed it for ‘general paralysis of the insane’,²⁷ which had recently been shown to be caused by syphilis infections, while some US surgeons used it in cases of ‘spastic paralysis’ assumed to be caused in many cases by cerebral accidents during difficult births.²⁸ The French surgeon Odilon Lannelongue advocated decompression for ‘microcephaly’ on the assumption that the condition was caused by a premature ossification of the cranial sutures and fontanelles.²⁹ Following Lannelongue, a number of surgeons from both sides of the Atlantic adopted the procedure in cases of ‘feble-mindedness’ (a diagnosis that was sometimes made in conjunction with microcephaly, while at other times apart from it).³⁰ A few doctors strongly criticised these dangerous procedures, especially in the case of the latter diagnoses. Abraham Jacobi, a prominent doctor from New York, pointed to the horrifying mortality rate (42% in a sample of 33 cases from multiple surgeons) and decried the surgeons’ ‘*furor operandi*’,³¹ while doctors such as S. V. Clevenger, a Chicago-based specialist in nervous disorders, pleaded for ‘conservative brain surgery’ more generally.³²

The popularity of exploratory trephining and decompressive procedures was aided by the (at least theoretical) promise that aseptic techniques could dramatically decrease the dangers of surgery. It was based as well on an optimistic culture—both surgical and social—that encouraged experimentation and ‘heroic’ interventions. Popular attitudes to surgery have always been complicated by ever fluctuating levels of hope and confidence on the one hand and anxiety on the other, and the US press at the turn of the twentieth century liked to print a fair share of positive articles that lionised the promise of surgical operations.³³ Brain surgeries received widespread coverage, fanning the public’s interest, and although other medical interventions and scientific experiments, such as vaccination or vivisection, did engender a powerful backlash,³⁴ responses to brain surgeries were generally positive, even when narratives betrayed anxiety about the potential danger to the integrity of both body and mind that such surgeries could threaten.³⁵

From a historiographical point of view, telling the story of brain surgery by focusing not just on elite figures, but investigating the kinds of procedures on the brain and skull performed by general and provincial surgeons who may not have been prominent on the national scene, allows historians to shed light on the diversity of surgical commitments present at this time and

to uncover a pervasive ethos that privileged surgical intervention. At the same time, this focus throws into relief complex continuities in the history of surgery, such as the idea and the practice of intervening into the brain to address what were perceived to be problems of affect and behaviour. This continuity stretches from the 1890s (when decompression procedures were applied to ‘general paralysis of the insane’) through the first two decades of the twentieth century (when they were deployed in cases of ‘criminality’³⁶) and finally to lobotomy and other psychosurgical procedures starting in the mid to late 1930s.³⁷

NEUROSURGERY AS SPECIALTY

At the turn of the twentieth century, in a context in which a few elite surgeons were devoting increased attention to the brain, while many other general surgeons eagerly tried this new type of surgery, one US doctor embraced a more conservative approach while at the same time putting significant effort into building a community of neurological surgeons. Harvey Cushing, who received his MD from Harvard and subsequently trained with William Halsted at Johns Hopkins, subscribed to a surgical approach that aimed for little damage to healthy brain tissue and minimal loss of blood; he believed that surgical intervention was warranted in only a limited number of conditions—mainly tumours, trauma, and trigeminal neuralgia.³⁸ Cushing played an important role in founding the first neurosurgical specialist society (the Society of Neurological Surgeons) and created an international school of neurosurgery by training surgical fellows from all over the world thus exporting his particular technical and moral vision about brain surgery to other countries.

A historiographical focus on the beginnings of neurosurgery as an organised medical specialty through the lens of the politics of specialist societies uncovers larger issues that are important for the history of surgery. More generally, the rise of medical specialisation has been described in terms of large-scale social changes (nineteenth-century urbanisation and immigration), the unification of medicine and surgery, various professional interests, an initiative toward clinical research, the administrative drive toward classification and rationalisation, and the development of medical knowledge.³⁹ That professional medical clubs were both a symptom and a consequence of this process is patently obvious. But historians have not paid much attention to the internal workings of these clubs and have thus neglected a source of rich information about the ways in which a collective ethos informed specialisation and surgical practice. Specialist societies are surgical, social, and cultural spaces within which the moral and technical landscapes of the specialty are negotiated and within which the professional persona of the specialist is crafted.

An in-depth history of the Society of Neurological Surgeons (SNS), which first met in March 1920 at the Peter Bent Brigham Hospital in Boston, reveals the specific mechanisms through which a group of surgeons built a

successful and elite specialty—technically, economically, and symbolically (in popular imagination). The founding members were motivated by a desire to learn from each other. They articulated the importance of tacit knowledge in the performance of surgery, an aspect that neurosurgery shared with all of surgery, such that sometimes surgeons travelled great distances to learn techniques in the flesh.⁴⁰ Despite this undeniably practical aspect, the idea that surgical practice was not fully communicable by text surely had a rhetorical dimension as well, as historian Christopher Lawrence has shown in the case of elite UK physicians of the same period, who emphasised ‘an epistemology of individual experience which, by definition, defied analysis.’⁴¹

But the benefit of a close analysis of the correspondence between the members, the inclusion and exclusion policy, the structure and content of the meetings goes beyond this practical dimension of the surgeons’ gathering. It becomes clear, for instance, that far from answering a democratic impulse of bringing together surgeons with a special interest in brain and spinal cord surgery, the founders’ deliberate plan was to create a group of men who shared particular moral qualities, qualities that in their view were not always represented by the larger associations, like the American Medical Association or the American College of Surgeons. Those who failed to measure up to the moral standards were purposefully excluded. Therapeutic over-optimism or involvement with the press constituted such grounds for exclusion.

The SNS was, from the very beginning, an elite and exclusive club that encouraged a particular collective ethos.⁴² This ethos is immediately evident in the choices that Harvey Cushing and Ernest Sachs made when they extended the invitation to join the society. Ernest Sachs was a neurological surgeon at Washington University in St. Louis, and he belonged with Cushing to the select number of surgeons who were committed to an epistemology based on animal experimentation.⁴³ He had spent time in Victor Horsley’s laboratory in London, where he investigated experimentally the functions of the thalamus.⁴⁴ Cushing himself had travelled to Europe for a year and worked in Kocher’s laboratory in Berne as well as with the physiologist Angelo Mosso in Turin, where he tried to understand the relationship between blood pressure and intracranial pressure.⁴⁵ Thus Cushing and Sachs saw themselves as speaking the same language of experimentally based surgery.

Historian Samuel Greenblatt has suggested that Cushing’s experimental work during his European Wanderjahr instantiated a new understanding of intracranial pressure. As a consequence, Cushing’s research precipitated a paradigm shift that helped build a ‘theoretical and practical technology’⁴⁶ and made brain surgery a more successful intervention. Beyond the practical value of this paradigm, Cushing insisted on the importance of laboratory work for aspiring surgeons. He argued in 1920 that ‘[f]or the development of surgical technic no place is comparable to the experimental laboratory’.⁴⁷ These ideas had a powerful influence on the kinds of surgeons he and Sachs wanted to

include in their society: namely, elite surgeons whose surgical epistemology was entrenched in the laboratory.

Their preferences also seem to reflect a conservative reaction to the enthusiasm for surgical intervention that, as described above, had swept the medical community in the last decades of the nineteenth century. Equally relevant was an anxiety over what Cushing called ‘the spectacularization of surgery’:⁴⁸ some surgeons’ preference for technically daring operations and an interest in performing surgery in front of large audiences in order to showcase their technical prowess. Cushing’s reaction was to embrace a cautious approach, both in the operating room and on the public scene (avoiding, for instance, to engage with a printed press that, in his view, was eager to either peddle radical cures or to malign surgeons).⁴⁹ Although they are sometimes described as audacious pioneers, many of the first generation neurosurgeons in fact championed conservative surgical techniques and emphasised the moral value of self-restraint.⁵⁰ They exemplify how, as historian Thomas Schlich has put it, ‘specific sets of rules of performance in surgery [...] are embedded into wider cultural expectations and evaluations’⁵¹ at a point in time. For Cushing, the most dangerous surgeons were thus not the ‘somewhat awkward craftsmen’—those surgeons who did not possess a dazzling technical ability—but rather those ‘whose operative technic exceeds their judgment as to when it should be put to use’.⁵²

From the inception of the SNS, the meetings were structured such that surgical performances represented the centrepiece of the event and were then followed by extensive discussions. In the context of an emerging surgical specialty, the function of these technical performances was to encourage collective surgical norms and to seek a consensus in surgical knowledge. In addition, the collective witnessing of the surgery also served to demonstrate the abilities and, importantly, the character of the neurosurgeon. The operations that the host neurosurgeon put on for the visiting colleagues acted as a tangible overture to claim a specialist identity, to integrate the attending surgeons into a community, all the while helping that inchoate community negotiate its norms of conduct and its scientific knowledge.

However, after about a decade, the exclusionist ethos that the first generation of neurosurgeons embodied in their stingy membership policy led to an increasing dissatisfaction on the part of younger neurosurgeons who were not being admitted into the SNS. In 1932, four of these younger surgeons—William van Wagenen, Glenwood Spurling, Eustace Semmes, and Temple Fay—decided to form another neurosurgical society: the Harvey Cushing Society (HCS). For political reasons, they named their society after the founding member of the SNS—the very society against whose rules they were rebelling. And, ironically, in the coming years, their society too was beset by

arguments about inclusion and membership restriction.⁵³ The story repeated itself in 1938, when younger neurosurgeons once again established a new society, the American Academy of Neurological Surgeons, and again in 1948 with the establishment of yet another society, the Neurosurgical Society of America. It was only in 1951 that a more inclusive society, the Congress of Neurological Surgeons, was created. In the 1960s, the Harvey Cushing Society changed its name to the American Association of Neurological Surgeons and became the premier organisation for North-American neurosurgeons, giving representation to the other four neurosurgical societies.⁵⁴

We can see how a focus on specialist societies allows the historian to reveal how neurosurgeons appealed to particular cultural repertoires,⁵⁵ borrowing tropes and collective narratives to create a shared professional ethos. Their professional identity found expression in three different kinds of performances at these meetings: the technical performance in the operating room that I mentioned earlier; second, especially for second-generation neurosurgeons, a rhetorical performance by means of public presentations about the state of the field; and, as a third, remarkable practice, a theatrical performance on stage in which the surgeons performed plays that combined entertainment and professional polemics. This last kind of performance literally involved costumes and music and elaborate scripts that spoke to current professional tensions or concerns. All these different types of performances—technical, rhetorical, theatrical—were linked by the choice of words the surgeons employed to talk about them (all being described, for instance, as ‘putting on a good show’) and by a unifying specialty-building objective. These performances can be conceptualised as ‘technologies of the self’ that allowed neurosurgeons to borrow from wider cultural repertoires in order to fashion a distinct and authoritative professional self. Part of the reason why the neurosurgeon is seen as such an elite professional with distinct characteristics is because this persona was created as such in the professional sphere of specialist societies.⁵⁶

The first generation of US neurosurgeons—Cushing, Sachs, Charles Frazier, Alfred Adson, and others—saw themselves primarily as general surgeons and not all were convinced that neurosurgery would remain a distinct surgical specialty.⁵⁷ In contrast to the first generation, the neurosurgeons who practiced in the 1930s and 1940s embraced a much more fluid professional identity, often calling themselves neurologists as well, and they greatly expanded neurosurgery’s purview. An increasingly exigent epistemic commitment to bench science fuelled the return of a more interventionist ethos vis-à-vis surgical operations. For these men, surgical practice became less conservative, as they extended their repertoire to new medical conditions, from epilepsy to various movement and pain disorders to psychiatric conditions, and to more ‘radical’ procedures to treat them.

NEUROSURGERY AS KNOWLEDGE

The career of the US-born Canadian neurosurgeon Wilder Penfield exemplifies key aspects of the shift toward a more interventionist approach in neurosurgery. Through the work of second- and third-generation neurosurgeons such as Penfield, this medical specialty enjoyed extraordinary professional success in the 1930s and 1940s. This was a time period in which, among other achievements, neurosurgeons assumed leadership of neurology departments and institutes, to the dismay of many clinical neurologists. In 1943, one neurologist who practiced in New York, Louis Casamajor, conceded with a mixture of dejection and resignation that '[i]n North America today there are three Neurological Institutes, in New York, Montreal and Chicago, and each one is headed by a neurosurgeon.'⁵⁸

When building his neurological institute in Montreal, Penfield lobbied the Rockefeller Foundation for funding by employing a particular rhetorical strategy that drew on the premise that surgery held the key to knowledge about conditions of the nervous system as well as their therapy.⁵⁹ He challenged the authority of clinical neurologists by proclaiming the therapeutic superiority of neurosurgery and portraying neurosurgeons as men of action who were also best suited for the production of medical knowledge. In addition, Penfield spearheaded a profession-wide debate in an important specialist journal—the *Archives of Neurology and Psychiatry*—in order to stimulate the kind of review of the field—a 'collective examination of conscience'⁶⁰—that the Rockefeller Foundation had intimated it wanted in order to fund Penfield's institute. These disputes about what sociologist Andrew Abbot has called professional jurisdiction and which, as he has shown, were often a feature in the constant reframing of specialist labour⁶¹—reveal how neurosurgeons and neurologists subscribed to different ideas about specialisation. For neurosurgeons, therapy was the key to specialisation. Neurologists by contrast, tried, unsuccessfully in the middle decades of the twentieth century, to make the argument that their specialty ought to have authority over all disorders of the nervous system, be they organic or functional, independently of the ways in which such conditions were to be treated.⁶²

The neurosurgeons' arguments that their branch of surgery was not just an empirically based endeavour, but was deeply tied to the question of theoretical scientific knowledge, was an older one that was merely amplified for the second and third generations. The genesis of these ideas rested with the previous generation and, as I have shown, their insistence on a laboratory-based epistemology for neurosurgery. The fear that surgical practice could eclipse or take priority over scientific knowledge had been articulated by some surgeons for quite a while. This was perhaps a fear rooted in older tropes about the surgeon as unthinking butcher and in anxieties about the inferiority of the work of the hand and the status of surgeons.⁶³ Thus, Sir Charles Alfred Ballance, a UK surgeon who contributed to neurological surgery, cautioned his

colleagues in a 1921 lecture in which he noted the close links between brain surgery and the development of scientific knowledge:

I have an uneasy feeling, shared by some of my friends, that during the last two or three decades the cult of operating among some of the younger Fellows of this College has displaced in part the sacred duty, laid upon each one of us, of adding one more stone to the building of surgical knowledge. Every man is a debtor to his profession. We are pilgrims of surgery who have reached only to the threshold of Truth. A vast field of our art and science still remains unmappped and unexplored. I trust that succeeding generations of surgeons, who look upon this College as their alma mater, will devote time to research work. Research adds zest and satisfaction to life, and gives the promise of that thrill of delight which accompanies the first perception, the slow unfolding of some new truth or principle. Thus may we surgeons rightly forge new weapons against disease and death.⁶⁴

The elite members of the first generation of neurosurgeons typically worked on scientific problems such as the classification of brain tumours and the function of various brain areas.⁶⁵ The second and third generation of neurosurgeons enlarged their therapeutic repertoire significantly and subscribed to a deeply interventionist ethos. In part, this ethos is likely related to a more pervasive interventionist ethos that affected other types of surgery at the time.⁶⁶ But the neurosurgeons were also emboldened by their growing conviction that the laboratory work offered a rational and perfectly trustworthy justification for their labours. By assuming the mantle of neurology and simultaneously cementing their epistemic commitment to bench science, the neurosurgeons of this period expanded the purview of the specialty and embraced what they called ‘rational’ and ‘radical’ procedures.⁶⁷

From the mid-1930s, they were now operating extensively in cases of epilepsy (the Montreal Neurological Institute (MNI), under Wilder Penfield, becoming the most famous centre for such surgeries),⁶⁸ hydrocephalus, hypertension, Parkinson’s Disease, various pain disorders, Reynauld’s Disease, and psychiatric conditions. The lobotomy would eventually become the most contested of these new and aggressive procedures, and although the specialty of neurosurgery is linked in popular imagination less powerfully to lobotomy than psychiatry is, a significant number of US neurosurgeons—such as Laurence Pool, Francis Grant, Glenwood Spurling—were encouraged to embrace psychosurgery by experimental physiologists such as John Fulton starting in the mid-1930s.⁶⁹ Dissenting voices opposing this mutilating surgery existed from the beginning, but it was much later that neurosurgeons began to doubt the technique that created such massive and everlasting damage, although some of them—like the Canadian Kenneth Livingston—advocated for more localised lesions rather than the abolition of the practice.⁷⁰ Soon, a powerful public reaction that raised questions about consent, ethics, the

problem of irreversible damage, as well as the spectre of behavioural control led to legislation that either banned or severely restricted psychosurgery.⁷¹

The period from the 1940s to the 1970s saw the introduction of many new techniques and technologies into the repertoire of neurosurgery. There is a rich technical literature, usually authored by former neurosurgeons, that analyses in fascinating detail the intricacies of work related to such issues as neuroanaesthesia, neurovascular surgery, hydrocephalus, and pituitary surgery.⁷² Here, the broad history of the neurosurgery community has benefited a great deal from a plurality of scholarly voices and interests. While social and cultural historians ask questions about professional identity or ethics, a more technically oriented history sheds light on other aspects of this complex specialty. Perhaps because this is such a small community, the internalist-externalist divide seems less relevant in the history of neurosurgery, and the broad marketplace of ideas and historical questions and interests that exists in the historiography of neurosurgery should be celebrated.

NEUROSURGERY AS IMAGINATION

The identity that the first generations of neurosurgeons fashioned in their professional communities was crafted in parallel in popular imagination. Thus, to mention one important example of such a parallel, in the meetings of their professional societies the neurosurgeons created a highly distinctive type of masculinity, one that was curiously inflected with feminine traits. They called their work a ‘delicate performance’⁷³ of surgical technique, and they likened it to embroidery: Cushing, one of his students decreed, had ‘lifted neurosurgery up from the rough butchery of the nineteenth century to the painstaking embroidery of the twentieth’.⁷⁴ In the theatrical performances put on by members of professional societies such as the American Neurological Association, the neurosurgeon often played the role of the ‘prima donna’, a role that embodied this delicate tension between masculinity, authority, and femininity.⁷⁵

Meanwhile, in the parallel identity created in popular culture, neurosurgery came to be seen as so elite and so masculine that it assumed an emblematic role in women’s fight for gender equality, as it is evident from the numerous fictional stories of women performing neurosurgery decades before any actual women were admitted into the profession. For instance, in the Broadway play ‘Doctors Disagree,’ based on Rose Franken’s story ‘Women in White’ which had been serialised in 1940 in *The Ladies’ Home Journal*, Dr. Margaret Ferris is an aspiring surgeon whose sexist male colleagues continuously impede her professional success. Her success, when it does come, is predicated on a brilliant and life-saving brain operation that she performs on a child.⁷⁶

Over the course of the decades of the twentieth century, the neurosurgeons’ cultural authority grew in the North American press, fiction, theatre,

film, and the visual arts. From the 1930s especially, brain surgeons—both the elite members who belonged to the neurosurgical societies⁷⁷ and others who were excluded⁷⁸—were lionised in the press, both in terms of their moral and their physical qualities. *Time* magazine feted Cushing for his seventieth birthday in an article titled ‘Brainman’. The article characterised the aging surgeon as ‘wiry, bright-eyed [...] one of the most single-minded men in the history of medicine [...] [h]is inspiration burned with icy clarity’.⁷⁹ Neurosurgeons were often pronounced to be ‘handsome.’ In an article about the 1935 International Neurological Congress which took place in London, UK, interestingly the reporter did not mention any neurologists; instead he or she lionised neurosurgeons for their ‘chess player’s intricate mentality’ and their ‘unpassionate fingers’.⁸⁰ The writer described every neurosurgeon as handsome: ‘handsome Dr. Wilder Graves Penfield’ who had ‘opened the skulls of 75 epileptics, [and] removed the scars and abscesses he found on their brains’; ‘handsome Dr. Max Minor Peet’, who had cut ‘abdominal nerves which stimulate the kidneys, adrenals, spleen, pancreas, liver, stomach and intestines’, and other organs for the purpose of relieving patients of high blood pressure; ‘handsome Dr. Richard Max Brickner,’ who ‘took out both frontal lobes of a man’s tumourous brain’; and ‘handsome’ ‘senior’ Dr. Alfred Adson, who was operating on patients suffering from Raynaud’s Disease. The overuse of the epithet was not lost on the public, and readers wrote to the magazine to mock the ‘susceptible reporter who covered the “Nerve Congress”’. ‘Is she blonde or brunette?’ one reader quipped.⁸¹ The editor defended the language of the article by appealing to the supposedly ‘inexplicable fact that most US brain surgeons are notably good looking’, which apparently was ‘a standing joke among US physicians.’

Thus, we can see that many popular representations testify to an increasing glamourisation of brain surgeons. However, close attention to the popular narratives that were crafted in popularising articles on neurosurgery or in fictional depictions shows that the dominant hagiographic narrative was complicated by other, less celebratory counter-narratives. Thus, surgery could still evoke unpleasant fears related to bodily integrity: the ideal cure for brain tumours, for example, was portrayed as medical, not surgical.⁸² Likewise, the public often expressed an ambivalent reaction to the inescapably graphic nature of surgery: disturbed by graphic photographs of a brain surgery in progress, one reader wrote to *Life* magazine: ‘It was the most disgusting story I have ever read. What made you think that the public would be interested in THAT?’⁸³

CONCLUSIONS AND FUTURE SCHOLARSHIP

Many of the historiographical questions that have helped historians elucidate the rise of neurosurgery stand to make a contribution to the collective history of surgery as well. I have argued in this chapter that to understand the

formation of surgical specialties like neurosurgery, it is critical to examine the connections between the doctors' ideas about their professional identity and the kinds of surgical practices they sanctioned, the connections between surgical ethos and broader domains of knowledge, and the ways in which all these ideas were reflected in the social institutions and cultural concerns of the day as well as in public imagination. These tasks can be accomplished in many ways, depending on the historical questions a scholar wishes to entertain. The study of other surgical and medical specialties could profit from the kind of pluralism and diversity that characterises the community of historians who have written about brain surgery. One important dimension that should not be overlooked in such studies is the privileged social space where identity and practice took shape in a most intimate manner—the specialist societies.⁸⁴ It is here that neurosurgeons appealed to particular cultural repertoires and technologies of the self to create a shared professional ethos. At the meetings held within the sphere of these societies, they cultivated their identity in three different kinds of performances: technical performances in the operating room, rhetorical performances in polemical papers that discussed current issues, and theatrical performances on stage in plays the surgeons produced in an astonishingly elaborate fashion, complete with costumes and scripts and music.

Historians of surgery and medicine have not explored the culture of these institutions in depth, but it is clear that neurosurgeons were not creating entirely unique traditions and rituals. Their performances were, in fact, rooted in a broader culture of clubs, medical and otherwise. One such medical club was the Pithotomy Club at Johns Hopkins, where medical students put on raucous burlesque shows throughout the twentieth century, shows in which a particular medical masculinity that reflected the normative commitments of the day was performed.⁸⁵ Historians of surgery stand to gain a great deal by drawing connections to this larger culture, by looking not only at other surgical specialties, but at other clubs in which elite professional men performed a particular social identity. In a recent article, for instance, Christopher Lawrence and Michael Brown describe the intersecting cultures—of manliness and heroism,⁸⁶ of industrial capitalism, of the project of colonialism—that come to play in similar ways in different professional endeavours—surgery, geographical exploration—in the period between 1840 and 1914.⁸⁷

Recently some historians have called for more historical studies that tackle the *longue durée*, studies which they believe would lead to more socially engaged history.⁸⁸ The challenge with sweeping studies that cover a long period of time will be to create narratives that respect continuity without essentialising illness or glossing over the changes in social context. By paying attention to the historiographical issues that have been raised in the history of neurosurgery—the question of epistemic breaks versus conceptual continuities, the ethos of surgical interventionism versus conservative approaches, the epistemic underpinnings of surgical therapy, the relationship between identity, performance, and practice—historians of surgery might be able to establish

links between different surgical specialties and to create deeper and broader narratives of this fascinating profession.

NOTES

1. See F. Vidal, 'Brainhood, Anthropological Figure of Modernity,' *History of the Human Sciences* 22 (2009).
2. On this see also the chapter 'A Revolution through the Keyhole: Technology, Innovation, and the Rise of Minimally Invasive Surgery' by Nicholas Whitfield, in this handbook.
3. See Robert Arnott, Stanley Finger, and C. U. M. Smith, eds., *Trepanation: History, Discovery, Theory* (Lisse; Exton, Pa.: Swets & Zeitlinger, 2003).
4. See the chapter 'The History of Surgical Wound Infection: Revolution or Evolution?' by Michael Worboys in this handbook.
5. See the chapter 'Surgery and Anaesthesia: Revolutions in Practice' by Stephanie Snow in this handbook.
6. For the surgical treatment of head trauma before 1867, see Eugene S. Flamm, 'From Signs to Symptoms: The Neurosurgical Management of Head Trauma from 1517 to 1867', in *A History of Neurosurgery in Its Scientific and Professional Contexts*, ed. Samuel H. Greenblatt, T. Forcht Dagi, and Mel H. Epstein (Park Ridge, Ill.: American Association of Neurological Surgeons, 1997).
7. On trephining for epilepsy see Owsei Temkin, *The Falling Sickness: A History of Epilepsy from the Greeks to the Beginnings of Modern Neurology*, 2d ed. (Baltimore: Johns Hopkins Press, 1971).
8. Stanley Finger and William T. Clower, 'On the Birth of Trepanation: The Thoughts of Paul Broca and Victor Horsley', in *Trepanation: History, Discovery, Theory*, ed. Robert Arnott, Stanley Finger, and C. U. M. Smith (Lisse; Exton, Pa.: Swets & Zeitlinger, 2003).
9. On the histories of surgery, see also the chapter 'Surgery and Its Histories: Purposes and Contexts' by Christopher Lawrence in this handbook.
10. See, for instance, the assertion of one early neurosurgeon, the American Walter Dandy: 'Surgery of the brain is the outgrowth of three discoveries of the nineteenth century—anesthesia, asepsis and cerebral localization'. Walter Dandy, 'The Brain,' in *Practice of Surgery*, ed. Dean Lewis (Hagerstown, 1932), 7. On the complex history of the localisation of function in the nineteenth and twentieth century see Katja Guenther, *Localization and Its Discontents: A Genealogy of Psychoanalysis and the Neuro Disciplines* (Chicago: The University of Chicago Press, 2015); Robert Maxwell Young, *Mind, Brain and Adaptation in the Nineteenth Century: Cerebral Localization and Its Biological Context from Gall to Ferrier* (Oxford: Carendon Press, 1970).
11. Susan E. Lederer, *Subjected to Science: Human Experimentation in America before the Second World War* (Baltimore: Johns Hopkins University Press, 1995); Delia Gavrus, 'Informed Consent and the History of Neurosurgery', in *Handbook of Neuroethics*, ed. Jens Clausen and Neil Levy (Dordrecht: Springer, 2014), 8–9.
12. Arthur E. Lyons, 'The Crucible Years 1880 to 1900', in *A History of Neurosurgery in Its Scientific and Professional Contexts*, ed. Samuel H. Greenblatt, T. Forcht Dagi, and Mel H. Epstein (Park Ridge, Ill.: American Association of

- Neurological Surgeons, 1997); Samuel H. Greenblatt, 'The Historiography of Neurosurgery: Organizing Themes and Methodological Issues', *ibid.*
13. Malcolm Macmillan, 'Localisation and William Macewen's Early Brain Surgery Part I: The Controversy', *J Hist Neurosci* 13 (2004); Malcolm Macmillan, 'Localisation and William Macewen's Early Brain Surgery Part II: The Cases', *J Hist Neurosci* 14 (2005).
 14. Sir Charles Alfred Ballance, *Glimpse into the History of the Surgery of the Brain: Delivered before the Royal College of Surgeons of England on December 8th, 1921* (1922), pp. 79–84.
 15. William Sharpe, *Diagnosis and Treatment of Brain Injuries, with and without a Fracture of the Skull* (Philadelphia: Lippincott, 1920), 45.
 16. Thomas Schlich, "'Physiological surgery": Laboratory science as the epistemic basis of modern surgery and neurosurgery', in Stephen Casper and Delia Gavrus, *The History of the Brain and Mind Sciences: Technique, Technology, Therapy*, University of Rochester Press, 2017, pp. 48–76. Thomas Schlich, *The Origins of Organ Transplantation: Surgery and Laboratory Science, 1880–1930* (Rochester, NY: University of Rochester Press, 2010), 17; Thomas Schlich, *Surgery, Science and Industry: A Revolution in Fracture Care, 1950s–1990s* (New York: Palgrave Macmillan, 2002).
 17. Thomas Schlich, 'Surgery, Science and Modernity: Operating Rooms and Laboratories as Spaces of Control', *History of Science* 45, no. 149 (2007); Schlich, *The Origins of Organ Transplantation: Surgery and Laboratory Science, 1880–1930*.
 18. Letter c. 1906–1910 from Foster Kennedy to his wife, In Foster Kennedy and Isabel Kennedy Butterfield, *The Making of a Neurologist: The Letters of Foster Kennedy M.D., 1884–1952 to His Wife: From Queen Square, London 1906–1910, New York City 1910–1912, British Expeditionary Force 1915–1918* (Hertfordshire: The Stellar Press Hatfield, 1981), 27.
 19. *Ibid.*, 20.
 20. *Ibid.*, 21.
 21. *Ibid.*, 34.
 22. Gert H. Brieger, 'From Conservative to Radical Surgery in 19th Century USA', in *Medical Theory, Surgical Practice: Studies in the History of Surgery*, ed. Christopher Lawrence (London and New York: Routledge, 1992).
 23. See Delia Gavrus, 'Skill, Judgement and Conduct for the First Generation of Neurosurgeons, 1900–1930', *Medical History* 59, no. 3 (2015).
 24. J. E. Scarff, 'Fifty Years of Neurosurgery, 1905–1955', *International Abstracts of Surgery* 101, no. 5 (1955).
 25. R. W. Amidon, 'A Plea for More Heroic Surgical Interference in Affections of the Brain', *Medical News* 44, no. 25 (1884).
 26. 'Society Proceedings', *Journal of the American Medical Association* (1891).
 27. J. B. Tuke, 'The Surgical Treatment of Intracranial Fluid Pressure', *British Medical Journal* 1, no. 1514 (1890); German E. Berrios, 'The Origins of Psychosurgery: Shaw, Burckhardt and Moniz', *History of Psychiatry* 8, no. 29 pt 1 (1997).
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30. Ibid., Delia Gavrus, ‘“Making Bad Boys Good”: Brain Surgery and the Juvenile Court in Progressive Era America’, in *Beyond Innovation: Historical Perspectives of Technological Change in Modern Surgery*, ed. Thomas Schlich and Christopher Crenner (Rochester: University of Rochester Press, 2017, pp. 71–99).
31. Abraham Jacobi, ‘Non Nocere’, *Medical Record* 45, no. 20 (1894).
32. S. V. Clevenger, ‘Conservative Brain Surgery’, *Journal of the American Medical Association* XXIV, no. 26 (1895): 1004.
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34. Michael Willrich, *Pox: An American History* (London: Penguin Books, 2011); Lederer, *Subjected to Science: Human Experimentation in America before the Second World War*.
35. See Delia Gavrus, ‘Men of Strong Opinions: Identity, Self-Representation, and the Performance of Neurosurgery, 1919–1950’ (PhD Thesis, University of Toronto, 2011), especially: Chapter 6, ‘The Inexplicable Good Looks of American Brain Surgeons: Neurosurgery and Public Imagination in the First Half of the Twentieth Century’, pp. 261–320.
36. This was on the assumption that a blow to the head (from mild to severe) led to ‘pressure on the brain’, which in turn led to changes in behaviour.
37. Gavrus, ‘“Making Bad Boys Good”: Brain Surgery and the Juvenile Court in Progressive Era America’. For an emphasis on continuity see also Berrios, ‘The Origins of Psychosurgery: Shaw, Burckhardt and Moniz’.
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 41. Christopher Lawrence, ‘Incommunicable Knowledge: Science, Technology and the Clinical Art in Britain 1850–1914’, *Journal of Contemporary History* 20 (1985): 505; Christopher Lawrence, ‘Still Incommunicable: Clinical Holists and Medical Knowledge in Interwar Britain’, in *Greater Than the Parts: Holism in Biomedicine, 1920–1950*, ed. Christopher Lawrence and George Weisz (New York: Oxford University Press, 1998).
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 46. Greenblatt, ‘Harvey Cushing’s Paradigmatic Contribution to Neurosurgery and the Evolution of His Thoughts About Specialization’, 794.
 47. Harvey Cushing, ‘The Special Field of Neurological Surgery after Another Interval’, *Archives of Neurology and Psychiatry* 4, no. 6 (1920): 611–612, note 8.
 48. Harvey Cushing, ‘Surgical End-Results in General with a Case of Cavernous Haemangioma of the Skull in Particular’, *Surgery, Gynecology and Obstetrics* 36, no. 3 (1923): 304.
 49. On Cushing’s mistrust of the press, see Bliss, *Harvey Cushing: A Life in Surgery*, 247.
 50. Gavrus, ‘Skill, Judgement and Conduct for the First Generation of Neurosurgeons, 1900–1930’. Self-restraint here refers to surgical judgement. Some of these surgeons were known to throw surgical instruments in frustration in the operating room and to behave in other un-restrained ways toward their assistants.
 51. Thomas Schlich, ‘“The Days of Brilliancy Are Past”: Skill, Styles and the Changing Rules of Surgical Performance, ca. 1820–1920’, *Medical History* 59 (2015): 402.

52. Cushing, 'The Special Field of Neurological Surgery after Another Interval', 612.
53. Gavrus, 'Men of Strong Opinions: Identity, Self-Representation, and the Performance of Neurosurgery, 1919–1950'.
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67. For one example, see the way in which Penfield used laboratory data to craft a theory of idiopathic epilepsy and to justify a particular surgical intervention, which was later discarded: Delia Gavrus, 'Epilepsy and the Laboratory Technician: Technique in Histology and Fiction'. In *The History of the Brain and Mind Sciences: Technique, Technology, Therapy*, Rochester University Press, 2017, pp. 136–163.
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Cancer: Radical Surgery and the Patient

David Cantor

One of the main themes in the history of cancer surgery concerns its impact on patients, especially women. In this account, women were the primary victims of the misguided belief that cancer began as a local condition and was best treated early, before it spread, by cutting away not only the tumour, but also substantial amounts of surrounding body tissue. From the 1890s the argument goes, women underwent such operations on the breast and cervix at the first hint of cancer, leaving them severely scarred, in pain, and often profoundly disabled, both physically and emotionally. This standard narrative has led to a characterization of cancer surgeons as arrogant, condescending, paternalistic and blind to their own ignorance—a characterization enhanced by surgeons' long-standing tendency to hide a diagnosis of cancer from the patient, and to pressure women into one-step mastectomy operations. In such a procedure, the surgeon operated immediately when a biopsy was confirmed as (potentially) cancerous, without further discussion, while the patient remained unconscious on the operating table.

However, this kind of story does not capture the full complexity of the impact of cancer surgery on patients. Thus, for example, radical approaches were not confined to cancers of women. During the twentieth century, surgeons applied them to many types of tumours. They routinely treated prostate cancer with radical operations that could leave patients impotent, if not castrated: the latter the fate of some of those with metastatic disease, since prostate cancer growth was (and still is) believed to be driven by androgens.¹ They regularly treated stomach cancer with a total gastrectomy, the removal

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of the entire stomach, and treated the same cancers with radical and super-radical operations: the total extended gastrectomy, which removed the spleen and pancreas in addition to the stomach; interscapulo-thoracic amputations (the separation of the collarbone, shoulder blade and arm, macabrely called the ‘fore quarter’) were frequent, as were hemipelvectomies (in which a leg and an adjacent bone from the pelvis were removed, labelled the ‘hind quarter’); and radical operations for cancers of the oesophagus, pancreas, spleen, colon, and liver. There are many examples, especially after World War II, when—bolstered by wartime improvements in anaesthesia and blood transfusion, as well as the development of antibiotics—cancer surgeons seemed destined to cut ever deeper and farther.

Such examples lend themselves to tales of transformation: among them the displacement since the 1960s of many radical operations for more conservative ones; the decline of localistic models of cancer development in favour of systemic models; the emergence in the 1940s of the field of cancer rehabilitation to address emotional and physical adjustment after an operation; the introduction of cosmetic surgery to address physical and emotional scarring, and more recently to offer patients the opportunity to reinvent their bodies.² Further examples are the growing tendency to combine surgery with a variety of other therapeutic modalities (radiation, chemicals, targeted therapies, and immunotherapies); and the suggestion that some slow-growing cancers and precancers can be left alone, the rationale being that patients are more likely to die with them than of them. In this chapter, I will put particular emphasis on the transformation in (especially US) surgeons’ willingness to involve their patients in decision making and how the surgeon’s façade of god-like certainty came to be displaced by one of uncertainty that made a virtue of patient choice and shared decision making.

RADICAL SURGERY SINCE THE LATE NINETEENTH CENTURY

We first look at the development of radical surgery from the 1890s to the 1960s. Historians writing on this period have shown how surgery gained a reputation for ever more radical operations. Cancers already the subject of surgery were treated more aggressively, and deep-seated cancers of the stomach, colon, and other internal sites, previously eluding the knife, came within its reach: all this facilitated in part by the development of anaesthesia in the 1840s, and of aseptic techniques in the 1860s,³ and the displacement of systemic models of cancer by localistic ones, which helped transform older reservations about radical surgery, and opened the door to a range of operations, including oophorectomies and hysterectomies.⁴

The story has been revised by Early Modernists such as Marjo Kaartinen and Alana Skuse, who have traced the emergence of radical forms of breast cancer surgery to the late eighteenth century.⁵ However, radical surgery of this period was quite different to that of the late nineteenth century. It was performed less commonly than later, and generally removed less tissue. It was

also both palliative and curative, where radical surgery since the 1890s tended to be seen only as curative, and it was not so strictly tied, as late nineteenth-century surgery was, to the idea of the local character of cancer. In addition, where early modernists have highlighted a more balanced relationship between (radical) surgeons and patients, modernists have traced a paradoxical situation in which the radicalization of surgery was accompanied by tendencies among surgeons to both marginalize patients from surgical decision making, and incorporate the lay public into efforts to get would-be patients onto the operating table. Indeed, surgeons came to see the lay public as crucial to the success of surgery for cancer in this period.

The development of historical writing on radical surgery in the period since the nineteenth century can be explored by looking at cancers of the female breast and cervix, the focus of most historical attention in cancer surgery. For a long time, the major work in this area was Daniel de Moulin's 1983 history of breast cancer that included a chronicle of therapeutic (often, surgical) interventions against this group of diseases, and their intellectual rationales.⁶ In 1987, James T. Patterson's social and cultural history of cancer in the USA joined de Moulin's, providing the first overview of programmes of cancer control and prevention neglected by his predecessor.⁷ Where de Moulin's account told an internalist tale of ideas and techniques largely divorced from their social and cultural context, Patterson went in the other direction, focusing on external cultural and social developments around cancer more than surgical and other interventions or their rationales.

In the late 1990s and early 2000s, however, a slew of new scholarship transformed the historiography of breast cancer, and for the first time began to highlight the marginal position of patients in surgical decision making. The first was Ellen Leopold's feminist critique of the radical mastectomy, which argues that the prominence of this operation in the late nineteenth century was, in part, a consequence of sexist, misogynist, and paternalistic impulses among surgeons, which also drove their tendency to limit the role of patients in surgical decision making. Such impulses, she argues, were exemplified by one of the key figures in the emergence of the radical mastectomy, the Johns Hopkins surgeon William Stewart Halsted (1852–1922). According to Leopold, Halsted was an aloof figure. He gave patients very little say over their treatment. He often neglected to mention even the word cancer, and never doubted the correctness of his own therapeutic decisions.⁸ Yet, despite their marginalization, for the women concerned these decisions were significant. Unlike a simple mastectomy, the 'Halsted operation' involved cutting away all flesh until the surgeon reached the chest wall. As a result, patients were left disabled, in pain and terribly mutilated, often with a painful and debilitating swelling of their arm.

Barron Lerner's wide-ranging survey of breast cancer of 2001 takes a different tack. Lerner acknowledges feminist concerns about the radical mastectomy. He confirms the tendency of Halsted to be somewhat remote from his patients, and that his detachment allowed him to undertake such disfiguring

operations. Nevertheless, as Lerner shows, Halsted maintained contact with many of his former patients and revised his technique to address some of the issues raised by them. He also questions Leopold's account of the misogynistic impulses behind the growing focus on radicalization by pointing out that women with breast cancer were not alone among cancer patients in facing mutilating and ineffective treatments: many other cancers were subject to such procedures, and men as well as women.⁹ (He does not, however, address the suggestion that surgeons might have been driven by both misogynistic and misandristic impulses: the two were not mutually exclusive.) A third book on breast cancer, written by James Olson provides a more optimistic gloss on the story of the radical mastectomy. It paints a more favourable image of Halsted and the shift from systemic to localistic understandings of the disease that underpinned his operation.¹⁰

Halsted is a key figure for all these historians in part because of the breast operation that bears his name, which he based on the belief that breast cancer spread centrifugally from the primary tumour to nearby structures. He was not, however, the first to propose a radical operation. His procedure built on a longer tradition of radicalization, and specifically on techniques developed by the English surgeon Charles Hewitt Moore (1821–1870) and German surgeons Lothar Heidenhain (1860–1940) and Richard von Volkmann (1830–1889).¹¹ However, in Halsted's view, most of these surgeons did not remove enough flesh, and so left some cancer tissue within the body to become the source of recurrences. To catch these remnants, surgeons had to cut more aggressively, he claimed. They had to remove not only the breast, but also surrounding body tissues including the skin, neighbouring lymph nodes, muscles, and parts of the rib cage or shoulder. In short, they had to excise a lot of healthy tissue to successfully eliminate a malignancy.

Halsted is often seen as a pioneer of radical surgery, but he did not see himself in this way.¹² In his view, he was a practitioner of a conservative form of surgery, which meant that the surgeon had to anticipate and alleviate the effects of the surgery on the body. Such a perspective was common among surgeons who adopted a physiological approach to their practice. According to Gert Brieger, many radical surgeons argued that their approach was in reality conservative because it saved the lives of their patients.¹³ Even though Halsted's contemporary, George Washington Crile (1864–1943), noted that many patients subjected to radical (conservative) surgery went into shock, their blood pressure would fall and the blood flow to their organs would be inadequate,¹⁴ Crile still argued that only radical approaches offered a cure. The risk of shock needed to be dealt with through the specific measures that he had developed for that purpose.¹⁵

Halsted and Crile may be crucial to the notoriety of the radical surgery, but as Lerner and others note, radicalism (and conservatism) was not confined to them. In the 1890s, Halsted's gynaecologist colleagues at Hopkins—John Clerk and Howard Kelly (1858–1943)—building on the work of earlier French and German surgeons, proposed a radical (conservative) operation for

the cancer of the cervix of the uterus. So too did the Austrian gynaecologist Ernst Wertheim (1864–1920), who in 1898 performed the first radical abdominal hysterectomy for cervical cancer, an operation that involved the removal of the uterus, parametrium, tissues surrounding the upper vagina, and pelvic lymph nodes, while leaving the ovaries intact. Indeed, between 1890 and 1910 the radical hysterectomy emerged as the major treatment for cervical cancer. The surgery was dangerous, however, with an average of 10–15% immediate mortality, while even in the best centres only about a third of women survived their operation.¹⁶ Other surgeons also developed radical operations. For example, the Austrian surgeon Theodor Billroth (1829–1894) developed a whole string of such operations for the gastrointestinal tract, the oesophagus, larynx, stomach and pancreas, as well as ovarian and breast cancer.¹⁷

Halsted's methods rapidly became central to breast cancer therapy in the USA. Where Leopold focuses on the sexist impulses behind this operation to explain this centrality, Lerner focuses on professional and institutional issues. In his view, its popularity was helped by Halsted's position at one of the leading US medical schools, his role in establishing the first US surgical training programme for young surgeons, and because his students colonized leading US hospitals and medical schools, trained their own students in his approach, applied it to other cancers, and in 1913 helped establish the first national campaign against cancer, the American Society for the Control of Cancer (ASCC). Halsted's approach to breast cancer became a foundation for the ASCC's cancer control programme focused on early detection and treatment.

It is here that the role of the lay public becomes important. The problem facing the ASCC and its surgical leaders was how to persuade often-reluctant would-be patients to undergo radical surgery, and, to this end, they turned, in part, to the lay public. The point is made by a fourth book, written by Kirsten E. Gardner, that explores the important role of women's activism in the emergence of US programmes of cancer control. (It also expands the focus from breast cancer to include cervical cancer.)¹⁸ Surgery was at the heart of such programmes, and Gardner's account demonstrates that lay-women were crucial to efforts to draw patients into the doctor's office and onto the operating table. My own 2007 survey of the historiography of cancer built upon these points, arguing that the doctrine at the centre of such programmes—early detection and treatment—was driven initially by surgical views of cancer.¹⁹ From this perspective, cancer began as a local circumscribed condition, which spread out from the original site to affect adjacent tissues and organs, and eventually travelled through the blood or lymphatic systems to distant parts of the body, where it formed the seeds of other tumours. Surgeons argued that successful operations depended on identifying a cancer (or something that might turn cancerous) as early in its natural life as possible, while it was still a local condition, before it grew too large to be operated on, or metastasized elsewhere in the body. These surgeons were in a race against time and the tumour, and the earlier a patient arrived on the operating table,

the better the chance of successful surgery, they claimed. The problem, they argued, was that many patients arrived in the doctor's office with advanced, inoperable tumours, for which nothing could be done except palliation. Hence, the need for the cancer education campaign urging people not to delay seeking proper help, and the thousands of women, that Gardner discusses, who helped to promote the message.

Later books on women's cancers echoed and expanded the point about the centrality of surgery to cancer control. Robert Aronowitz's book on breast cancer also shows that doctors widely embraced Halsted's strategy, but suggests that they paid little attention to his clinical observations, which indicated that while the operation prevented local recurrence of breast tumours, it did not save lives. As Halsted himself came to argue, breast cancer patients tended to die of metastatic, not local, cancer. Aronowitz also highlights the tendency of surgeons to marginalize patients from decision making, and emphasizes how surgeons sought to use public fears of cancer to overcome resistance to surgery. Fear of cancer, he suggests, changed over the course of the twentieth century from the isolated, private fears of the disease and its treatments shared by the affected individual, her friends and family, to a vast collective fear of the risk of cancer used by surgeons (and other physicians) to persuade would-be patients to overcome their dread of cancer and surgery and seek (surgical) help. Among the drivers of this change, he suggests, was the 'do not delay message' of the ASCC/ACS, the emergence after World War II of screening programmes, and a growing focus on so-called precancerous conditions. Such developments, he argues, have led to over-diagnosis, and to more interventions, including surgical ones. They have also pushed patients into the arms of physicians and surgeons by promoting a view among women that their breasts constituted a potential cancer risk.²⁰

Ilana Löwy's history of preventative interventions against breast and others cancers builds on Aronowitz's insights. Surgery had long been characterized as a component of prevention: surgeons claimed that the removal of a tumour could prevent the further development of cancers established in the body, and that the removal of a precancer could prevent it turning cancerous—this last assertion despite the uncertainties that Löwy highlights about whether they would in fact turn cancerous. Thus, from the late nineteenth century, surgeons and dentists used surgical interventions to remove sources of irritation or infection such as warts, moles, or bad teeth that were often seen as precursors to cancer. Indeed, by the early twentieth century, such approaches had come to dominate the field of cancer prevention, and older notions of prevention, which sought to forestall the onset of cancer through environmental or lifestyle change, began to give way. Physicians might still advise their patients to reduce their exposure to irritants or infections by changing their clothing or diet, or by avoiding occupations that involved work with carcinogenic substances, but such recommendations were increasingly subordinated to a therapeutic model of prevention in which the surgeon (and general practitioner and dentist) removed cancers or precancerous

conditions. Surgery would dominate cancer prevention until the 1960s and 1970s when smoking, occupation, and later diet were identified as causes of cancer, and focused attention on primary prevention again. However, surgery would never entirely disappear as a tool of prevention. Indeed, as Löwy shows, radical surgery re-emerged in the late twentieth century as a prophylactic tool for removing cancer risks, after a long period where its value—in therapeutics—had been called into question. At the same time, she also notes the inherent uncertainties behind the category of precancer. These are anomalies that might (or might not) turn cancerous, yet surgeons have often used them to press for prophylactic surgical intervention, despite the uncertainty over whether they will turn malignant: indeed, surgeons turned their uncertainty into a sort of virtue that opened the door to shared decision making.²¹ Löwy's second book on approaches to cervical cancer follows her earlier book in broadening the focus from the USA, highlighting, for example, the fact that French gynaecologists were less willing than their US colleagues to perform hysterectomies in cases of CIS (carcinoma in situ, a precancerous anomaly), because of French pro-natalist policies that mitigated against the sterilization of fertile women.²²

Finally, Keith Wailoo added a further dimension to this literature, when he highlighted the centrality of race to constructions of cancer. The cancer campaigns of the early twentieth century, he argues, were mainly targeted at and run by white women, in part, because cancer was viewed as a disease of civilization that did not affect most African Americans, a view that persisted until after World War II. Indeed, African Americans were doubly discriminated against: they were not regarded as probable cancer victims, and even if they were, they often had much poorer access to health care than whites did in a society that often regarded them as second-class citizens. The women that Gardner in her account highlights as activists in promoting the surgical solution to cancer control were predominantly white, and addressed a predominantly white audience: a situation that would not begin to change until the 1960s.²³

HOSPITAL, LABORATORY, SURVEILLANCE, AND THE PATIENT

The marginalization of patients from surgical decision making did not, however, begin in the 1890s and was not only tied to radicalization. As the British sociologist Nicholas Jewson put it many years ago, this process was tied in part to broader and longer-term changes in medicine.²⁴ From this perspective, a key development for cancer treatment was the emergence, since the eighteenth century, of hospitals as key sites of care and knowledge production. As medical and surgical staff gradually took charge of the growing number of hospitals from their lay governors, hospital wards became training grounds where patients served as clinical material. Within the hospital, surgeons could now see many more patients than hitherto possible, especially in the larger hospitals that came into existence in that century. The result was that they

could develop skills in diagnosis and treatment, and establish programmes of surgical training on a scale that would be difficult or impossible outside the hospital walls, where they would see far fewer patients with cancer and far few varieties of the disease. Surgeons also had access to the bodies of dead patients, and so could begin to correlate internal lesions with diagnoses of illness in the living.²⁵

Surgeons' access to such 'clinical material' within emergent European and North American hospitals was helped by the fact that patients in these institutions were primarily the poor recipients of private philanthropy or local or central government aid. While as Mary Fissell argues, it was possible for such patients, even the very poor, occasionally to assert themselves, in general they were dependent on the goodwill of donors and overseers and on physicians and surgeons, who could exert considerable power over these patients, treating them while alive, and anatomizing them after death. In such a context, patients began to lose control of their bodies, and their understandings of health, illness, and physicality were increasingly dismissed by physicians. Vernacular healing traditions based on the concept of sympathy, an understanding of balance (especially of bodily humours), and a knowledge of botanical healing was dismissed by physicians as the mistaken views of the poor. Illness was no longer something written on the outside of the body, there for all to see and interpret. The causes of illness were lesions deep within the body as revealed by the anatomist. This was surely a context that was favourable for the emergence of the modern image of a god-like surgeon, able to determine what was best for the sick person, with little or no input from the patient or his or her family and friends.²⁶

This is not to say that surgeons went unchallenged. In the first place, many voluntary or charitable hospitals refused to take advanced cancer patients, so that surgeons seeking to use their wards to train future colleagues could be frustrated. One consequence of this was the creation of specialist cancer institutions. Patrice Pinell notes that the first cancer hospital was established in Rheims, France in the mid-1700s (it closed in 1778), but most institutions were created later. In the UK, the Middlesex Hospital opened its specialist cancer wards in 1792; the Society for Investigating the Nature and Cure of Cancer was established in 1802; it was followed by specialist cancer hospitals in London, Leeds, Liverpool, Manchester, and Glasgow from the 1850s. Similar specialized hospitals were also established in France from the 1850s and in the USA from the 1890s. Some of these hospitals were little more than homes for the dying, but in many of them the surgeons had a chance to diagnose, treat and dissect, and draw conclusions about cancer based on their hospital work.²⁷

In the second place, surgeons generally could not treat their upper- and middle-class patients as they treated the poor. Most of them would not enter the nineteenth-century hospital as patients, many were operated on at home, and would not countenance the ways a surgeon might deal with the poor, so that surgeons often had to negotiate care rather than impose it. However, as

middle-class patients began to enter the hospitals in the early twentieth century, they too could find themselves subject to the sorts of treatment that had previously been the privilege of the poor.²⁸ This is not to say that all middle-class patients were treated this way; Aronowitz, for example, provides some examples of earlier traditions of more balanced power dynamics between doctors and patients persisting in elite hospitals between physicians and middle- and upper-class patients.²⁹ However, many patients were still relatively powerless vis-à-vis their surgeons. They could easily find themselves pressured into rapid treatment after diagnosis, and they might be given few opportunities for dissent.³⁰

The prevalence of the one-step procedure for US breast cancer patients is a good example. In this procedure, the patient would go into the operating room for a biopsy, and would remain unconscious on the table until the results came back from the laboratory. If negative, the surgeon would close the patient up and return her to the ward. If positive, the surgeon would immediately perform the mastectomy, without waking the patient, the rationale being that the surgeon had to act fast, and that time would be lost in waking and discussing with the patient in the interval between the removal of the biopsy and the operation. Thus, a woman could go into the operating room for a biopsy and come out with a mastectomy. Aronowitz shows how some elite physicians discussed such operations in detail with their upper- and middle-class patients.³¹ However, it is difficult to know how widespread such consultation was, especially among surgeons at non-elite hospitals, and patients from different social classes. It is clear that some women were reluctant to undergo such a procedure, and there is also evidence to suggest that some were given little option but to agree to it.³²

In the third place, in the early twentieth century, X-rays and radium joined the therapeutic armamentarium. They were initially used for surface growths, and as supplements to surgery, especially for inoperable conditions. Radium and X-rays offered the surgeon a means of reducing advanced tumours to operable size, treating metastatic cancers that surgery could not remove, and killing cancer cells that the surgeon might have left behind. Sometimes they were presented as an alternative to surgery: surgery without the knife as they were sometimes labelled.³³ However, the label was not entirely accurate. For example, radium therapy sometimes required a surgery-of-access to insert needles or tubes containing a radium salt or radon in or around a tumour. Moreover, the use of X-rays and radium highlights the beginnings of a longer-term trend towards teamwork in cancer therapy, in which surgeons would increasingly coordinate care with other therapeutic specialists (radiotherapists from the 1910s and 1920s, chemotherapists in the 1960s, and specialists in targeted therapies and immunotherapy by the end of the century). It was a trend, I shall argue, that resulted in the displacement of surgeons from the heart of cancer control, even as the model they had created—early detection and treatment—persisted.

A second key development in the changing relations between surgeons and patients that follows from Jewson's approach happened between 1901 and 1930: the arrival of the pathology laboratory as the arbiter of diagnosis.³⁴ Until then, diagnosis had primarily been in the hands of the surgeon, who would look for gross anatomy and clinical signs to diagnose the disease. The emergence of the pathology laboratory as the locus of diagnostic authority in cancer had roots in the development of cell theory in the late nineteenth century. Cell theory gave further credence to the old idea of cancer as alien to the body, a gangster, a criminal, or the enemy within. No longer regarded as a humoral imbalance, or an internal contagion, cancer now involved a transformation of normal cells into something more aggressive, something that reproduced uncontrollably, crowded out the surrounding normal cells, fed off the body, and refused to die. If an echo of the older contagion metaphor remained, it was in the idea of metastases, in which cancer cells travelled via the blood or lymphatic system to distant parts of the body to 'seed' new growths, or when surgeons failed to remove every cancer cell, which then became 'seeds' of further recurrences.

Cell theory was useful to surgeons because it helped to legitimate a localistic model of cancer, which was a central rationale for early surgical intervention.³⁵ From this perspective, cancer began when a single cell turned malignant, and expanded out from this local point to spread elsewhere in the body. Surgeons already regarded a small early growth as more treatable than an advanced tumour. The key was to remove it while it was still a local, circumscribed entity, and nothing could be more circumscribed than a single cell turned malignant, while the ability of cells to dislodge and travel in the body helped explain the importance of operating before a cancer metastasized. Finally, cell theory also gave credence to rationales for radical surgery. The idea was that it was almost impossible to detect any microscopic cancer cells left behind during surgery, or displaced to other part of the body by the knife. Such cancer cells were regarded as the source of future recurrence, and radical surgery promised both to remove any tissue that might contain a cancer cell, and to give the knife a wide berth to any cancer cells that might lurk near the tumour, and which might be spread by contact with the surgeon's instruments.

This is not, however, to say that surgeons always fully embraced pathology based in the laboratory. Some late nineteenth- and early twentieth-century surgeons justified radical surgery without reference to cell theory, and some were resistant to the notion that the pathologist might be the judge of whether of growth was cancerous or not.³⁶ So, as Stephen Jacyna has argued, the pathologist was used sometimes only as confirmation of the surgeon's diagnosis, after the operation was over.³⁷ However, by the mid-twentieth century, the tables had turned, and few, if any, surgeons would challenge the pathologist over a diagnosis. Indeed, the pathology laboratory helped surgeons assert further control over patients, for the subtle changes that pathologists defined as a cancer or a precancer could happen without any symptoms to alarm a patient. The patient could be ill without knowing it, and

surgeons had a further tool in their efforts to ensure that the seemingly well but cancerous came within their purview.

A third key development goes beyond Jewson.³⁸ In the 1990s, the sociologist David Armstrong extended Jewson's account by suggesting that in the mid-twentieth century a new form of medicine emerged, what he calls 'surveillance medicine.'³⁹ This, he argues, was (and is) a form of clinical practice that stressed the centrality of risk-factors and medical surveillance for understanding health and illness, and that questioned the pathological model of disease at the heart of hospital and laboratory medicine. In surveillance medicine, the relationship between the symptoms the patient reported, the signs of underlying pathology determined by the doctor during clinical examination and laboratory and other tests (which together under hospital and laboratory medicine had pointed towards the precise pathology underlying the illness including cancer), became reconfigured as risk factors. Risk factors, he suggests, problematized what constituted normality and abnormality as health blurred seamlessly into illness. Indeed, in this new world of medicine, everyone was potentially ill and none were fully healthy as everyone had a particular risk factor profile that a watchful medicine sought to manage. This new configuration of health and illness, he suggests, helps to account for the extension of health care from its narrow focus on the hospital into the community and into everyday life during the last half century. Historians such as Aronowitz have added complexity to this story, raised some questions about the timing of the transition (for example, insurance companies were interested in risk factors long before the mid-twentieth century, and the blurry boundary between health and illness predated the risk factor), and its conflation of surveillance medicine with risk factors.⁴⁰

Three different forms of surveillance can be mentioned here. The first—self-surveillance by members of the public—was a central part of US educational programmes that developed in the 1910s, and included from the late 1940s techniques such as breast self-examination. For this form of surveillance to work, the ASCC/ACS and other cancer organizations launched vast educational programmes that asked members of the public to learn about the early warning signs of the disease, to monitor themselves (and also family and friends) for these signs, and to go to a recognized physician the moment that one was spotted. Concerned that such a message might generate unwanted public anxieties, the ASCC/ACS reassured its audience that these symptoms often did not turn out to indicate cancer, but that only a recognized physician could determine this. It followed that only doctors could relieve the worry and concern their identification created, or ensure that appropriate medical intervention happened if the symptoms turn out to be cancer or a precancer.⁴¹ As Löwy has shown, however, such claims were often ill-founded: it was often impossible for physicians or surgeons to tell whether a precancer would turn cancerous, something not always communicated to the patient, and yet they often intervened with (often radical) surgical procedures anyway.⁴²

Given that physicians argued that patients could not determine whether a symptom indicated cancer, and the existence of concerns that lay surveillance led to unnecessary demand for medical care, the ASCC/ACS and other cancer bodies urged a second form of surveillance to ensure that patients got to the operating room in time: medical or professional surveillance. From the late 1910s, the US public were asked to go for regular medical check-ups once or twice a year even if they felt well. A regular check-up was a means of identifying precancers or asymptomatic cancers, ensuring that patients who might be unaware of or missed the early warning signs of the disease came under a medical gaze. It also laid the groundwork for the development of screening programmes, first for cervical cancer in the 1940s–1950s, then breast cancer in the 1960s, and subsequently other cancers. Screening was not generally a diagnostic test—except in some cases such as for skin and colon cancers—but a means of identifying anomalies that needed a second look, and of beginning the process by which a person got to the doctor early in the natural life of the disease or a precursor.⁴³ It is here that Armstrong's notion of surveillance medicine and its chronology seems to fit best.

A third form of surveillance focused not on patients or would-be patients, but on other healers, especially so-called quacks, who, according to leaders of cancer organizations, enhanced the risk of succumbing to cancer by encouraging people to delay seeking help from a recognized physician, often by exploiting their fears of surgery. In the USA, for example, the American Medical Association urged regular physicians to monitor alternative practitioners in their area, and report on their activities to the Association. A vast network of medical informants thus emerged allowing the organization to monitor the activities of irregular medical practitioners across the nation, and to take action against them, and their claims to cure cancer without the knife.⁴⁴

PATIENTS AND SURGICAL DECISION MAKING

Jewson's and Armstrong's approaches suggest that the marginalization of patients in surgical decision making was a complex and long-term process, but they also allow for the fact that surgeons failed to entirely exclude patients from decision making. Indeed, if the recent historiography has shown anything, it is that patients had always been involved in such decisions, most importantly in reporting their symptoms to the physician, which provided an important guide to surgeons' treatment choices and advice in an age before pathology and radiography tests. The growing use of such testing provided surgeons with new ways of diagnosis that did not rely on patient self-reporting, and joined older diagnostic methods that focused on gross anatomy and clinical signs. Yet they were unable to replace self-reporting completely. Wedded to the gospel of early detection and treatment, surgeons found themselves dependent on patients to identify the early warning signs of what might be cancer, and to come into the doctor's office or clinic. The problem was that often they did not, and the fear of radical surgery was a major reason for this.

How did educational and control programmes respond this fear of surgery? One answer, highlighted by historians, was to minimize any mention of (radical) surgery in public cancer education programmes. However, with radical surgery (and from 1930s super-radical surgery of the sort described in the introduction to this chapter) on the rise, such silence was difficult to maintain. Knowledge of the disfigurement and mutilation caused by the knife leaked out through newspapers and magazine articles, from alternative healers, and in private conversations. In such a situation, cancer agencies came to fear that their silence only breathed life into dread of surgery, and likely added to the problem of delay. Indeed, they devoted considerable effort to managing patients' fears of surgery, teaching their audiences to identify the early physical signs of the disease, but also the early psychological signs that fear might prompt them to delay. By recognizing these responses in themselves, people could, they suggested, identify their fears and overcome them, and get to the doctor in time.⁴⁵

If public education was often silent about the operation, so too were many surgeons, who frequently failed to tell their patients of the nature of their operation, and even that they had the disease. They did this not so much to deceive the patient, but to sustain hope and relieve fears of the disease and the operation. Yet such views came to be challenged in the 1950s, as attention increasingly focused on the role of patients within the healing process.⁴⁶ In the context of such debates, a surgeon's failure to discuss an operation with the patient, it was argued, could do harm by breaking a trust between the professional and the patient. In addition, as the psychologist Arthur M. Sutherland at Memorial Sloan Kettering argued, patient responses to cancer and the prospect of surgery were adaptive responses—and thus not completely irrational—though perhaps maladaptive in the case of delay. They varied depending on the type of cancer, the form of the operation, and the meanings, often formed in early childhood, of the parts of the body that the patient might lose (the prospective loss of a colon meant something very different to the loss of a breast or larynx.) Only by addressing these adaptive responses in the lead-up to surgery could issues of fear and delay be countered, Sutherland argued. He also claimed that they promised to help post-operative recovery. For Sutherland, as for others in the emerging field of cancer rehabilitation after World War II, recovery from cancer meant much more than physical recovery. It also involved psychological recovery as patients learned to adapt to their new condition. The danger for him was that while surgery might cure a patient, it might leave him or her both physically and psychologically scarred.⁴⁷

Patients' concerns are more difficult to document for the immediate post-war period, and most historians of cancer surgery have relied on the records and recollections of only a few patients, which has made generalization difficult. There are examples of patients' criticizing surgeons for not telling them about the diagnosis or the operation, and questioning the ability of surgeons to fully address their rehabilitation needs. Surgeons had long encouraged their patients to talk with other post-operative patients to share knowledge

and experience and to provide mutual support. In some cases, such informal groups evolved into something more formal: for example self-help organizations for laryngectomees in the 1920s, and mastectomees and ostomates in the 1950s. By the end of the 1950s, many of these groups had formed national organizations to help members navigate their new lives after surgery.⁴⁸ Surgeons had mixed feelings about such organizations. Some resisted their claims to special expertise, others found them valuable in managing post-operative patients, and a few, such as the Mount Sinai surgeon Albert S. Lyons, in fact welcomed their special expertise. Nevertheless, the patients' organizations of the 1950s were generally keen not to challenge surgical authority, even as they sought to figure out a role for patients in rehabilitation.⁴⁹

Criticism really began to take off in the 1960s and 1970s as patients and patient groups asserted expertise in areas other than post-operative life. Informed by participatory models of patient action, feminist criticisms of (surgical) paternalism, and inspired by the civil rights movement, patients increasingly began to argue for a say in deciding what care they received before and during the operation. It was here that the surgeons' continuing tendency to hide a diagnosis came in for criticism. How could a patient be involved in surgical decision making if he or she did not even know the diagnosis? Others raised the same question about the one-step procedure, in which surgeons operated immediately following the pathologist's identification of cancer, without input from the patient. In 1973, a Gallup Poll conducted for the American Cancer Society showed that 48% of women rejected the procedure, which had been standard practice only a few years before. Instead, they preferred to review several options if it turned out that their biopsies were positive.⁵⁰ In addition, growing evidence (often from Europe) that conservative treatments were as effective as more radical ones generated disquiet among some patients in the persistence of radical surgery in the USA. The same was true for the need for speed in operations—a key rationale for the one-step mastectomy—which now seemed to be overstated. Surgeons' resistance to efforts of comparing radical surgery with less invasive surgical approaches, for example through clinical trials, did not help patient trust.

In the USA, the idea that the patient should be involved in health care policy is now often cited a guiding principle of care. In this context patients figure either as economic actors or as the physician's collaborators in making therapeutic decisions, notably around the concepts of informed consent and shared decision making.⁵¹ Where once only the cancer surgeon had determined what was best for the patient, by the 1980s US courts increasingly argued that that patients had to be specifically informed of the potential harms, benefits, and alternatives of proposed medical interventions so that patient consent to a proposed treatment was informed. The mantra of shared decision making has gained ground since then. It is said to reassure patients about procedures, promote patient compliance, and guarantee respect for patients' values, especially where medical uncertainty exists over an intervention. Critics, however, suggest that the focus on the collaboration

between doctor and patient may be at the expense of attention to broader structural factors shaping health care such as cost, profit margin, quality, and efficiency.⁵²

THE NEW MILLENNIUM

By the end of the twentieth century, surgeons had lost their central place in cancer treatment. At the start of the century, they had portrayed themselves as the only hope of a cure for cancer. This view had been challenged first by radiotherapists, and then from the 1960s by chemotherapists. Surgeons increasingly found themselves to be part of a team that evaluated which of the three modalities to apply to an individual patient, and in what combination, along with experts on rehabilitation and nursing. By the end of the century, other modalities had joined the mix: drug therapies targeted at molecular 'lesions', and immunotherapy that sought to use the body's defences against cancer. Surgery was still the treatment of choice in a few cancers, but in the 2000s, the days had long gone when it was touted as the only cure for this group of diseases. Indeed, to some specialists surgery seemed increasingly marginalized, prompting calls for the creation of separate sections of surgical oncology within universities and medical schools. Oncological surgery, they argued, required forms of knowledge—especially of other treatment modalities—that most general surgeons did not have, and to ensure that surgery retained a place in cancer treatment and research.⁵³

Surgeons also found themselves displaced in diagnosis. Whereas at the start of the century, the surgeon could still claim to be the arbiter of diagnosis, using clinical observations and gross anatomy, this pre-eminence was soon to be challenged, notably in the 1910s and 1930s with the rise of the pathology laboratory, and of other diagnostic tests such as X-rays. The introduction of screening in the 1950s—for cervical cancer, then for breast cancer, and then for a range of other cancers—further displaced the surgeon. While it potentially opened a range of previously undetected cancers and precancers to surgery along with other therapeutic modalities, it also raised a series of difficult questions. What to do, for example, about those tiny lumps composed of slightly unusual cells such as actinic keratosis and leucoplakia, abnormal cervical smears, or polyps in the colon. These might turn cancerous, or they might not, and, as Löwy indicates, it was not always clear how to decide whether they should lead to prophylactic surgery or other interventions or to no therapeutic intervention at all. The general response in the USA was to act aggressively, but elsewhere and at other times, responses could be very different, from conservative clinical observation to radical surgery, radiotherapy, chemotherapy, and other therapeutic modalities.⁵⁴

As the above suggests, the types of cancer that surgeons saw had also changed over the course of the twentieth century. At the beginning of the century, surgeons had seen many advanced cases, sometimes huge,

suppurating growths, spread over a large area of the affected part of the body. By its end, they rarely saw such cancers, at least in richer, more developed countries.⁵⁵ Indeed, with the advent of screening technologies, and more recently of genetic testing, many surgical operations are now undertaken on patients with tiny abnormalities that may or may not turn cancerous. Surgeons had long removed such tiny aberrations, but the introduction of new genetic tests for the risk of cancer has led to a rise in more major preventive surgery, notably preventative mastectomy, but also colectomy for colon cancer, oophorectomy for ovarian cancer, thyroidectomy for medullary cancer of the thyroid, and orchiopexy for testicular cancer.⁵⁶

If we want to describe the situation at the end of the twentieth century we can say that radical surgery remained a possible intervention in some cases, but it did not have the same importance as it had at mid-century, in part because survival rates for more conservative treatments often turned out to be as good as for more radical procedures, and also because localistic models of cancer were increasingly displaced by systemic ones, which removed one of the main rationales supporting radical interventions. At the same time, the need for speed also had been called into question by the realization that many cancers—including some of the breast, prostate and lung—turned out to be slow growing, and would do little harm to a patient during his or her lifetime. By the end of the twentieth century, surgeons still made a case for operating on solid tumours that were confined to the anatomical site of origin, often in combination with other therapeutic modalities. They also argued that surgery could reduce the bulk of some cancers and thus allow them to be treated by other therapeutic modalities more efficiently. Even some metastatic cancers were amenable to surgery, especially where metastases were limited to a single site, and where the cancers did not respond well to systemic chemotherapy. Surgery also had a role in cancer-related emergencies (such as exsanguinating haemorrhage, perforation, drainage of abscesses, or the imminent destruction of vital organs), in palliation (to relieve mechanical problems or to remove growths that cause severe pain or disfigurement), and in reconstruction and rehabilitation.⁵⁷ Indeed, reconstructive operations were often undertaken at the same time as the cancer surgery, so that the sorts of severe mutilation experienced by many patients at mid-century were less common, and patients were sometimes given the opportunity to determine what the final cosmetic outcome should be: larger or smaller breasts, for example.

It should be clear then that surgery's place in cancer therapy shifted dramatically over the course of the twentieth century. Once at the very centre of the field, the surgeon moved to a more circumscribed, at times marginal, role as a member of a team of specialists involved in care: a team that might also include patients or their representatives. While there is evidence that, throughout the twentieth century, some surgeons involved their wealthier patients in decision making, such interactions were not always the norm. Indeed, early in the century, surgeons could project an image of certainty to justify their own therapeutic decisions and limit patients' involvement in ways

that were much more difficult a hundred years later. By the end of the century, it was much easier for surgeons to admit their own uncertainties over appropriate interventions and to involve patients in determining the sort of surgery that should be undertaken. Ironically, at the end of the day, patients were still burdened with the responsibility for outcomes. If in the 1950s, patients were made responsible for seeking care early in the life of the disease as possible, often with little regard for the structural factors that might encourage delay, in the 2000s they were given responsibility for choosing what types of treatment fitted best with their values, again often with little regard to structural factors shaping health outcomes.

The changes in patient involvement in surgical decision making is a topic that requires more attention by historians. Historical research can tease out how shared decision making in cancer surgery emerged. It can illuminate the context of broader changes in medical attitudes towards patient involvement in the healing process, and the roles of various stakeholders in shaping its meanings and practice: surgeons, ethicists, insurance companies, health providers, government agencies, advocacy groups, and patients themselves. We know there was enormous suspicion and resistance among early twentieth-century cancer surgeons towards patient involvement in therapeutic decision making, and that the little that has been written on modern patients suggests that, like their Early Modern forebears, they were by no means passive in their response to cancer and surgery. We also know that surgeons' attitudes towards patient involvement had changed by the end of the century, as had the nature of patient involvement in decision making, and that a new set of stakeholders and structures had emerged to support such involvement. Quite how and why this changed is not clear, and further work on this issue promises to open a critical eye on the factors shaping patients' involvement in not only in cancer surgery, but also in surgical decision making more generally.

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Surgery and Clinical Trials: The History and Controversies of Surgical Evidence

David S. Jones

Surgery, perhaps more so than any other area of medicine, makes remarkable demands on its patients. They must accept the promise that cutting into their bodies will, in the end, provide relief of their suffering. The drastic nature of many surgical interventions, especially as practiced in the nineteenth and twentieth centuries, forced surgeons to think seriously about a fundamental question: how could they be confident that their operations would indeed help? This is part of a broader set of questions that has long fascinated not just historians of surgery but also historians of medicine and science more broadly. How do physicians and surgeons know what they know about the efficacy and adverse effects of their interventions? How confident are they that their knowledge is correct? How does that knowledge, along with other factors, motivate the decisions that patients and doctors make about therapeutic interventions?

Compared to internal medicine, surgery has a distinct origin and historical trajectory, one grounded in craftsmanship and technique. The question of efficacy was often easily answered. Surgeons and their patients could see, with their own eyes, whether or not the desired mechanical rearrangement of tissues had been achieved (e.g., the abscess was drained, the tumour removed). When surgeons intervened in the setting of life-threatening emergencies, such as trauma or gangrene, the mere survival of a patient testified to the success of the intervention. But much of surgery is subtler than this. As Christopher

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Lawrence has argued, and subsequent historians have explored, surgery is not simply a question of technique.¹ Surgeons, like other physicians, have theories about the body and disease that guide their interventions. The potential benefit of an operation, as a result, depends not just on the surgical technique but also on the underlying idea that motivated the intervention. In addition, surgeons, like other physicians, have many ways to gauge the efficacy of their operations, including both theory (i.e., is it likely that the operation could work?) and empirical observation (i.e., what outcomes did the surgery produce?), documented through testimonials, case reports, case series, and formal clinical trials.

One of the hallmarks of the history of surgery in the nineteenth and twentieth centuries has been the integration of surgery into medicine. Surgeons, to put it bluntly, were no longer simply craftsmen. Instead, they had adopted medical science and professionalism. The success of organ transplantation, open-heart surgery, and many other operations in the twentieth century testifies to the achievements of scientifically oriented surgery. Despite such success stories, surgeons have in the recent past often been criticized for failing to adopt the most robust methods of modern clinical research, in particular the method of randomized controlled trials (RCTs), which emerged as the ‘gold standard’ of clinical research in Europe and North America after World War II.² Surgeons have not adopted this method as enthusiastically as other physicians. A 2003 review of 134,689 RCTs published between 1966 and 2000 found that only 15.1% of them addressed surgery. Of all articles in the five leading surgical journals, only 3.4% were RCTs.³ The relative scarcity of RCTs of surgical procedures suggests that standards of knowledge production differ between medicine and surgery, a difference that opens an opportunity for historical analysis to identify and understand the many factors—technical, professional, social, and economic—that influence how surgical knowledge is produced.

While many excellent histories of clinical trials in medicine have been written, the history of surgical trials remains incomplete. Most of the existing historiography of clinical trials ignores surgery or engages with it only in passing.⁴ This chapter reviews the history and historiography of clinical trials in surgery, with a focus on the development, implementation, and controversies of surgical RCTs. It examines existing scholarship and highlights opportunities for future research. A few disclaimers are in order. First, this chapter focuses on the English-language literature, both surgical and historical. Second, it focuses on clinical trials, and not the full scope of surgical research which, since the 1950s, has included substantial laboratory work in biochemistry, cell biology, molecular biology, and tissue engineering. Third, because of its clinical focus, it does not take up questions of animal research.⁵

THE ORIGINS OF CLINICAL TRIALS

The question of efficacy is one of the oldest in medicine, one that historians of medicine and medical anthropologists have studied intensively throughout the twentieth century.⁶ Ancient physicians debated two polar positions, empiricism and rationalism. Empiricists argued that physicians should only consider therapeutic outcomes. Rationalists argued that medical theory, specifically knowledge of the mechanisms of disease and therapeutics, could guide judgments of efficacy.⁷ Historians have traced in considerable detail how these standards of efficacy have evolved, especially over the past two centuries. In their classic works, Charles Rosenberg, John Warner, and George Weisz examined how nineteenth century physicians developed new ways of thinking about disease, new ways of measuring outcomes, and new standards for what counted as a successful intervention.⁸ Harry Marks, Jeanne Daly, and Scott Podolsky have studied the work of therapeutic reformers in the twentieth century who struggled to establish a more rational basis for clinical research.⁹ Their work has substantially revised the conventional narrative of clinical trials in medicine and surgery.

Traditional narratives typically celebrated early pioneers, such as James Lind, for introducing careful methods into clinical research, and then jumped ahead to the story of how RCTs emerged out of specific developments in statistics and collaborative research in England between the 1920s and 1940s. Such narratives celebrate R. A. Fisher, for instance, who developed techniques of randomization for agricultural research both to account for variations in conditions of research (e.g., differences in soil quality between two plots) and, more importantly, to enable new techniques of statistical analysis. A. Bradford Hill adapted these techniques to medicine and, with support from the British Medical Research Council, organized collaborative RCTs in the 1940s, most famously the 1948 trial of streptomycin for pulmonary tuberculosis.¹⁰ RCTs gained regulatory power in the USA in 1970 when the Food and Drug Administration specified that control groups should be assigned at random to permit appropriate quantitative evaluation of new pharmaceuticals.¹¹ Regulators in Europe and Japan followed suit. By the 1980s, RCTs had become the gold standard for clinical research, fuelling a massive industry that produced thousands of trials involving millions of patients and costing billions of dollars.

Careful historical work has been able to replace this narrative with a more complex and interesting history. The method of modern clinical trials involves several distinct components, including controls, blinding, quantification, and randomization, and each has a distinct history. Moreover, once any trial is published, its fate depends on many factors, especially professional interests and the regulatory environment. Historians have now looked in more detail at all of these aspects.

Systematic efforts to determine the efficacy of new remedies stretch back at least to the sixteenth century. In the 1580s, Seville surgeon Bartolomé Hidalgo de Agüero examined hospital records to determine the relative

merits of two different techniques of wound management.¹² Scholars of medieval and Early Modern medicine have recently turned their attention to efforts made by physicians to test the effects of Early Modern cures, especially poison antidotes.¹³ State-sponsored regulation sometimes motivated this work, with German princes and French kings demanding that drug sellers submit proof of efficacy, typically from a trial of some sort, before licensing drugs. Scepticism was widespread. As historian and placebo researcher Ted Kaptchuk has shown, concerns about advocates' bias and enthusiasm led scholars to develop deliberate methods to minimize their impact. Kaptchuk has traced the technique of blinding to sixteenth century public trials orchestrated by protestant authorities to discredit catholic exorcisms, trials that utilized sham holy water and incantations. Blinding reached medicine by the eighteenth century, as seen in the trials organized by Antoine Lavoisier and Benjamin Franklin in 1784 to debunk mesmerism.¹⁴

Two other techniques appeared by the eighteenth century. Researchers began to use deliberate controls, most famously with James Lind's report that he had tested different anti-scorbutics in six pairs of sailors in 1747.¹⁵ They also began quantitative analyses. Ulrich Tröhler has collected many examples from the UK literature showing how physicians turned to quantitative arguments (e.g., of X cases, Y survived) to make the case for or against treatments for fevers, scurvy, dropsy, palsies, rheumatic diseases, syphilis, and ophthalmia. Surgeons also employed this 'medical arithmetic', publishing influential analyses of amputation and techniques to remove bladder stones.¹⁶ Proponents and critics of smallpox inoculation were especially prolific—and well-publicized—with their numerical analyses in the 1720s.¹⁷ Physicians' use of more robust methods was not simply a technical question, but also a moral one. Tröhler has shown this well in his analysis of Edward Alanson's 1782 treatise on amputation. As Alanson wrote,

When we attempt to introduce any new and important deviations from the common mode of practice into general use, and particularly in a point of such consequence, as the directing almost a total change in the mode of performing and after-treating one of the principal operations in surgery, the public have a right to be fully acquainted with the author's reasons and motives for such attempt; and such trials should likely previously have been made, as are sufficient to demonstrate, that the doctrine recommended will bear the test of general experience.¹⁸

As Tröhler and Weisz have each shown, quantification was a well-established tool by the nineteenth century. Physicians and surgeons deployed statistics extensively in the debates about the efficacy of many interventions, including Joseph's Lister's techniques of antiseptis, surgical drainage for empyema, or tracheostomy for croup.¹⁹ In 1865 Thomas Spencer Wells published a comprehensive report on all of his ovariectomy procedures, documenting his outcomes both good and bad.²⁰ Wells's work, especially his 'frank statistics',

influenced Swiss surgeon Theodor Kocher, who, in turn, taught key figures in US surgery.²¹ Anna Greenwood has shown how Lawson Tait employed meticulous empirical methods, reporting data from hundreds of patients, ‘systematized into extensive statistical tables and charts’, to critique the value of Lister’s methods.²² Peter Kernahan has described George Callendar’s contribution to these debates: Callendar used the statistics drawn from the records of St. Bartholomew’s Hospital to demonstrate the value of his own program of cleanliness—both in the operating room and on the wards—and to question some of Lister’s assumptions.²³ Weisz has argued that it was especially easy for surgeons to quantify outcomes because ‘the consequences of acting or not acting were survival or death’.²⁴ Early practitioners of anaesthesia, including John Snow, also turned to quantitative analysis of case series to document the safety of their new technique.²⁵

However, while these surgeons adopted quantification, they generally did not use controls. In part because of this, quantified debates were rarely conclusive. Different counters produced different counts, and sceptics inevitably emphasized the variability of individual patients. The willingness of protagonists to leave out data and present one-sided statistics, as Lister did in his arguments for antiseptics, did not help.²⁶

Despite calls for more careful methods, case series long remained the dominant mode of knowledge production in surgery and often established both the promise of new techniques and the fame of particular surgeons. Thomas Schlich has argued that the growing case series published by surgeons like Kocher from the 1880s into the 1900s fostered the emergence of a new, statistical approach to risk management in surgery, a new ideal of ‘safe surgery’.²⁷ Barron Lerner has shown how reliance on case series fostered both the spread of radical mastectomy after Halsted’s initial reports, and the enduring debates by the 1920s: surgeons published competing case series in support of their own opinions.²⁸ Sally Wilde has similarly described how Australian surgeons in the 1930s published case series of competing prostate surgery techniques without ever converging on consensus about the best technique.²⁹ This lack of agreement can in part be explained by the fact that surgeons were not researchers so much as inventors: ‘Most elite surgeons spent much of their intellectual energy in trying to devise ever better practical ways to perform both new and existing operations ... Their operating theaters were not so much laboratories, where scientific facts were discovered, as workshops where surgical knowledge was constructed.’³⁰ However, questions of efficacy were never far from their thoughts. Surgeons struggled to discern the value of a surgical technique amid the variability of individual patients. Case series were useful here. As Harry Marks has described, surgeons used case series as part of their attempt to overcome ‘an irreducible uncertainty by accumulating experience’.³¹

Case series, however, were not adequate for the task. Surgeons and their historians have long known that many new procedures appeared and became popular, only later to fall into disrepute. They have often attributed the

problem, in part, to research methods. In 1977 surgeon Benjamin Barnes reviewed surgical research published in the *Transactions of the American Surgical Association* from 1880 to 1942 about operations that were later abandoned (e.g., operations to treat ptosis or constipation, or early procedures on endocrine glands and autonomic nerves). Why had surgeons ever thought these techniques might work? For Barnes the answer was clear: 'Possibly the most critical and central defect in these cited studies of innovative surgical therapy is the lack of control experience. The concept of controls appeared to be totally unknown to the surgeons of this period'. Barnes attributed this in part to surgeons' willingness to accept the conventional wisdom, to their lack of attention to study design, and to the long traditions of 'operations being an act of faith in the absence of scientific validation'.³² Barnes, however, overstates his case: surgeons, as will be seen, did sometimes use controls.

Historians of medicine have described how research methods became increasingly self-conscious and sophisticated in the late nineteenth and early twentieth century. Since bias was increasingly considered a problem, researchers turned to alternate allocation as a more objective technique of assigning patients to treatment groups: as appropriate patients presented to doctors seeking care, researchers would choose their treatment regimen by alternating back and forth between the remedies being tested. Iain Chalmers has identified over 200 studies based on alternate allocation had been performed before 1948.³³ Alternate allocation began to be used in surgery at least as early as 1922. Simon Wessely, for instance, has described how this strategy was used to debunk a notorious surgical therapy for psychiatric disease.³⁴ In the 1910s and 1920s, New Jersey psychiatrist Henry Cotton hypothesized that mental illness resulted from focal infections. He attempted to cure patients by rooting out hidden sites of infection, including teeth, tonsils, colons, and other organs. Sceptical of this approach, Clarence Cheney and Nicolas Kopeloff conducted their own trial and used alternate allocation to compare operated patients to non-operated controls. This reduced, as the authors tellingly phrased it, 'the study as nearly as possible to the terms of an experiment' and let them distinguish the specific results of the operation from the non-specific effects of hospitalization.³⁵

Sceptics of alternate allocation, however, worried that physicians could, intentionally or not, subvert predictable systems of alternate allocation and re-introduce bias into research studies. Chalmers argues that it was for this reason, with little or no awareness of Fisher's agricultural studies, that medical researchers turned to randomization: its appeal was not to enable certain modes of statistical analysis, as Fisher had intended, but to minimize the impact of researcher bias.³⁶ US researchers performed the first randomized trial in 1926, of sanocrysin (a gold compound) for tuberculosis.³⁷ They also turned to blinding and sham controls to eliminate other forms of bias, especially 'psychic influence'. UK researchers went one step further and launched a double blinded (but alternate allocation) control trial of patulin (a penicillin extract) for the common cold in 1943.³⁸

The net effect of two decades of concerted historical research has been to complicate the traditional short history of RCTs that emphasizes the narrative from Fisher to the 1948 MRC streptomycin trial. Controls, blinding, quantification, and randomization emerged not over decades but, in fact, over centuries. They were not simply the result of a search for the most scientific modes of knowledge production. Instead, physicians sought increasing methodological sophistication in the setting of fierce debates (e.g., about inoculation, antisepsis, or psychosurgery), or for diseases in which outcomes were difficult to assess (e.g., pulmonary tuberculosis). Method served as a tool of argument in a contested therapeutic marketplace.

The increasing use of sophisticated clinical trials was also motivated by a series of scandals about drug safety and commercial influence from the 1930s to the 1960s that put pharmaceuticals under increasing scrutiny. These scandals fuelled the emergence and establishment of RCTs. Surgeons were initially spared. Wilde has argued that surgeons were seen to be free of commercial interests and therefore granted higher baseline levels of trust: 'The motives of surgeons were not suspected in the same way, and surgery in the 1930s was not subjected to the same tests of safety or efficacy that were beginning to be applied to drugs. Surgeons were free to adopt, adapt, or invent any surgical procedure as they saw fit'.³⁹ As a result, even as some surgeons turned to alternate allocation, case series persisted as the norm. Prominent surgeons grew concerned about the state of affairs. In 1947, for instance, in his president's address to the section of surgery of the Royal Society of Medicine, Sir Max Page criticized modern surgery for being 'over-dependent on judgments tintured by the emotional reactions' and failing 'to utilize statistical research'.⁴⁰ However, Page's proposed solutions were modest. He did not demand that surgeons join the RCT bandwagon. Instead, he simply asked surgeons to keep better records to facilitate compilation and comparison of surgical outcomes.

THE FIRST RANDOMIZED CONTROLLED TRIALS IN SURGERY

Many historians and surgeons credit a team from Leeds and York led by J. C. Goligher with the first surgical RCT.⁴¹ Their study, begun in 1959 and published in 1964, randomized 634 patients to one of three operations for duodenal ulcers.⁴² However, this was not the first surgical RCT. The question of priority has long fascinated physicians, historians, and sociologists. It is rarely just a simple question of who did something first. Instead, it offers an opportunity to define the features of an innovation (e.g., controls, blinding, randomization, cooperative multi-centre trials, adequate statistical power, etc.), to trace and understand the history of each, and to understand the contexts and interests that motivated them. Many trials had many of these features before Goligher's study, and his was certainly not the first to include all of them.

Prospective controls—defining both the experimental and control groups in advance of the intervention, and then following both over time to compare

the results achieved—were used by surgeons at least as early as the 1920s, as seen in Kopeloff and Kirby's trial of surgical treatment of mental illness. In 1944 a Swedish surgeon began a study of ganglionectomy for angina pectoris, comparing operated patients to non-operated controls (it is not clear how she allocated patients to the two groups).⁴³ In 1950 six Veterans Administration Hospitals began a prospective study of lobotomy using matched (but not randomized) controls.⁴⁴ In November 1951 a Copenhagen group began a trial of simple mastectomy plus radiation therapy versus extended radical mastectomy for breast cancer, using alternate allocation. What meaning did such controls have for surgeons? Some surgeons wanted to be able to make the strongest comparisons between the interventions. As the Copenhagen group explained, they used alternate allocation 'in order to obtain two comparable groups.'⁴⁵ But researchers often had broader goals. As Jack Pressman has shown, the lobotomy trial was part of a wider effort by the leaders of US psychiatry to establish a more scientific basis for psychiatric therapeutics.⁴⁶

Surgeons soon turned to randomization for that purpose. In March 1953, a Brooklyn team began a study of surgical and medical management of upper gastrointestinal bleeding, comparing conservative management (bedrest, sedation, and a liquid diet), immediate intervention (transfusion and gastrectomy), and selective intervention (transfusion, followed by gastrectomy only if shock persists). They began with alternate allocation but in 1955 switched to randomization. As they explained, 'the pattern of therapy to be provided to any individual patient in the study must be truly random to achieve statistically sound conclusions'.⁴⁷ Four studies, each launched in 1958, also used randomization, testing internal mammary artery ligation, prophylactic surgery for esophageal varices, and radical mastectomy.⁴⁸ These studies offer historians an opportunity to examine the meanings and purposes of randomization and methodological rigour, as well as the controversies that must have ensued. Sometimes these early randomized trials had unintended consequences. Carsten Timmerman studied the British Medical Research Council's RCTs of surgery for lung cancer in the 1960s. The dismal results of those trials dampened enthusiasm not just for cancer surgery, but for lung cancer therapeutics more broadly, fuelling a shift in focus towards prevention.⁴⁹

There are several interesting aspects to these early trials. First, none of them drew attention to their innovations: none advertised themselves as major pioneers deserving credit for having brought the RCT to surgery. More work is needed to understand the extent to which surgeons saw these early RCTs as innovative or controversial. Second, there is an ambiguity about what counts as a surgical trial. Surgery involves more than just an operative procedure. It also involves pre-operative preparation, anaesthesia, intra-operative management, and post-operative care. It involves not just surgeons, but anaesthetists, nurses, technicians, and many others. One of the earliest RCTs in surgery, for instance, was anaesthesiologist Henry Beecher's 1955 study of three different anti-emetics for post-operative vomiting.⁵⁰ Surgical research often required collaboration, and this again offers historians

a valuable opportunity, in this case to understand how different specialists reached consensus about standards of knowledge. For instance, in order to characterize the cerebral complications of cardiac surgery, surgeons had to collaborate with anaesthesiologists, neurologists, psychiatrists, and psychologists. As I have shown in my previous work, these groups had to agree about what kinds of studies to do, on which patients, and with which measurements of what outcomes. The difficulty of such work delayed recognition of the full scope of the dangers of open heart surgery.⁵¹

Such questions aside, it is clear that many surgeons in the USA and England were aware of the principles of rigorous trial design in the 1950s. Some were fully committed to randomization, blinding, and sham controls, but few were willing to go that far. Further research could characterize the values and interests that shaped trial design in surgery in the 1950s and 1960s.

THE EFFICACY OF SURGICAL RCTs

If Wilde is right that surgery had been spared the serious scrutiny to which drugs were subjected from the 1930s through the 1950s, this changed in the late 1960s. Two emerging problems focused attention on surgical decision making: geographic variations in surgical practice and the rising cost of health care. Although J. Alison Glover had described 27-fold variations in tonsillectomy rates among different London neighbourhoods in 1938, only in the late 1960s did studies of variations in surgery rates in Sweden, England, and the USA capture significant attention.⁵² Meanwhile, the increasing technological sophistication of health care in the 1950s and 1960s—more hospitals, medications, surgical procedures, diagnostic tests, intensive care units, specialists, and so forth—had led to a notable increase in the costs of health care.⁵³ Concern soon appeared about the extent and causes of ‘unnecessary’ surgery. Part of the problem, according to anaesthesiologist John Bunker, was that ‘the indications for surgery are sufficiently imprecise to allow a 100% variation in rates of operation’.⁵⁴ Policy analysts sought ways to discipline the practice of surgery and they hoped that RCTs would do so. In the 1970s historians and surgeons published case studies of the efficacy of RCTs. Two competing arguments appeared almost immediately: while some argued that RCTs had indeed influenced surgical practice, others emphasized their limits.

Boston surgeon Ernest Barsamian, for instance, examined the rapid rise and fall of internal mammary artery (IMA) ligation.⁵⁵ First proposed in Italy in 1939, and routine there by the 1950s, IMA ligation was first performed in the USA in late 1956. It received favourable coverage in the popular press, but was met with great scepticism by surgeons who did not accept its physiological rationale. Surgeons in Seattle and Kansas City put it to the test in small RCTs, finding that IMA ligation and a sham control both provided modest relief of angina.⁵⁶ The procedure quickly disappeared. Barsamian saw this as proof-of-principle of the power of surgical RCTs: ‘Rarely has any operation had its usefulness questioned at the zenith of its popularity in as decisive

a test as that to which the mammary artery operation was subjected'. The rapid rise and fall of IMA ligation 'is a vivid demonstration of the efficacy of a properly designed study in answering difficult questions about the value of a surgical procedure'.⁵⁷

Statistician Lillian Lin Miao drew a similar lesson from the history of gastric freezing for peptic ulcer disease.⁵⁸ Owen Wangenstein first performed the procedure in October 1961. Surgeons responded enthusiastically: 10,000–15,000 procedures had been done by 1963. However, as with IMA ligation, many surgeons grew sceptical. They began to publish critical editorials and case series in 1963. No fewer than 20 comparative studies were conducted, six of which used sham controls and double blinding. The largest trial began in 1963, enrolled 160 patients, and published conclusive evidence against the efficacy of gastric freezing in 1969. Miao held out this case as an example of successful professional self-regulation:

In the absence of any working machinery of public policy decision-making or FDA regulations concerning innovation and adoption of a new procedure, the evaluations and sanctions of procedures fell upon the shoulders of the medical profession. Through the collaborative effort on a carefully randomized investigation, the physicians reached a consensus whereupon the use of gastric freezing for the treatment of duodenal ulcer was discontinued. This process is an example of the medical profession's successfully evaluating and regulating the use of its own innovative treatments.⁵⁹

These two histories of surgical RCTs, part of a broader effort to analyse surgical practice, were optimistic about the power of RCTs to discipline surgery.

Competing histories immediately challenged this optimistic assessment. In 1976 the Institute of Medicine began a study of the role of medical technology in the health-care system. Harvey Fineberg re-examined the history of gastric freezing. His narrative emphasized the fact that the procedure was already in serious decline by 1965, before the major RCTs were published. The 1969 RCT 'was unequivocal in its negative conclusions, but of little practical consequence, as if a marble tombstone were erected over the grave of a patient already several years deceased'. For Fineberg, the take-home message was not the power of RCTs, but their limitations: the 'most disheartening aspect of this study is the minimal relation between properly designed clinical trials and the diffusion process, a problem that might be described as the inefficacy of efficacy studies.'⁶⁰

The history of RCTs for breast cancer—analysed in the 1970s and more recently by Barron Lerner—is especially interesting in this regard.⁶¹ Surgeons had called for an RCT as early as 1942, but post-war surgeons doubled down on the procedure and instead pursued ever more aggressive operations. Renewed calls for RCTs in the late 1950s and early 1960s were dismissed. American Cancer Society surgeon Ronald Grant described RCTs as 'Scientific Russian Roulette' and compared them to Nazi human experimentation.⁶²

It was not just defenders of radical mastectomy who scoffed at the need for trials. As Lerner has shown, critics of the procedure, most famously Barney Crile, also rejected the need for trials, arguing that their own experience and case series made the case against radical mastectomy with sufficient clarity.⁶³

As US surgeons debated the issue, European surgeons began trials, in Copenhagen in 1951 (published in 1965) and in Cambridge in 1958 (published in 1966).⁶⁴ They showed that radical mastectomy provided no benefit beyond simple mastectomy in either case. However, as McPherson and Fox noted in their 1977 history, these trials had no evident impact on surgical practice in the USA.⁶⁵ As late as 1970, 80% of US women with breast cancer underwent radical mastectomy. US surgeons, led by Bernard Fisher, finally took on the challenge of RCTs for breast cancer and launched major trials in 1971 and 1976. Rates of radical mastectomy in the USA fell dramatically, from 50% in 1972 to 3% in 1981. This fall, however, occurred before the trials were published. As had happened with gastric freezing in the 1960s, the decisive RCTs of radical mastectomy in the 1970s and 1980s certified a change that had already taken place. Changing disease models, financial conflicts of interest, and the preferences of newly empowered patients had all played a role.⁶⁶ These histories demonstrate the wide range of factors that influence surgical practice, and that historians must examine in order to understand the nature of surgery.

Historians continue to examine the role of surgical RCTs. Tang and Schlich have examined the first RCT of laparoscopic cholecystectomy.⁶⁷ As they show (and as Whitfield reviews in this handbook), the new operation rose to prominence on the basis of case series. By the time that researchers at McGill University managed to complete an RCT, the procedure was so well established that the RCT was irrelevant. Schlich has examined another revealing example, again of a case in which surgeons did not need RCTs to establish a procedure. In his history of fracture repair, he showed how advocates of operative fracture treatment with osteosynthesis were committed to accumulating convincing evidence of efficacy. However, they did not pursue clinical trials. Instead, they attempted to establish a comprehensive registry. In the end, even that was not necessary: 'the fact that research was being done at all was enough to establish credibility. The actual results of the research were only of secondary importance, considering that the average surgeon had too little time in his schedule to read and evaluate the research reports anyway'.⁶⁸

Taken together, these histories have enriched our understanding of surgical trials. Surgeons have been willing to perform RCTs. However, they have generally used RCTs not to introduce new procedures into surgical practice, but to assess procedures already in wide use. Sometimes they have been motivated by widespread scepticism of a procedure (as in the case of IMA ligation, gastric freezing, or radical mastectomy), and sometimes they have been motivated by a commitment to evidence-based care (as at McGill). These RCTs have often had little impact on surgical practice, with the procedures either abandoned or firmly entrenched before the trial results were released. Other modes of assessment,

whether the empirical results of case reports and case series, or the mechanistic logic of operative interventions, have allowed surgeons to propose and reject procedures in the absence of rigorous clinical trials.

THE RESISTANCE TO RCTs, ESPECIALLY IN SURGERY

The introduction of clinical trials into medicine, even after the acclaimed 1948 RCT of streptomycin, did not produce unbridled enthusiasm. US researchers had considered performing their own RCT of streptomycin, but had backed away out of concern about the ethics of withholding a plausible new treatment from patients. As Harry Marks has shown,

To many clinicians, the basic procedures of the randomized controlled trial were unfamiliar. Allowing a roll of the dice to determine a patient's treatment, withholding innovative therapies from one group of patients, keeping treating physicians in the dark about what medications their patients were receiving—these were all innovative and somewhat disturbing practices.⁶⁹

This anxiety left many physicians unwilling to perform RCTs unless they were truly ambivalent about whether or not the new therapy would succeed.

Even when researchers have conducted RCTs, their implementation has been complex. RCTs did not reflect simply the development of specific techniques of randomization, blinding, and statistical analysis. They also required new institutional arrangements and new sources of funding to support large scale, multi-centre, collaborative research.⁷⁰ The institutional context of RCTs has been well described in Pressman's history of lobotomy, in which he argued that 'the introduction of modern experimental design into US medicine was not a just a matter of controlling the experimental conditions within a laboratory setting or hospital ward, but of controlling the researchers themselves—a situation that only came about with the entrance of centralized bureaucracies.'⁷¹ The act of doing an RCT also created tensions between physicians' roles as clinicians and researchers. Physicians had to see themselves not as individual practitioners, but as members of a group with new norms for research, knowledge, and practice.

Most importantly, RCTs have often not fulfilled their promise of resolving therapeutic uncertainty. Controversies have swirled around the conduct and interpretation of many trials. Harry Marks has demonstrated that 'even the simplest RCT is the product of a negotiated social order, replete with decisions—some contested, some not—and with unexamined assumptions.'⁷² Evelleen Richards, who studied the debates about vitamin C and cancer, concluded that 'Clinical trials, no matter how rigorously they are organized and conducted, do not give unproblematic direct access to nature or reality.'⁷³ Steven Epstein analysed the debates about early clinical trials for HIV drugs and concluded that debates about RCTs and drug approval 'are crucial sites for the negotiation of credibility, risk, and trust. Widely considered

to be the pathway to objectivity in modern biomedical research, clinical trial results in practice may be subject to considerable amounts of interpretative flexibility'. As a result, 'when the environment in which trials are conducted and interpreted is so contentious, then these experiments, rather than settling controversies, may instead reflect and propel them'.⁷⁴ RCTs are not simply a scientific method, but a social and political institution. They reveal as much about researchers and the social contexts of medical research as they do about the efficacy of medical therapeutics.

The tensions about RCTs for pharmaceuticals became even more dramatic when researchers applied RCTs to surgery. One of the first major battlegrounds came in cardiac surgery. Surgeons had worked for decades to develop operations to treat the morbidity and mortality of coronary artery disease. A promising new treatment, coronary artery bypass grafting (CABG), appeared in the 1960s and quickly became popular: 100,000 CABG operations were performed annually by 1977.⁷⁵ Sceptics immediately called for RCTs. They cited the long history of discredited techniques of coronary artery surgery, which stretched back even before the sham trials of IMA ligation. Writing in the *Annals of Thoracic Surgery* in 1972, Thomas Chalmers noted that of 152 published trials of coronary artery surgery, only two had been controlled—the two that debunked IMA ligation.⁷⁶ Chalmers and other critics had no illusions about why surgery had been spared proper scrutiny. As his protégé, David Spodick, wrote, 'the mystique of surgery—the presumed efficacy of a mechanical rearrangement of tissue—makes these natural referees suspend disbelief in a way that no pill could'.⁷⁷ Faced by this criticism, surgeons did organize RCTs of CABG, with prominent trials led by the VA, by NIH, and by European researchers. Even though the trials found that CABG provided little benefit beyond medical care for most patients, they had little impact on the utilization of CABG.⁷⁸ CABG rates increased steeply into the mid-1990s, until challenged by the rise of angioplasty which, like CABG, had risen to prominence in the absence of supportive RCTs.

How did surgeons evade the results of the clinical trials? Their critiques of the trial reveal much about both the limits of the method and the differences between medicine and surgery. Jack Love, on the editorial board of *JAMA*, responded to Spodick's calls for RCTs by arguing that operations were different from pills and required different kinds of evaluations. Operations, for instance, depended on surgeon skill and involved hundreds of details, each of which surgeons constantly tweaked in pursuit of better outcomes.⁷⁹ This undermined the standardization of therapeutic process that RCTs required. Lawrence Bonchek reiterated these differences between surgery and medicine, and added others. Drugs are stable compounds, whose effectiveness is unrelated to physician skill, while new operations undergo significant refinement in their early years. It was important to get as many surgeons performing a promising procedure as quickly as possible to optimize the procedure. But by the time an operation has been suitably refined, it has such a constituency among surgeons and patients that RCTs are both impossible and

inappropriate. As he concluded, 'We should resist the almost religious fervor of those who would sanctify randomized studies as the only means of learning the truth'. Patients and policy makers simply needed to trust surgeons: 'Modern medical therapy is sufficiently sophisticated so that only physiologically sound operations achieve wide use'.⁸⁰

As I have argued in my analysis of this history, these critiques and responses led to an uneasy balance of power in cardiac surgery.⁸¹ Critics demanded RCTs while surgeons acknowledged their value, emphasized their limitations, and performed them occasionally. The inevitable limitations of surgical RCTs allowed surgeons to critique the trials that were published and discount negative results. They could operate according to their best judgment, informed not just by RCTs but also by evidence that continues to be published from case series.

The pattern set in the 1970s in the debates over RCTs for CABG has persisted for decades. Surgeons continue to highlight, with ever greater sophistication, the problems faced by RCTs in surgery, whether in their design, conduct, interpretation, or application.⁸² To make matters worse, there has been little funding for surgical RCTs, unlike the situation in medicine, where pharmaceutical companies have invested massively in the technique. Furthermore, surgeons have not been as pressured to do RCTs as physicians have been: no regulator requires RCTs of new operations.⁸³ Surgeons and policy makers have come together to make the case for pragmatic approaches to surgical research, ones that prioritize not just RCTs, but also case series, registries, and prospective databases.⁸⁴

Historians have as yet written little about these recent debates. The many claims of difference between medicine and surgery provide rich fodder. This is especially true for diseases that can be treated with both medicine or surgery (e.g., coronary disease, back pain, Parkinson's disease, many cancers): such cases allow nuanced analyses of discipline-specific standards of knowledge and decision making. It is also likely that differences exist among surgical specialties, and among different kinds of surgical problems (e.g., surgery to manage an emergency, to prolong survival, or to improve quality of life). Historians can use the debates around RCTs to explore the shifting standards of knowledge in surgery and examine who determines these standards, what happens when others push back, and how, in practice patients and doctors use evidence to make treatment decisions.

ETHICS AND SURGICAL TRIALS

Some of the most exciting historical scholarship on clinical trials has explored research ethics. As Marks showed, physicians and surgeons have long been uncomfortable with equipoise and randomization. Fierce debates have emerged about whether or not new treatments should be made available to patients while RCTs are underway, about the use of placebo controls, and about policies of informed consent and respect towards research subjects.⁸⁵

Controversies became especially heated in the 1990s as research increasingly moved from Europe and North America to resource-poor settings worldwide, where lack of access to health care created fraught opportunities for medical researchers.⁸⁶ One particular concern has been the role of the pharmaceutical industry, which has emerged as a major producer of RCTs. Critics have argued that industry has coopted RCTs, using them to gain market access for new drugs instead of working in the best interests of clinicians and patients.⁸⁷

Historians of surgery have only just begun to examine the ethical questions raised by surgical research. Surgeons, for instance, have grappled with informed consent since the nineteenth century. Wilde has described how surgeons, who developed dozens of new operations in the 1890s and 1900s, had to persuade prospective patients to submit to these procedures.⁸⁸ In the decades that followed, surgeons constantly struggled to navigate the line between clinical practice, innovation, and research. Wilde and Hirst have examined how surgeons often tried out new procedures and learned from their mistakes without seeing this as experimentation.⁸⁹ The boundary between clinical care and experiment blurred further with the expansion of surgical research in the 1950s and the drive to develop organ transplantation, open-heart surgery, and other complex techniques of modern surgery. Renée Fox and Judith Swazey observed much of this work and have written astute analyses of the fraught boundaries between surgical care and experimentation.⁹⁰ More recently, Robert Aronowitz has analysed research on prostate biopsy and prostatectomy performed on Skid Row alcoholics in New York City in the 1950s and 1960s, another startling example of researchers coopting a marginalized population. Aronowitz also used this case to examine how an aggressive system of prostate cancer screening and intervention took root in US medicine without good evidence of its value.⁹¹

Historians, including Scott Podolsky and Chris Crenner, have also been drawn to the ethical dilemmas raised by sham controls and blinding in surgical research.⁹² First used in the trials of IMA ligation in the late 1950s, sham controls have remained uncommon. Surgeons generally did not use them in trials that compared surgical and medical treatments, or in trials that compared substantially different surgical interventions (e.g., simple vs. radical mastectomy). Shams were possible for IMA ligation because only a small skin incision was required. This reluctance arose from the reasonable concern that it is inappropriate to harm a patient for the sake of methodological purity. Despite the ethical hurdles, sham trials made a comeback in the 1990s, first with cell implant therapies for Parkinson's Disease, and then in trials of arthroscopy for osteoarthritis, vertebroplasty for compression fractures, and meniscectomy for degenerative knee disease. A 2014 review of 53 placebo controlled surgical trials found that the intervention performed no better than placebo in just over half of the trials. It should be noted, however, that the placebo provided benefit nearly three-quarters of the time.⁹³

The interpretation of these findings is ambiguous. The 2014 review's authors concluded, as had been concluded in the 1970s, that RCTs are

essential for challenging dubious procedures and removing them from practice. The prevalence of negative trials, however, should not be misunderstood. As historians have shown, sham trials are usually done when it is likely that the results will be negative. Negative results, therefore, are predictable and should not necessarily discredit other procedures for which confidence is so high that no sham study has been done. Sham controlled trials thus embody irreconcilable tensions: they can provide an essential, definitive test of a surgical procedure; they are only used in limited settings, especially when surgeons doubt the efficacy of a procedure; and, as the end of the day, they are unlikely to alter clinical practice. Careful work by historians is needed to ferret out the motivations and meanings of this puzzling *détente*.

CONCLUSIONS

The relative paucity of RCTs in surgery should not lead to the conclusion that surgeons have not bought into evidence-based medicine or that the culture of surgery is somehow anti-intellectual. As Harvard researchers wrote in 1977, 'The reason is not that surgeons have been slow to accept new patterns of thought, but rather the very real conceptual, practical, ethical, and economic difficulties of carrying out in adequate numbers and sizes experiments involving complex surgical procedures in human beings'.⁹⁴ This insight remains relevant decades later. Surgery played a key role, going back centuries, in the origins of clinical trials. Though fewer RCTs have been done in surgery than in other areas of medicine, they have made significant contributions to knowledge production in surgery. However, the impact of surgical RCTs has often been undermined by the controversies that inevitably consume each of them. In many cases the critics' concerns have had some justification: it is difficult, sometimes impossible, to conduct a methodologically perfect RCT of a surgical procedure. Historians have debated the impact—or not—of RCTs on surgical practice and analysed the factors that have contributed to their success or failure. Their work has shown, in part, that RCTs have played a fundamentally different role in medicine than in surgery. In medicine, RCTs are performed to prove that a new drug works in order to gain access to the market. In surgery, RCTs have largely been performed late in the natural history of a procedure, only after substantial scepticism has already emerged.

The history of surgical trials offers many opportunities for further research into the nature of knowledge production and the cultures of surgery. History raises a number of questions that could be used as starting points of further inquiry into the area: How did surgeons decide whether the efficacy of a new procedure is self-evident or needed to be proven with a clinical trial, especially a randomized one? When did surgeons think it was appropriate to ask patients to participate in a sham-controlled trial? What mix of legitimate methodological concern and professional self-interest motivated their critiques of clinical trials? In what settings did trials prove to be persuasive, or not? How can

historical perspective inform the current debate between those who insist on the methodological ideal of RCTs and those who call for pragmatic use of different modes of knowledge production, despite their known liabilities? Answers to these sorts of questions will be invaluable not just for the history of medicine and science, but also for the theory and practice of surgery and medicine more generally.

NOTES

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Acknowledgments Funding for this “Scholarly Works” project was made possible by grant 1G13LM012053 from the National Library of Medicine, NIH, DHHS. The views expressed in any written publication, or other media, do not necessarily reflect the official policies of the Department of Health and Human Services; nor does mention by trade names, commercial practices, or organizations imply endorsement by the U.S. Government.

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Bariatric and Cosmetic Surgery: Shifting Rationales in Contemporary Surgical Practices

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Cosmetic and bariatric surgery were two of the fastest growing medical specialties of the late twentieth century. Revealing both the malleability of the human body and the ability of modern medicine to adapt it to cultural standards of beauty, both practices have been viewed by historians and social scientists as tools of normalization and social control. While the medicalization of deviance may indeed be seen as central to the spread and acceptance of these two surgical approaches, it does not fairly represent all aspects of their development or their significance for the history of the medical sciences. This chapter will show that the medical rationales invoked for these procedures are not only multiple—they have been deemed curative and experimental as well as elective—but that the reasons for their use are often intertwined. Indeed, the medical importance of reconstructive surgery has often been obscured by the purely cosmetic interventions of the late twentieth century and their disputed claim to produce psychological soothing. Similarly, despite the use of bariatric surgery for cosmetic purposes, history shows that obesity surgery was first developed in an attempt to cure gastric and duodenal ulcers. Moreover, its use nowadays in the treatment of type II diabetes and its integration into endocrine and metabolic research suggests that the ‘cosmetic/social control view’ is overly reductive. This chapter thus investigates the evolving indications for surgical treatment in different historical contexts, showing that the conventional categories are more ambiguous than normally thought.

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Cosmetic surgery, a practice dedicated to modifying the appearance of human bodies bearing neither disease nor birth defects or functional disabilities, arose at the turn of the twentieth century and quickly established itself as a common practice.¹ Despite its fast growth, by the 1990s Sander Gilman recalled that he could find only ‘skeletal or quite narrowly conceived’² historical studies on cosmetic (or as he called it ‘aesthetic’) surgery—the vast majority of them written by practitioners, as he remarked in the foreword to *Making the Body Beautiful*, a key reference in the history of cosmetic surgery. Since then, the historiography has evolved significantly. At odds with the cosmetic surgeon’s technically driven narrative, professional historians tend to agree with Elizabeth Haiken for whom the internal history of medicine, while providing a seemingly natural context for plastic surgery, fails to explain its appearance, development, and social significance.³ But while Haiken saw in ‘the increasingly visual, psychologized culture of the twentieth century United States’⁴ the single most significant determinant in explaining the rise of cosmetic surgery, other historians have adopted a wider perspective. Gilman, for instance, views the evolution of cosmetic surgery in modern Europe as moving from a nineteenth-century attempt at correcting signs of ‘racial’ features to a much broader alteration of other forms of bodily difference—those attempts at reducing gender, age, and class indicators highlighting the importance for patients to ‘pass’ as members of groups with which they want or need to identify.⁵ While admitting that the history of remodelled bodies might still be situated within a ‘history of scientification,’ Annelie Ramsbrock has framed the practice in the continuity of a more ancient discourse on medical cosmetics, and suggested that the practice might above all be seen as a ‘social system’ upon which social, cultural, and political values were etched—that is, a system primarily concerned with ‘the creation of normality as an expression of health’.⁶

Bariatric surgery, a medical specialty devoted to the treatment of severely obese patients, emerged in the 1950s and became one of the most discussed medical specialties by the end of the 20th century.⁷ For the most part, its history has been written by actors engaged in its technical development, a state of affairs that has obviously favoured the production of a more ‘internalist’ or ‘whiggish’ narrative that takes the present as standard for judging the past. As explained by the surgeon Henry Buchwald, one of its most vocal proponents and earliest historians, although bariatric surgery operates on healthy organs with a view towards gains for the whole organism,⁸ thus marking a somewhat revolutionary turn in surgery’s rationale, its general development has nonetheless followed a more conservative path. Buchwald reveals a tacit but widespread opinion held in surgical circles by explaining that bariatric surgery’s history followed the ‘general medical progress [of] innovation, trial, standardization, and obsolescence’⁹—with social dynamics playing no significant role. Loudly contested by academics from the social sciences, this technologically driven history of obesity surgery has not yet been properly challenged by professional historians.

Cosmetic and bariatric surgery thus represent distinct domains of surgical practice in terms of their techniques, medical claims, networks of practitioners, and historical trajectories. Although historiography has largely mirrored such differences in addressing the two specialties independently and in very uneven ways, bringing them together within a single review has the merit of highlighting some rather noteworthy aspects of surgery in contemporary societies. Because both specialties intervene on healthy bodies or body parts, cosmetic and bariatric surgery raise specific problems of historical understanding. According to Nicolas Guirimand there are four such problems.¹⁰ The first problem is the identification of the conditions of possibility for the interventions. That means we must take into account the technical problems that shaped the development of the constitutive procedures of the specialties as well as the social structure of the market in which those procedures were consumed. Second, historical analysis must explain the regime of medical legitimacy underlying the recourse to such operations and thus examine their psychosocial and metabolic rationales. Third, the historian must identify the specific characteristics of the historical actors implicated in the establishment of these novel specialties, which would include their individual and professional trajectories as well as their economic interests and political goals. Finally, the social dynamics leading to the official recognition of these practices as surgical specialties must be understood within the movement of demarcation that separates the specialties from preceding and often competing medical undertakings.¹¹ Each of these aspects, as we shall see, has received varying attention in the historiography.

MODERN SURGERY IN THE DISTANT PAST

Cosmetic surgery's history is for the most part a twentieth-century story. Despite of this, surgeons consistently describe the practice as a 'medical specialty with ancient roots'.¹² Portrayed as a natural extension of reconstructive facial surgery, a much older domain of medicine, it has indeed been given a lineage that draws on ancient medical traditions and some practitioners have pushed the search for origins beyond the plausible. Writing in 1942, Walter Kunstler proposed that 'aesthetic considerations in surgical procedures are as old as the science of surgery itself'.¹³ George Milkomane has even suggested that cosmetic surgery might be nothing less than 'the oldest branch of the surgeon's art'.¹⁴ Based on scant historical evidence, this view has been widely repeated by surgeons ever since with some maintaining as recently as 2013 that the origin of cosmetic surgery 'relates to the healing of wounds [and thus] goes back millions of years'.¹⁵ In support of the ancient origin of the practice, surgeons invariably refer to the descriptions of procedures for nose, lips, or ears reconstruction found in ancient medical treatises such as the Egyptian *Edwin Smith Papyrus*, the Sanskrit *Sushruta Samhitā* or Celsus' *De Medicina*.¹⁶

Because it generally omits the analysis of social, institutional, and epistemic issues, this technical genealogy offers a typical example of what Christopher Lawrence calls a ‘popular mythology’¹⁷ in the history of surgery. Some scholars outside surgical circles have nonetheless adopted it. Gilman, for instance, suggests that we consider the decircumcision procedures described by Celsus as the first truly cosmetic surgical interventions.¹⁸

The appearance of plastic surgery in ancient medicine has been more broadly linked to the physiognomic doctrines developed by Hippocrates, Aristotle, and Galen. From this perspective, it has been argued that plastic surgery reveals an enduring feature in the way human bodies are perceived throughout time. As the feminist sociologist Jane Northrop put it, ‘ancient’ plastic surgery manifests: ‘an omnipresent belief that external appearance accurately reflects the character, the soul or the inner self.’¹⁹ Although this view has been widely accepted by social critics of cosmetic surgery and although Gilman, Haiken, and Ramsbrock have examined a similar relationship between nineteenth-century physiognomy and modern plastic surgery,²⁰ there are little serious historical studies on the problem in ancient medicine. One of the few authors to tackle the issue has been Mariacarla Gadebusch Bondio, who locates the origin of the ‘cosmetic problem’ in medicine in Galen’s anatomical theory—even though Galen himself supported a fundamental separation between a positive medical cosmetic, that contributed to the natural and healthy good looks, and a negative cosmetic art that sought to transform the body in an artificial way.²¹

Like much else at the end of antiquity, reconstructive plastic procedures were lost. In order to maintain the ‘medical specialty with ancient roots’ narrative, cosmetic surgeons have thus provided their specialty with a second starting point, and associated it with the advent of Early Modern academic medicine. The pioneer cosmetic surgeon Jacques Joseph outlined the story in the 1920s. It begins with a Sicilian surgeon named Branca de’Branca who was reported to have repaired mutilated noses, lips and ears towards 1440.²² While his methods were identical to those developed in ancient times, using forehead or cheek flaps to replace the neighbouring missing parts, the modified technic devised by his son Antonio, using the arm as the primary donor site to avoid producing facial scars, was unquestionably new. The operative manual, however, was kept a family secret, a clear advantage in a competitive medical market but not a popular academic manoeuvre. The Brancas were thus long despised by academic surgeons. In the nineteenth century, Joseph-François Malgaigne dismissed them as a lower order ‘race of empiricists’.²³ As far as academic environments are concerned, the ‘Italian’ procedure for rhinoplasty emerged at the end of the sixteenth century, when the Bologna University professor of surgery Gaspare Tagliacozzi published the results of his experiments in his book *De curtorum chirurgia per insitionem*. Here, Tagliacozzi documented numerous cases of his own, minutely explained the principles of the operation, its indications and contraindications, the healing process of the graft, the various body parts where grafts could be used, and

even envisioned the possibility of allogenic transplants. The nineteenth-century historian of medicine Charles Daremberg consequently suggested that Tagliacozzi took plastic surgery 'out of the hands of the empirics or specialists to finally ensure its entry in the field of science'.²⁴ Despite this academic recognition rhinoplasty essentially went nowhere. Surgeon-historians are thus forced to explain a second 'disappearance' of plastic surgery. To do so, they invoke powerful social forces that prevented its recognition as an advance for the medical sciences. Specifically, in a culture where deformed facial features were thought to incarnate the punishing handiwork of God, and at a time when syphilis ran pandemic throughout Europe, recourse to plastic surgery was seen as vain, an act against God's will, and a threat to the lifeblood of entire nations. As such, the surgeon-historians claim, the possibility of plastic surgery was precluded by church and state.²⁵

In any event, and by all accounts, rhinoplasty progressively disappeared from the surgical armamentarium. The eighteenth-century surgeon Pierre Dyonis thought of Tagliacozzi's interventions as 'apocryphal stories' or 'amusing tales rather than true facts',²⁶ and writers such as Samuel Butler or Voltaire wrote satirical poems mocking the procedure as unlikely. But the story of a cultural opposition to nasal reconstruction is open to debate among historians. Gadebusch Bondio has shown that practitioners did not explicitly associate rhinoplasty with syphilitic disfigurements and their moral ramifications. In her view, such problems had little influence on the development of plastic surgery as the true impediment was the distinctive non-therapeutic rationale for the procedure.²⁷ This argument has been further developed by François Delaporte, who examined the thesis of a religious and cultural condemnation of Early Modern plastic surgery and decided that it was little more than a projection of contemporary practitioners' difficulties onto the past. As surgeons sought a birth of cosmetic surgery marked by a victory over its critics, Delaporte suggests, it was necessary that Tagliacozzi be confronted by a shadowy conspiracy of social forces. In Delaporte's view, however, the resistance to nasal reconstruction in Early Modern medicine might be more rationally explained by epistemic circumstances as eighteenth-century surgeons 'did not see the point in repairing, at a high price, a loss of substance so long after the mutilation', and thus were not convinced that a procedure more dedicated to eliminating 'the signs of a deformity than curing a wound' was worthy of pursuit.²⁸ Gilman offers another view of the problem when he suggests that the social prejudice associated with the syphilitic nose, the 'preeminent symbol of all that was unclean, inferior, and undesirable'²⁹ in the human constitution, played a leading role in opening a medical space where cosmetic surgery could blossom in the late nineteenth century.

In presenting their specialty as a natural extension of reconstructive surgery, cosmetic surgeons have obviously tried to frame their practice as a logical and necessary historical achievement rather than a contingent undertaking. This strategy has been denounced by plastic surgeons themselves as an outright prostitution of their art,³⁰ and reduced by the sociologist Anne

Gotman to a mere ‘claim for nobility and legitimacy that the discipline clearly lacks’.³¹ Although bariatric surgery has its own legitimacy concerns, obesity surgeons have been somewhat less eager to search for predecessors in ancient or Early Modern medical history. Only recently have they begun to seek out slimming operations in the distant past. We are told, for example, that in the Talmud, Rabbi Eleazar, a severely overweight man, was given a sleeping potion and then taken into a marble chamber, where his abdomen was opened and ‘many basketfuls of fat were removed from him’.³² Pliny the Elder, in his *Natural History*, describes a similar heroic cure for obesity, but such findings are as rare as they are irrelevant. Although prominent bariatric surgeons and physicians have used them on occasion to suggest that ‘surgical intervention for obesity can be dated more than 1000 years ago’,³³ and while others have suggested bariatric surgery should be encouraged pragmatically, as they claim it was in ancient times,³⁴ these scattered cases are unable to sustain an organized attempt at providing the field with some ancient dignity.

In general, as Roger Cooter has noted, such efforts at providing surgical practices with a mythological past make it doubtful that ‘anyone, other than the surgeons themselves perhaps, take surgeon’s histories of surgery at face value’.³⁵ Indeed, practitioners themselves readily admit that no surgeon ever operated solely to improve his patient’s appearance before the modern era.³⁶ When approached with due caution, however, such genealogies of operative procedures do reveal an under-studied aspect in the history of surgery.

REPURPOSING SURGERY

It has long been known that drug discovery has often been prompted by clever clinical observers who have recognized unforeseen properties in drugs intended for other purposes.³⁷ Although such therapeutic repositioning has historically been unintentional, it has proved to be a relatively inexpensive and efficient way to bring therapeutics to market—and as such, it has generated sufficient interest in the pharmaceutical industry to become a research protocol in its own right. Both cosmetic and bariatric surgery reveal that medical repurposing has not been exclusive to pharmaceutical research. As we will see, the delineation of such surgical repurposing emphasizes the importance of analysing the shifting rationales attached to relatively standardized sets of operative procedures.

While the topic of repurposing has not been formally conceptualized in the historiography of cosmetic surgery, it has implicitly guided many studies. It is generally admitted that the roots of modern cosmetic surgery lie in the reconstructive surgery developed during the late nineteenth and early twentieth century. However, its promise was not immediately evident to all at the time. In one of the first handbooks on ‘medical cosmetics’ published in 1892, German dermatologist Joseph Eichhoff surmised that the shape of the nose was fixed at birth so that no surgeon could ‘change anything about it’.³⁸ Considering the advances made in plastic surgery during the preceding decades,

even at the time this judgement was dated. Surgeons such as Karl Ferdinand von Graefe in Germany, Joseph Carpue in the UK, Louis Ombredanne in France and Edward Ely and John Roe in the USA had all devised a number of procedures for the correction of ‘saddle’ or ‘pug’ noses, thick nostril walls, ‘angular deformities of the nose’, and even protruding ears, cleft lips, and cleft palates. Johann Friedrich Dieffenbach, the most prominent of these surgeons, demonstrated that physicians were not only beginning to experiment with some of the operations that came to supply the modern plastic surgeon’s arsenal, but had also, as Haiken has noted, identified many of the concerns that would shape the profession well into the twentieth century.³⁹ In an 1829 discussion of a patient who, grievously disfigured by syphilis, was condemned to live a life of seclusion, Dieffenbach showed clear awareness of the ‘psychosocial’ aspects of plastic surgery. Convinced that surgery offered the only route to social reintegration in such cases, he argued that the ‘restoration and amelioration of maimed body parts, especially the human face, is of such importance for the maimed and for human society alike that even the smallest promotion of the art in this regard is worth reporting’.⁴⁰ Like the Berlin surgeon Eugene Holländer, who found no ‘universally binding theories about the need for cosmetic surgery’,⁴¹ practitioners nonetheless showed themselves initially reluctant to document their progress. At the beginning of the twentieth century, the status of cosmetic surgery remained uncertain, largely tainted by scandals and often associated with quackery.

Although the role of military conflicts in the development of modern medicine has been discussed critically in historiography,⁴² historians of cosmetic surgery take it for granted that the First World War played a key role in organizing this particular practice. Trench warfare gave rise to an unprecedented number of wounded, suffering unseen types of head injuries. The care of all those ‘broken faces’ led to the creation of special surgical units on both sides, fostering specialization. In 1916, a Department of Plastic Surgery was established at the Charité Hospital in Berlin, the direction of which was assigned to Jacques Joseph, already well known for his work in facial surgery. The operations performed there were not about saving patient’s lives; rather, the rationale for plastic surgery rested on the return of the injured to a productive role in the war and post-war economy. It thus echoed the social functions Dieffenbach had assigned to cosmetic surgery by stressing the close relationship between appearance and sociability—except that now, as Ramsbrock significantly pointed out, it affected an entire army of wounded soldiers instead of isolated cases.⁴³ The Allied Powers showed a similar interest in plastic surgery. There again, according to Haiken, the rationale for surgical intervention was entangled with social and economic needs. As a contemporary civilian observer noted, the miracle wrought by plastic surgery on the European battlefields was to take ‘torn, mutilated beings, without any faces, who would otherwise be unbearably repulsive and almost certainly economically dependent’, and turn them ‘into normal men again, so that they can live normal lives, as individuals, and be of service to their country

as well'.⁴⁴ After the battle of the Somme in 1916, English military surgeons realized that existing field installations were inadequate to cope with the large number and novel types of casualties. They thus established a new hospital, exclusively devoted to facial surgery. Located at Sidcup, in Kent, the facility was directed by Harold Gillies, a young otolaryngologist from New Zealand. In order to ensure both the provision of care and technical progress, Gillies recruited military physicians and surgeons from all over the Allied countries. Bringing crucial expertise in specialties such as anaesthesia, dermatology, and maxillofacial or dental surgery, as Haiken claims, those physicians were also instrumental in spreading the operative procedures developed in Sidcup when they returned home after the war.⁴⁵

Modern cosmetic surgery was fundamentally changed by the conversion of the wartime expertise into a lucrative peacetime practice. But because of different national contexts, this transformation proved uneven. In England, Gillies maintained his civil surgical practice within the realm of pathological or traumatic deformities—those resulting, for instance, from lupus, syphilis, burns, or rhinophyma—and regarded breast reduction as 'the borderline of what is justifiable'.⁴⁶ In Germany, on the other hand, Joseph gained a reputation for excellence in purely aesthetic surgery and made a fortune surrounding himself with an international network of admirers—practitioners and wealthy 'coquettes' alike. In the USA, cosmetic surgery also developed significantly as demobilized military surgeons attempted to translate their expertise into successful careers. But their tendency to test new procedures in often unfavourable settings was such that by the 1930s, as Haiken has observed, leading figures like Wilray Blair and Jacques Maliniak began to promote the corporate monitoring of the profession.⁴⁷ While such national differences in the evolution of pure cosmetic surgery during the interwar period should allow us to assess more precisely the respective roles of socio-cultural, institutional, economic, and epistemological determinants in structuring the field, this has not yet resulted in any sustained comparative analysis.

According to surgeons and historians alike, the logic sustaining the repurposing of wartime plastic surgery into a purely cosmetic practice was quite simple: in integrating the modern economy and consumer culture, surgeons redirected their attention from male patients disfigured on the battlefield to a massively 'self-diagnosed' female clientele, ready to submit their bodies to social standards of beauty. In collaboration with this new clientele, who had in complicated ways driven, as well as supported, the growth of cosmetic surgery, as Haiken suggests, surgeons sought 'new remedies for what were perceived to be problems of human inferiority and inadequacy'⁴⁸—even if, as Ramsbrock added, this female clientele was 'subjected to male strategies of repression, and that the presentation of her body was a reaction to masculine demands'.⁴⁹ Max Thorek, one of the practitioners engaged in this transitional process, laid things out clearly when he asked in his memoirs: 'If soldiers whose faces had been torn away by bursting shell on the battlefield could come back into an almost normal life with new faces created by the

wizardry of the new science of plastic surgery, why couldn't women whose face had been ravaged by nothing more explosive than the passage of time find again the firm clear contours of youth?'⁵⁰ But because pure cosmetic surgery was by definition concerned with 'non-pathological' imperfections of the face, not with the reconstruction of its missing parts, practitioners had to find new justifications for its use so that the undertaking could still claim medical status.

They did so by adapting the nineteenth-century's psychosocial argument. In the process, they often linked surgery to frankly political matters and their agendas covered the entire ideological spectrum. Explaining that 'subjects with obvious disgrace started their battle in life with a severe handicap',⁵¹ Raymond Passot for instance suggested that aesthetic 'sculpture of the face' was a social necessity. Manifesting sympathies for fascistic conceptions of social progress, as Guirimand noted,⁵² Passot went on to claim that cosmetic surgery constituted a hygienic duty. By 'standing in the way of the universal decay of the face', he explained, surgery could reverse a degenerative process that had long afflicted the human race and he looked forward to the day when it would be 'as inappropriate to be ugly and old than to seem dirty'.⁵³ Further to the left of the political spectrum, other surgeons saw facial blemishes as a most 'brutal weapon' in the class struggle for power. But instead of addressing this stratification at the level of its cultural determinants, as Ramsbrock argued, they insisted that surgery could provide a simple and effective technical means to resolve this expression of social inequality by giving the working poor a better chance to move up the economic hierarchy.⁵⁴

In addition to these socio-political arguments, the repurposing of plastic surgery led inter-war practitioners to value cosmetic surgery for psychological reasons. In *Creating Beauty to Cure the Soul*, Gilman reported that in 1929, beauty surgeon Adalbert Bettman deemed the practice already 'perfected to such a degree that it is now available for the improvement of the patient's mental well-being.'⁵⁵ Jacques Joseph endorsed a similar view in Germany, arguing that cosmetic surgery's primary function was to 'cure the patient's psychological depression'⁵⁶ by freeing him from 'antidysplasia'—a purely subjective feeling of aversion toward one's own appearance. In the USA, according to Haiken, surgeons made multiple references to Alfred Adler's psychoanalytic theory of the 'inferiority complex'.⁵⁷ In their hands, she argues, those references became the basic justification for surgery. Maxwell Maltz, for example, explained that the reconstruction of a 'normal appearance eliminates a torturing feeling of inferiority and a distorted view of the world,'⁵⁸ and thus offered a permanent cure for depression. In his opinion, cosmetic surgery even prevented suicide and anti-social behaviour like theft and murder—a far-fetched theory against which FBI director John Edgar Hoover warned practitioners.

These attempts at repurposing cosmetic surgery within the medical realm fell short of convincing all observers—surgeons, historians, and social scientists alike. In the mid-1950s, trying to establish a clear criterion for

distinguishing between plastic and pure cosmetic surgery, Gillies suggested that medical reconstructive surgery was ‘an attempt to return to the normal’, while non-medical cosmetic surgery might better be seen as ‘an attempt to surpass the normal’.⁵⁹ Deprived of any real therapeutic aim, cosmetic procedures were eventually reframed as pure consumer commodities, mostly serving to ‘mark status, improve social position, and reflect personal state’⁶⁰—an idea, Thomas Schlich suggested,⁶¹ that could only make sense in a culture where physical beauty was understood as an external, independent, and thus alterable quality. It also permitted the assimilation of the practice to a ‘transhumanist’ philosophy, basically bestowing the biomedical sciences with a power to overcome human natural limitations.⁶² In an ideation reminiscent of the 1960s series *The Twilight Zone*,⁶³ cosmetic procedures were even characterized as a set of ‘cyborg technologies’ that allowed the appearance of a ‘postfeminist cyborg woman’ seeking to ‘enhance her heteronormative sense of the self’.⁶⁴

Most historians and sociologists, of course, do not entirely adhere to such views emphasizing surgery’s socio-technical pitfalls. Gotman, for instance, has pointed out that reconstructive and cosmetic surgery resort for the most part to the same procedural armamentarium and has insisted that a successful reconstruction often ends with cosmetic corrections hardly justifiable from a strictly functional perspective.⁶⁵ François Delaporte gave a clear example of this by analysing recent developments in face transplants, and called for a global reconceptualization of the relationships between the medical and the non-medical realm in surgery.⁶⁶ A good starting point for this might be found in the flexible concept of ‘technological fix’ introduced by Schlich, who has used cosmetic surgery as an exemplary case for various other interventions designed for a priori non-surgical problems—such as liver transplant in alcoholic cirrhosis, sex reassignment procedures in gender identity disorder, or bariatric surgery in excessive body weight.⁶⁷

Like cosmetic surgery, bariatric surgery also resulted from the repurposing of a set of operative techniques, but with the difference that in this case surgeons converted some of the most detrimental side effects of these surgeries into curative principles. Despite the fact that two different and competing approaches have been proposed in the surgical treatment of obesity—a ‘mal-absorptive’ and a ‘restrictive’ view of surgical weight reduction—both were based upon a renegotiation of the relationship between surgery and the physiological sciences. As Peter English has explained, while antisepsis and anaesthesia allowed late-nineteenth-century surgeons to develop and make use of ever more invasive procedures, problems such as shock also forced them to consider more systemic components of the body such as bodily fluids, hormones, and chemistry in order to minimize operative complications.⁶⁸ This attempt at developing a safer surgery by studying the normal functions of the body, known as ‘physiological surgery’, progressively gave rise to an unusual, more performative conception of operative medicine. Taking shape with the experimental work carried out since the mid-twentieth century by Owen

Wangensteen and his pupils at the University of Minnesota, the new approach basically entailed the study of physiology with the explicit purpose of operating upon healthy body parts in order to gain control over physiological functions—that is, as surgeons Henry Buchwald and Richard Varco explained in defining the project of a ‘metabolic surgery’, to consider ‘the operative manipulation of a normal organ or organ system to achieve a biological result for a potential health gain’.⁶⁹

Malabsorptive bariatric surgery surfaced through the attempt to resolve some metabolic complications in intestinal surgery. Like other surgeons, Wangenstein was puzzled by the ‘short bowel syndrome’, an iatrogenic disease of nutritional malabsorption that occurred when massive intestinal resections were performed in cases of intestinal cancer or occlusion. He thus charged two of his co-workers, Arnold Kremen and John Linner, with the investigation of the physiological functions of the various levels of the gut. Experimenting on dogs, Kremen and Linner developed a procedure of partial bowel defunctionalization and came to the conclusion that the major discernible abnormality after loss of the distal small bowel was a marked diminution in fat absorption, associated with loss of weight. Although their overall goal was to prevent such problems of malabsorption, they also considered the possibility of treating ‘extreme cases of obesity by removing from intestinal continuity sufficient small bowel to produce weight loss without any other serious hazard or impairment’⁷⁰—a hypothesis they had in fact already tested on one of the hospital employees. In the decades that followed, a number of researchers sought to locate a ‘therapeutic zone’ somewhere along the intestinal tract for the treatment of obesity. But on the whole, their results proved disappointing: having operated upon thousands of patients, surgeons were able to show little more than shorter shunts produced more weight loss and that these in turn were associated with an increased complication rate. In 1978, as the experimental procedures had nonetheless entered regular clinical use, the NIH convened a Consensus Development Conference on the surgical treatment of morbid obesity. Its chairman, Theodore Van Itallie, modestly explained from the outset that in this particular case, a medical gain could easily be reached simply by ‘encouraging restraint in undertaking drastic and hazardous procedures’.⁷¹ Convinced that the treatment carried more risks than the obese condition itself, the NIH panellists overwhelmingly agreed that the use of the intestinal bypass was unjustified, and even suggested that the procedure had to be considered an ‘iatrogenic life threatening disease’.⁷²

The restrictive approach to obesity surgery also rested on skepticism towards the idea of reframing operative complications as therapeutic principles, although the procedures came from a less experimental field of surgery. The side effects here fell under the heading of the ‘dumping syndrome’, a distressing nutritional condition resulting from the too rapid emptying of a surgically reduced stomach. This syndrome was identified in the 1950s by surgeons who had performed drastic gastric resections for cancer and peptic ulcers and who had noticed that an appreciable number of patients became malnourished and lost

weight. According to Wangenstein, that group of symptoms appeared sufficiently concerning 'to make the patient, as well as his physician or surgeon, weigh carefully the indication for operation'.⁷³ But on the other hand, as he also suggested, when occurring in obese patients, the inability to regain lost weight after gastrectomy for ulcer or cancer might be 'a blessing in disguise'.⁷⁴ It is precisely this hunch that set Edward Mason, one of Wangenstein's former students, on the path of the gastric bypass for obesity—a procedure he described in the mid-1960s as 'exactly like [the century old] Billroth II gastric resection except that nothing is removed'.⁷⁵ This gastric surgery for obesity, considered technically more complex to execute than the intestinal bypass, had long remained on the side-lines, but in a turnaround that historians might analyse in terms of a typical 'paradigm shift', the rejection of the malabsorptive approach in the early 1980s led rapidly to the establishment of gastric restriction as the core principle in obesity surgery research. Gathering around Mason to promote their practice, academic gastro-intestinal surgeons founded their own professional organization under the name of the American Society for Bariatric Surgery (ASBS), where they essentially worked at testing weight control procedures by decreasing the volume of the stomach. The fact that the organization was renamed the American Society for Metabolic and Bariatric Surgery (ASMBS) in 2007, however, indicates that a whole new cycle of therapeutic repositioning was underway. Gastric and intestinal procedures developed for the treatment of obesity began to be tested and used for new diseases such as diabetes, hypertension or hyperlipidaemia and were integrated into experimental endocrinology under the assumption that metabolic regulation could begin in the gut, which has the ability to send messages to the brain, liver, pancreas, kidneys, and immune system.⁷⁶

Historians have often claimed that, to varying degrees, weight-related concerns have always attracted the physician's attention.⁷⁷ But while weight regulation procedures had been the object of surgical experimentation since the mid-1950s, this failed to make bariatric surgery a medical specialty in its own right. Only the prospect of an obesity epidemic, first raised by the World Health Organization on the eve of the twenty-first century, gave the purview of bariatric surgery a new turn. Surgeons took the epidemic as an opportunity to promote their practice, albeit as a mere 'quick fix', to the extent that some doctors rapidly reckoned that the epidemic of obesity had 'spawned a second epidemic—of bariatric surgery'.⁷⁸ As the first non-contagious chronic illness to be framed in epidemiologic terms, the 'obesity epidemic' attracted its own critics.⁷⁹ In a widely cited book that summarizes the prevailing view in the social sciences, Michael Gard and Jan Wright suggested that 'rather than a global health crisis or an "objective" scientific fact, the "obesity epidemic" can be seen as a complex pot-pourri of science, morality and ideological assumptions about people and their lives which has ethically questionable effects'.⁸⁰ In the same way, the law professor and social critic Paul Campos condemned much of obesity research as 'little more than propaganda masquerading as the results of disinterested scientific investigation',⁸¹ while the

medical sociologist Annemarie Jutel construed the practice as a ‘religious fascination in establishing rules of normality’.⁸² In this regard, the late growth of bariatric surgery—which, according to some estimates, was performed on half a million elective patients worldwide in 2013⁸³—has problematized the recourse to surgical care in obesity as a drift to non-medical use of surgery, a normalization of bodily appearance, and a form of social control. Therein, as we shall see in the following section, despite fundamental differences in therapeutic claims, procedures, organizational networks, and historical trajectories, bariatric and aesthetic surgery have been drawn together in both popular representations and scholarly studies as well.

SURGERY, SOCIAL CONTROL, AND THE SELF

Arguing that their work was directed toward a ‘real’ disease entity, not a mere social prejudice, obesity surgeons confronted a number of recurrent difficulties in distinguishing their practice from simple aesthetics—and, as one attorney specialized in malpractice suits recently stated: ‘While bariatric procedures are elective, they are not cosmetic surgery’.⁸⁴ This common ground of electivity aroused critical scrutiny by both historians and social scientists, which tend to view bariatric and cosmetic surgery as particularly pervasive and diffuse types of normative control. The feminist philosopher Kathryn Morgan, for instance, criticised that ‘one tactic to normalize weight loss surgery involves assimilating it to “normal” cosmetic surgery’⁸⁵—both practices being ‘embedded in extraordinarily complex neoliberal biopolitical structures and dynamics of fat hatred camouflaged by liberatory discourses that promise “empowerment”, becoming “normal”, and discovery of her “real self”’.⁸⁶ Whether drawing on a cultural sociology of the body, on a political disapproval of the extension taken by contemporary medical institutions or on the hypothesis of a patriarchal domination, the key question has been to address the structural forces that drive individual agents to deliberately submit themselves to such ‘unnecessary’ interventions.

In a representative analysis of the work conducted in the social sciences and humanities, Eric Oliver held that bariatric surgery’s success in the US medical marketplace illustrates the problems in defining health relative to the pecuniary interest of the medical profession.⁸⁷ In a more structural phrasing of the same thesis, Natalie Boreo added that in a time when ‘biomedicine and technoscience expand ever further their presence into the multilayered world of human experience’,⁸⁸ bariatric surgery provides the social sciences with a spectacular example of how the moral discourse on health proves ideologically useful as a legitimizing tool in bending the body to social standards of acceptability. As US plastic surgeons have come to target distinct groups of consumers when marketing particular procedures, their success has been deemed by historians to reveal socio-economic or political stakes. While advising facelifts or breast implants for the aging middle-class woman, for example, they have also played the race card, devising specific rhinoplasty

procedures for Jewish or Irish clients eager to ‘Americanize’ their profile, and ‘double eyelid’, skin lightening, or lip reduction procedures to make Asians and African Americans more Caucasian. In the process, historians suggest, surgeons have invented pathological designations and ways to hide harmless blemishes, corporeal natural transformations and putative signs of ethnicity. In doing so, according to Gilman, they were not just concerned with beauty and attractiveness, but mostly with markers of ‘who cannot be honored with acceptance as an equal’.⁸⁹ This state of affairs, grounded in complex questions of gender, race, and personal identity, for Haiken also shows how proponents of aesthetic surgery were inspired by the twentieth century’s culture of superficiality as they simultaneously helped to shape it.⁹⁰

Aside from the pecuniary interest in medicalizing various bodily features, the ability of cosmetic and bariatric surgery to transform a patient’s appearance according to socially determined standards of aesthetics thus reveals their potential for normalization. In this regard, Ramsbrock has suggested that cosmetic surgery began its career at the beginning of the twentieth century as a ‘mandated *dispositif* of medical knowledge [...] linking ideas of beauty with normative conceptions of health’.⁹¹ On a sociological level, the medical discourse on obesity paralleled other types of gender, ethnic, or class stigmatization. It should thus come as no surprise that a group of self-declared ‘obesity sceptics’⁹² has created a field of ‘fat studies’, an endeavour that they have defined as ‘marked by an aggressive, consistent, rigorous critique of the negative assumptions, stereotypes, and stigma placed on fat and the fat body’.⁹³ In the ‘biopolitical’ perspective favoured by most of those researchers, the desire to be thin and beautiful, as it had been assimilated and endorsed by cosmetic and obesity surgery patients, is said to reveal a culture where surgeons, in addition to their traditional role of maintaining or restoring individuals’ health, also acquire the function of perfecting them in all aspects of their lives—especially the weight and appearance of their body.⁹⁴ In other words, as Morgan put it, the decision to submit to bariatric surgery allows a weight-loss subject to ‘carnally articulate her patriotic self-discipline, her sense of responsibility to American society, and her decision to become an attractive, healthy, productive worker, a laudable mother and wife, a publicly convivial friend, and a citizen of the twenty-first century’.⁹⁵ And, one hopes, lose weight.

While bariatric surgery has precipitated a fairly unanimous denunciation of the power structures sustaining its medical spread,⁹⁶ discourse on cosmetic surgery has proved a bit more divided—especially in feminist analysis.⁹⁷ Central to the debate is the matter of agency—or whether or not the intervention leads to a free and authentic experience of the body and its femininity.⁹⁸ From the perspective of its promoters, the true purpose of cosmetic surgery is to reconcile the divergent pictures that patients have of their bodies and their idealized selves, the ultimate duty of the surgeon being to bridge the distance between the two.⁹⁹ This conception of elective surgery as a positive tool for self-image enhancement, which leaves historians and most social scientists sceptical, to say the least, has been denounced by some authors as

producing a culture of ‘beauty junkies’¹⁰⁰ and criticized by feminist scholars as a form of patriarchal oppression. According to Suzan Bordo, more than an individual choice, cosmetic surgery must be seen as a burgeoning industry, a normative cultural practice, and consequently a ‘significant contributory *cause* of women’s suffering by continually upping the ante on what counts as an acceptable body’.¹⁰¹ In her view, what first appears to be an instance of choice turns out to be a capitulation to social norms, designed to discipline and victimize women in the name of beauty. More radical analyses even suggests that men’s appreciation and approval of achieved femininity becomes ‘all the more invasive when it resides in the incisions, stitches, staples, and scar tissues of women’s bodies as women choose to conform’¹⁰²—so that feminism and cosmetic surgery must of necessity be ‘unalterably opposed’.¹⁰³

A more liberal and individualistic strand of feminism concedes that women might have good, or at least justifiable reasons to resort to cosmetic surgery.¹⁰⁴ Framing the issue as a ‘paradox of choice’, scholars of this persuasion have suggested that if, at the macro-societal level, women undergoing surgery may appear to be collaborating in their own domination, when viewed from the level of the individual, those ‘actions to improve their physical appearance may be an investment in their physical capital and a means of achieving social power’.¹⁰⁵ In other words, adherents to this view suggest, instead of simply being an instrument to discipline and victimize women, cosmetic surgery can be seen as a tool for empowerment, a strategy for women to exercise control over their lives.¹⁰⁶ As we have seen, this emancipating role echoes an argument developed by some of the specialty’s promoters at the beginning of the century. Kathy Davis, Paula Martin, and Guirimand have stressed the role of Suzanne Noël, a French physician, feminist-activist and the first female cosmetic surgeon in forging this line of argument.¹⁰⁷ Already in the 1920s, ‘Mme Noël’ suggested that surgery might well serve the purpose of ensuring a woman’s presence in the workforce by repairing ‘the look of old age, of tiredness, of illness’—and in this way allow ‘those who could no longer work because of their appearance, to find a normal life, or almost normal life’.¹⁰⁸ Yet, as Sherrie Delinsky has shown, cosmetic surgery has still not become a common and socially accepted form of self-improvement. Despite its extension in contemporary society, individuals who pursue cosmetic surgery continue to be subject to disapproval and negative stereotypes about their personal characteristics, psychological adjustment, and individual choices.¹⁰⁹ As is the case for bariatric surgery, the history of those specific cultural resistances to otherwise successful surgical undertakings has not yet been investigated—probably in part because historians also endorse them.

CONCLUSION

As discussed in this chapter, the specific questions raised by cosmetic and bariatric surgery, two recent specialties that operate on healthy bodies or body parts, have been unevenly treated in the historiography. While their technical

conditions of possibility have largely been addressed by surgeons—if most often in an attempt at legitimizing their contemporary use—historians have conversely paid much attention to the cultural, professional, and socio-economic problems raised by the birth of a surgery dedicated to the remodelling of body appearance. As I have suggested, the parallel with bariatric surgery also heightens the importance of analysing the various regimes of medical legitimacy sustaining them, especially since the repurposing to which their constitutive procedures were subjected highlights major shifts in surgery's rationale. Because it has opened a space for 'non-medical' surgery in the modern culture of mass-consumption, such a transposition of existing surgical procedures to unforeseen clinical uses has received little approval outside their own professional circles. This situation has obviously affected the social acceptability of the new specialties. Seen as pursuing no real therapeutic aim, they have been seized by historians and social scientists as illustrations of the excesses of the modern medical field and the new political or 'bio-political' functions of surgery in contemporary society—that is, its role as a structural relay for social control, patriarchal domination, and normalization.

Thus, although the socio-cultural aspects of the new surgical practices have been extensively addressed, especially in terms of gender, race, and class, their appearance as organized branches of medical practice remains little explored. Aside from some already identified themes to be treated in further studies, such as the need for a comparative analysis of their various national evolution, a truly historical study of their technical developments or a reflexive study concerning their social critics, many issues remain unexplored. Despite a prosopographic analysis of six US cosmetic surgeons by Haiken,¹¹⁰ scant attention has been paid to the socio-professional characteristics of the actors involved in the structuration of the two fields. Similarly, more systematic studies on their respective networks of recruitment, training systems, and experimental orientations would be desirable, as well as an analysis of their governing structures such as their professional associations and practice guidelines. Those studies might prove helpful in understanding more precisely how the medical profession has positioned itself with regards to these new specialties and their distinctive features—in disclosing for instance how and to what extent doctors' initial reluctance has faded. Addressing the relations between the new groups of practitioners and the American College of Surgeons, the NIH and/or third-party payers would shed light not only on the transformations affecting the role of surgery in society, but also on the meaning of such transformations for the history of medicine.

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A Revolution Through the Keyhole: Technology, Innovation, and the Rise of Minimally Invasive Surgery

Nicholas Whitfield

INTRODUCTION

The history of modern surgery has no shortage of revolutions.¹ In the last 200 years its theory and practice have been subject to numerous upheavals, from the advent of anaesthesia and asepsis in the nineteenth century, to the succession of localism by physiological therapy in the early twentieth.² The rise of minimally invasive surgery (MIS) is among the most recent phenomena to have earned the epithet ‘revolution’. Also known as minimal-access or keyhole surgery, MIS came of age in the field of general surgery in late-1980s, and ushered in significant changes for practitioners and patients alike. Out were the long incisions of the classic approach, gone the deep-set scars and anguished recoveries. In was the endoscope, a visualisation tool by which surgeons worked remotely, manipulating abdominal structures through bloodless portholes, observing closed cavities on televised displays. This chapter presents a selective review of scholarly work on the recent history of MIS, identifying its dominant themes, exploring its relation to literature in the history of technology and innovation, and paying critical attention to the theme of a ‘surgical revolution’, as to the broader politics of continuity and change.

One procedure above others defined the rise of MIS in the latter decades of the twentieth century. Laparoscopic cholecystectomy, the endoscopic removal of the gallbladder, appears in many historical accounts as both

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symbol and cause of the MIS revolution, ‘truly a phenomenon that changed the focus of surgery and the mindset of nearly all surgeons, wherever they perform surgery in the body’.³ Developed in Germany and France during the mid to late-1980s, ‘lap chole’ (LC) as soon it became known to its pioneers, was by the early 1990s the standard procedure in North America and Europe for cases of uncomplicated cholelithiasis (gallstones), replacing the classic laparotomy of open surgery and clearing the way for a range of other endoscopic procedures. ‘In the history of surgery’, wrote one early advocate, ‘few procedures have so rapidly changed the surgeon’s custom of thinking and acting as has laparoscopic cholecystectomy. It has been the true detonator of the laparoscopic revolution’.⁴ The term ‘minimally invasive surgery’ was in fact coined independently of the first endoscopic cholecystectomies, and anticipated a sweeping transition in surgical outlook and practice. This chapter uses literature on LC as a way to explore some tendencies of a nascent historiography, and to pinpoint areas for future scholarship in the study of MIS.

Minimally invasive techniques are today common throughout the world.⁵ Surgeons and patients alike regard their advantages as self-evident, with benefits that include smaller scar sizes, quicker recovery times, reduced trauma, reduced hospital costs, and fewer post-operative complications. The professional repercussions of MIS have been similarly profound, as endoscopy transitioned from an exploratory and diagnostic technique specific to gynecology and internal medicine during the mid-decades of the twentieth century into a central therapeutic measure of general surgery by its end. Once the ‘sick man’ of the surgical trade, by the early 1990s general surgery was again expanding its practice, its very name synonymous with the frontiers of surgical innovation.⁶

To date, surgeons have enjoyed a prominent role in recounting this history, with many recognised innovators authoring reminiscences in journals such as *Surgical Endoscopy* and *World Journal of Surgery*, writing historical chapters for laparoscopic atlases or endoscopic handbooks, or offering oral testimony to interested scholars (most notably the Polish author Grzegorz Litynski whose *Highlights in the History of Laparoscopy* is among the few book-length treatments of the subject).⁷ This dominance is unsurprising given how recently changes occurred, given their rapidity and apparent ubiquity, and given the concomitant lack of archival documentation available for review. By taking the lead in its history, surgeons have created accounts that blur customary boundaries between primary and secondary source materials. Their narratives, which express the close overlaps between the writing of history and its making, proclaim both the revolutionary character of MIS and (paradoxically) its broad continuity with classic surgery. A new generation of scholars now faces the task of assessing the status of this work, and, more intriguingly, unpacking the ways in which historical consciousness among surgeons has played a role in the pursuit of their professional ideals.⁸ The present chapter is a preliminary attempt, and opens by reviewing historical accounts of endoscopy prior to and during the rise of MIS, noting a

prevailing emphasis on innovation, invention, novelty, and pioneers. A second section surveys more recent efforts to theorise differences between open and closed surgical methods, and a third considers how insights from the neighbouring field of the history of technology have implications for thinking critically about the revolutionary image of MIS. A fourth section continues the critique of revolution by considering the question of patients, both as a force for technical change and in connection to debates about surgical evidence. A concluding section points briefly to developments in the period after the early 1990s, and underscores the richness of MIS as a topic for medical historians.

HISTORICAL NARRATIVES OF ENDOSCOPY

Endoscopy is the central technology of MIS. An endoscope is an instrument for visualising the interior of a human body, which it enters either through an existing orifice (such as cystoscopes for the bladder), or percutaneously through a surgical incision (such as thorascopes for the pleural cavity or culdoscopes the female pelvic organs). Endoscopy is an umbrella term for a range of visualisation techniques, prominent among them *laparoscopy*, defined as the endoscopic visualisation of the peritoneal cavity.⁹ The history of endoscopy therefore predates that of MIS, leading one author to brand the latter as merely ‘the natural byproduct of the medical doctor’s curiosity to directly visualise and treat surgical diseases’, itself datable to antiquity, and materially to the specula of the Greco-Roman world.¹⁰ Despite this long trajectory, and despite recent historical interest in topics of medical imaging, visualisation, observation, and the senses, there have been few serious attempts to look at endoscopic history in detail.¹¹ The recent work of Claudio Pogliano, who connects endoscopic exploration to the historical privileging of vision in Western cultural and scientific traditions, and of Jose van Dijck, who studies the overlaps between endoscopy and media technologies, are two exceptions to prove the rule.¹² A third is Jesse Olszynko-Gryn’s historical account of laparoscopic sterilisation, which during the 1970s became the world’s most widely used contraceptive technology. By turning away from technological innovation to focus on use, Olszynko-Gryn pursues an approach that resonates with theoretical perspectives in the history of technology discussed later in this chapter.¹³

For the most part, however, endoscopic histories remain confined to the review sections of medical journals, and have in common a style of history that presents successions of technical innovations to define and divide historical epochs.¹⁴ Here it is possible to offer only the briefest of summaries, beginning in the early nineteenth century when an Italian obstetrician working in Frankfurt, Philippe Bozzinni, created a candlelit device comprising mirrors and tubes to glimpse inside the human bladder. Later that century a French surgeon named Antoine Jean Desormeaux published *De l’endoscope*, a treatise describing an instrument for exploring the bladder and urethra. It was adapted

in 1879 by the German urologist Max Nitze, then working in Berlin, who used burning platinum wires to improve illumination. In the early twentieth century, Georg Kelling of Dresden explored the abdominal cavity of living dogs with a Nitze cystoscope; he applied the term ‘celioscopy’ for what is today considered the first laparoscopic examination. The twentieth century saw various technical improvements that refined and expanded endoscopic applications. They have been the basis for an historical image of endoscopy ‘punctuated by three essential technological inventions’, each symbolic of an era: the invention of electric light in 1879 (the era of rigid endoscopes); fibre-optic technologies in the 1950s (the era of flexible and semi-flexible endoscopes); and the charge couple device of the late-1960s (the era of televised endoscopy).¹⁵

As a recent chapter in this story, laparoscopy has itself been subdivided on the basis of instruments and pioneers. Typical is a three-way split starting with the era of ‘diagnostic laparoscopy’, in which internists used rigid endoscopes for exploratory and documentary purposes,¹⁶ followed from the 1930s by the era of ‘operative laparoscopy’, when gynecologists began reporting new therapeutic applications, most famously tubal sterilisation popularised in the 1960s by the French gynecologist, Raoul Palmer.¹⁷ In Britain, Patrick Steptoe was to publish the first English-language atlas of laparoscopy in 1967, *Laparoscopy in Gynaecology*, followed in 1970 by the US gynecologist Melvin Cohen’s *Laparoscopy, Culdoscopy, and Gynecography*.¹⁸ Major figures of this period include the German gynecologist Hans Frangenheim, cautious advocate of endoscopy and a pioneer of laparoscopic sterilisation, and the formidable Kurt Semm, surgeon at Kiel University and prolific inventor of endoscopic devices, most famously an electronic insufflator for regulating abdominal pressure.¹⁹ In 1982, Semm performed the first laparoscopic appendectomy.²⁰ This era also saw the institutional consolidation of endoscopic surgery by means of learned societies: in Germany in 1976 the Surgical Study Group on Endoscopy and Ultrasound (CAES), and in the USA in 1981 the Society of American Gastrointestinal Endoscopic Surgeons (SAGES).²¹

Finally came the era of ‘modern laparoscopy’, ongoing from the early to mid-1980s²² (the chronological focus for the remainder of this chapter), in which general surgeons took up the endoscope with remarkable results. This period bore the term ‘minimally invasive surgery’, coined in 1986 by the UK urologist John Wickham.²³ Its revolutionary moment clustered around the years from 1987 to 1991, and proffered the iconography of surgeons poised upon a distended abdomen protruding rod-like scopes and trocars, hands remote from the patient’s body, eyes fixed on a two-dimensional screen. Here the iconic technology is the computer chip television camera, which opened up the once-private endoscopic view, and initiated the age of video-laparoscopic surgeries.²⁴ Phillippe Mouret, a French surgeon from Lyon and an early practitioner of LC, suggested that it ‘was the ... use of the video which made it possible to understand the technical procedures and to repeat them safely’, thus enabling the rapid and international dissemination of laparoscopic techniques.²⁵

It was not, however, for a technology but a procedure that this era became subsequently renowned. The first laparoscopic cholecystectomy was by the German surgeon Erich Mühe in September 1985. He was followed closely (and independently) by Mouret in March 1987, the first to perform the procedure with video guidance.²⁶ In secondary literature the operation remains ‘the single most important stimulus to the development of operative laparoscopy in surgery’,²⁷ emblem of a new surgical mindset and forerunner to a host of laparoscopic surgeries including (but by no means limited to) vagotomy, partial gastrectomy, repair of a diaphragmatic hernia, splenectomy, colon resection, hernioplasty. One historical review published in 1997 noted the impossibility of keeping abreast of the burgeoning procedures performed laparoscopically the world over.²⁸ This was scarcely 12 years after the original operation in Germany, less than 10 since its popularisation at the hands of a trio of French surgeons, and not more than three years after the National Institutes of Health in the USA declared laparoscopic cholecystectomy to be the ‘procedure of choice’ for the treatment of gallstones.²⁹ The feverish pace of change has been a focal point for commentators since, consolidating the image of LC as a watershed procedure and catalyst of a global revolution in surgical practice. According to the French surgeon Jacques Perissat:

Suddenly LC opened the eyes of general surgeons to the fact that the addition of endoscopy to their operating techniques was of the highest interest for their future and that of their profession. What term can one use other than ‘revolutionary’ to describe this sudden awareness which exploded on the scene, giving the innovators a new found freedom, impetus, and enthusiasm, showing the way forward in a discipline which was slowly seeing its field of application being whittled away[?]³⁰

For Perissat and his peers, laparoscopic cholecystectomy came to stand for the idea of a surgical consciousness revitalised by the endoscope and a surgical specialty salvaged by it.

Notably, not all MIS enthusiasts were hostile to other, non-surgical laparoscopic therapies, then popular at the time. As noted, the term MIS predated laparoscopic cholecystectomy by several years. It had been coined in the mid-1980s by John Wickham, director of the UK’s first Department of MIS at London’s Institute of Urology. In a recent paper, the historians Sally Frampton and Roger Kneebone have described in detail the interdisciplinary origins of Wickham’s concept, in particular its connections to interventional radiology, and its concert with a broader outlook of minimally invasive therapies. In a manifesto published in the *British Medical Journal* of 1987, titled ‘The new surgery’, Wickham outlined his vision of a surgical system that would renounce its craft-based roots and embrace the endoscope. He summarised the achievements of endoscopic surgery over a range of specialties (endarterectomy in vascular surgery, arthroscopy of the knee), and predicted

that in future, '[o]pen operations will remain only for trauma and reconstruction. This means that surgeons will need to be trained as microendoscopists and bioengineers rather than as butchers and carpenters'.³¹ Cautious advocates, like the Dundee surgeon Alfred Cuschieri, would later criticise the term 'minimally invasive surgery' on the grounds that it was semantically inaccurate. 'To invade', Cuschieri maintained, was absolute, not relative, and as such should not be qualified. Wickham's term moreover carried false connotations of increased safety, as well as the impression (also false) of restriction to minor surgical procedures. Most important, however, was that MIS failed to capture the 'essential attribute' of the new surgery: 'the reduction of the trauma of access'—hence Cuschieri's alternative: 'minimal-access surgery'.³² But this assault at the literal level missed a broader point that MIS, if descriptively weak, was yet conceptually ambitious. As Frampton and Knee-bone show, it countered the clumsy ethos of general surgery that Wickham, who had trained with neurosurgeons, thought barbarous. It also confronted head-on the belief, longstanding among surgeons since the nineteenth century, that the larger the scar size the more accomplished the practitioner.³³ In interviews and publications, Wickham clung unflinchingly to the prospect of a new surgery, technologically progressive and patient-led. His conviction that MIS implied a profound rupture explained his provocative phrasing, was behind it and built into it, and soon was buttressed by the meteoric ascent of laparoscopic cholecystectomy. It has since been reproduced by a secondary literature that assumes overwhelmingly the existence of a radical upheaval of one kind or another, and which continues to grapple with its theoretical implications. The next section will review two broad approaches to conceptualising the contrast between old surgery and new.

APPROACHES TO MIS: CONTINUITY AND REVOLUTION

In the first editorial of the journal *Surgical Endoscopy*, established in 1987, the US surgeon George Berci, co-founder of the American Association of Gynecological Laparoscopists (1972), and co-author with Alfred Cuschieri of the 1986 manual *Practical Laparoscopy*, announced, 'a new role is emerging for the surgeon, that of endoscopist, leading to the necessity for a surgical endoscopy journal with a wider scope'.³⁴ The requirements for this role were at that time controversial and have remained so³⁵; its nature has become a focal point for newer scholarship on MIS.

In his study *Surgeons and the Scope*, for instance, the occupational sociologist James Zetka begins with an instructive comparison of open and minimally invasive surgical procedures. In open surgery, Zetka writes, surgeons make large incisions in order to resect, restore, or otherwise intervene in a patient's anatomy. Although surgeons use instruments for cutting, clamping, stitching and so forth, they are free to manipulate anatomical structures almost directly; touch is mediated only by surgical gloves; hands and eyes are

focused on the same (immediate) location. Endoscopic surgeries are different. In laparoscopic cholecystectomy, for instance, a surgeon begins by distending the abdominal cavity with carbon dioxide, then inserts a laparoscope through a porthole to visualise the gallbladder and its surrounding structures. The endoscopic image is magnified and televised. Eyes in the operating theatre are trained on the televised display rather than the patient. Following the insertion of other instruments through additional portholes, the surgeon severs the gallbladder and removes it through the primary trocar.³⁶ Though Zetka acknowledges that video-laparoscopic surgeries import the principles and procedures of open surgery—a point discussed in the next section, and which bears directly on the critique of a surgical revolution—it is the fact of *discontinuity* that animates the early passages of *Surgeons and the Scope*.³⁷ In later chapters, Zetka asserts that general surgeons deliberately obscured these differences to emphasise abstract similarities and common traits. He maintains that laparoscopy came at a fortuitous time for them, ‘in the face of challenges to one of their bread-and-butter procedures’, a moment when their field of practice had been eroded for two decades by ambitious gastroenterologists. As LC gained momentum, surgeons sought to situate the endoscope as a natural extension of their field. Zetka notes the considerable economic and professional payoffs to this strategy: general surgeons hoped to gain a monopoly and sideline other endoscopic specialists. He thus depicts a turf war, a struggle for control of a new technology, where the politics of continuity and difference were decisive:

Surgeons ... argued that the operative laparoscopic approaches were not radical new approaches to surgery but embodied the time-honored principles of the surgical craft. They used these time-honored legitimation principles to pitch their program for exclusive control over these applications to the medical community in general and to hospital credentialing committees in particular ... [Their] arguments prevailed and helped to reestablish their control over threatened market turf.³⁸

Zetka, however, doubts the ‘technical merit’ of the surgeons’ ‘reductionist argument’—skillsets, he insists, *did* shift in the transition from open to laparoscopic methods. One limitation of his analysis is its one-sidedness—many surgeons (for example, John Wickham), beyond claiming abstract similarities also argued that with the spread of endoscopic techniques, ‘an entirely new way of operating had to be envisioned’.³⁹ Zetka, however, is not alone in favouring the study of discontinuity, or in supposing its self-evidence. Jose Van Dijck, for example, contends that endoscopic surgery ‘requires radically different skills from open surgery’,⁴⁰ which the anthropologist Rachel Prentice has characterised in the following terms:

Unlike traditional open surgeries, the technology [the endoscope] distances the surgeon’s eyes and hands from the operative site ... The perceptual skills required to work in minimally invasive space differ significantly from those of open surgeries ... Surgeons have no direct manual contact with the insides of

the patient's body. They cannot use their hands as probes ... And they have a less direct kinesthetic 'feel' for the body as transmitted through the instrument. Further, they must continually extrapolate from a two-dimensional image to an interaction of bodies and instruments in three dimensions ... by orally identifying anatomical structures as they appear on the screen.⁴¹

Where for Zetka the comparative approach is useful for pinpointing the precise locus of disruption, in Prentice's ethnography, addressed to various surgical specialities, the concern for difference is epistemological and fuels a generalised exploration of embodiment and learning. These diverging motives highlight the possibilities for approaching the problem of technical change in medicine, especially in the areas of tactile engagement, visualisation, and the widening distances between surgeons and patients—themes that have long been central to surgical history, as to the history of medicine at large.⁴²

Yet Zetka's background is in sociology, Prentice's anthropology. Historical scholarship on MIS has so far been much less enamoured of *difference* (perceptual, tactile, practical), and much more concerned with the problem of *change* (technical and professional), which it has characterised in the grander conceptual framework of a surgical revolution. Contrary to *Surgeons and the Scope*, where Zetka suggests that *continuity* dominates surgical characterisations of endoscopic techniques, the term 'revolution' has in fact become a leitmotif in recounting the rise of laparoscopic cholecystectomy, used as a proxy for the wider transition to the practical and psychological outlook of MIS.⁴³ Common to both primary and secondary literature (where that distinction still holds), the term evokes the international scope and rapid pace of change that characterised the substitution of endoscopic for classic methods. For contemporaries who employed it, 'revolution' stirred concerns about the nature of innovation (discussed later), specifically about patients' role in pushing for laparoscopic interventions. More recently, that early ambivalence has morphed into a characteristic celebration of inventive genius. Neither usage has been entirely dispassionate; both have sought in some sense to shape rather than merely interpret historical events. Typically, the revolution story contains certain key features, several of which are summarised in the following passage by Perissat:

This revolution took most surgeons by surprise, and even the innovators could not have predicted the explosion of interest and rapidity of dissemination worldwide of this new technique. It is also of interest historically that a good part of the motivation to move forward with this technique was patient-driven. It became clear to surgeons that if they didn't learn to perform laparoscopic cholecystectomy, they would soon not be doing many cholecystectomies at all.⁴⁴

Perissat's remarks recapitulate some key elements in what has become a common MIS revolution narrative: that the unanticipated transformation was explosive and uncontrolled, that it was unanticipated, even by its initiators, uninhibited by its sceptics, ubiquitous in its reach and most likely uncontrollable. It was moreover technologically enabled, thanks to

video documentation, and—a persistent claim of surgeons at the time and since—patient-driven.⁴⁵

The story is not without its merits. Certainly, it is undeniable, and of historical interest, that in North American and European contexts laparoscopic cholecystectomies became widely practiced in a short period—although the inequalities in their global spread have been little remarked upon and are deserving of greater historical attention. The speed of change has been a prominent theme in accounts of the first laparoscopic cholecystectomies, recounted by Litynski and others. The first such procedure on a human was in September 1985 by the German surgeon, Erich Mühe, whose efforts went unnoticed.⁴⁶ More influential was the work of Phillipe Mouret, a surgeon in Lyon, took place in March 1987. Mouret's work gained the attention of the Parisian surgeon, François Dubois. On declaring one day to a newly hired surgical assistant that his mini-laparotomy produced the smallest scar possible, Dubois received a curt rebuttal. The assistant, a former employee of Mouret's, described her recent participation in a laparoscopic cholecystectomy. Sceptical, Dubois contacted Mouret for confirmation. The two men met in a Paris hotel where Mouret brought video documentation of his procedure, which Dubois promptly replicated.⁴⁷ Another French surgeon, Jacques Perissat of Bordeaux, later saw Dubois talk on the topic of laparoscopic surgery, and began his own experimental procedures, a video of which he showed to the second annual meeting of the SAGES in Louisville, Kentucky in April 1989.⁴⁸ Kenneth Forde recalled the intense interest it generated: 'throngs gathered, some in amazement, some in dismay, some amused, but most affected—it was that singular event that changed the course of SAGES and surgery, perhaps for all time'.⁴⁹ The French operations, unlike Mühe's before them, gained positive international attention, in part through Perissat's film. By 1988, surgeons in Nashville, USA had started experimenting with laparoscopic cholecystectomy generating professional and public attention across North America.⁵⁰ By the early-1990s, surgeons both there and in Europe were already using the past tense to recall an unanticipated revolutionary shift in the surgical approach to cholecystectomy, an 'incredible explosion',⁵¹ comparable in the popular history of surgery to the introduction of antisepsis or anesthesia.⁵² It is these features that have motivated the widespread perception of a surgical revolution reviewed critically in the next section.

LIMITS TO REVOLUTION: TECHNOLOGY AND INNOVATION

As historians of surgery know, terms like revolution should be approached with caution, particularly as they feature in descriptions of technical change and innovation. Identifying their limitations, as this section aims to, is a first step towards understanding their wider historical significance. Critical literature from related fields supports the point.

During the 1990s professional historians of technology began shoring up distinctions between the historical study of *invention*, which until that point had dominated their field, and critical appraisals of *technology-in-use*, which,

eager to deepen their insights, they called on to enrich it. Besides the most recent work, the historiography of MIS has been resolutely of the former kind. The breathless adoption of laparoscopic cholecystectomy in the late-1980s, the rapid turnover of innovations and their high-tech nature (both then and now), seem to make MIS well-suited for the analysis of innovation, and to ratify prevailing stress on novelty and pioneer stories. Yet such work is necessarily vulnerable to the critiques put forward by these historians. One limitation, noted by Carroll Purcell, is that studies of innovation focus on inventors, and thereby ignore the users of technologies and others affected by them. A related set of concerns, voiced by David Edgerton, is that by privileging novelty, studies of innovation exclude the vast range of mundane day-to-day activities that constitute the bulk of technological practice. Edgerton has further argued that terms commonly found in descriptions of innovation—for instance, ‘revolution’—tend both to overstate historical discontinuities and to underplay the persistence of older technologies into high-tech eras.⁵³ Innovation besides is a historically peculiar fixation.⁵⁴ Preoccupation with it is comparatively recent, according to Christine Macleod datable to about the last quarter of the nineteenth century, and as revealing of that era (and arguably of the present one), as of any past event or period.⁵⁵ Given the pre-eminence of innovation as an organising principle of MIS scholarship, this critical literature has implications for thinking about its recent history, both as a cluster of innovations and as technology-in-use.

Most obviously, it raises the classic historical problems of (dis)continuity and novelty, the extent to which new practices departed from old, and the nature of their originality. By the time of the first laparoscopic cholecystectomies in the 1980s, the principles of endoscopy had been firmly established and most of its perennial problems—visual distortions, the privacy of an instrument restricted to a single viewer—resolved. Surgical atlases had provided one means for domesticating the unfamiliar visual field of early endoscopes, fibre-optics had produced clearer imaging, and television had allowed surgical teams to view operations collectively and in real-time, to record and share their procedures.⁵⁶ For the pioneers of the first LC operations, already skilled in laparoscopy, endoscopes had long ago demonstrated their diagnostic value, not to mention their surgical potential, across a range of specialisms.

The same was true for open cholecystectomy, regarded by the 1980s in North America as the ‘bread and butter’ procedure of general surgery.⁵⁷ The maturity of endoscopy and laparotomy gave surgeons a strong rationale for their experimental combination. Certainly this was the opinion of Douglas Olsen, co-worker of Eddie Reddick, the Nashville surgeon who was among the first to attempt laparoscopic cholecystectomy in the USA:

Since the techniques of laparoscopy and cholecystectomy by themselves were well accepted and the techniques worked well, it was our feeling that we could combine the two without going through extensive animal model testing. We further rationalized that since the patients who were going to undergo the

attempted laparoscopic cholecystectomy would otherwise require an open operation ... there was little to lose to initiate the procedure laparoscopically if we were quick to decide that we could not complete it safely though the scope and convert to an open cholecystectomy.⁵⁸

This passage raises two important issues. The first, noted already, is that the innovation of laparoscopic cholecystectomy was about the novel application of *established* techniques. It was not about altering the operative steps of cholecystectomy, let alone the principles of endoscopy. From the longer perspective of endoscopic history, the laparoscopic removal of the gallbladder was merely another application of an instrument with a widening spectrum of uses, another ‘natural by-product’ of an ancient curiosity.⁵⁹ Even before the efforts Mühe and Mouret, laparoscopic cholecystectomy had been on the horizon; its possibility was built on the cumulative events of decades, the slow mutation of endoscopy from an exploratory practice of internal medicine through a diagnostic tool of gynecology into a technology of widening surgical importance. Here was something akin to the ‘slow sequence’ of technical change flagged by a recent generation of historians to oppose the framework of invention studies, the ‘steady accretion of innumerable minor improvements and modifications’ that combine to reorient technologies along new lines.⁶⁰ The persistence of these steps and principles should underline a point made by historians of antisepsis and anaesthesia that claims to revolution are as much a matter of perspective, as much about retrospective decisions to *see* difference as they are about neutral reiterations of the facts.

A second issue concerns historical continuity: that in conjunction with the spread of MIS was a pronounced call to *preserve* the skills of open surgery, and also to integrate the two. Consider Jacques Perissat and his colleagues, who in 1990 insisted that ‘these new procedures must be established and evaluated by surgeons with vast expertise in the conventional surgical treatment. If there are difficulties, they can return to the traditional procedure without any risk for the patient’.⁶¹ In 1992, Kenneth Forde, second president of SAGES, made similar remarks:

Some of us have been concerned about whether the accomplished surgeon trained in traditional techniques can, should, or will adapt to minimal access surgery and at what price to both patient and surgeon. Some of us worry about how the still relevant basic open surgical techniques of yesteryear will be taught in the future so that the minimal access surgeon will be comfortable and competent in converting to open methods when necessary.⁶²

In recommendations to its members, SAGES called for the maintenance of existing skillsets and insisted that surgeons-in-training be versed equally in open and laparoscopic techniques. ‘The basic premise is that the surgeon must have the judgement, training, and capability of immediately proceeding to a traditional open abdominal procedure to complete an operation when circumstances so indicate’.⁶³

So while the analysis of revolution focuses purposefully on discontinuity, the technical maturity of endoscopy and classic laparotomy in many ways suggest an opposite story. Notable are the efforts to establish points of continuity between old surgeries and new. Consider Kurt Semm, commonly ranked among the greatest endoscopic pioneers of the twentieth century, who in describing his laparoscopic appendectomy of 1982 noted: ‘The instrument-set employed in this method permits the performance of all the usual classical operative steps’.⁶⁴ Many of Semm’s inventions were similarly conceived. His automatic insufflator, for example, aimed to replicate conditions of open surgery by maintaining the abdomen at a constant pressure.⁶⁵ This desire for replication was not specific to Semm. Even television—video laparoscopy—touted as the most significant departure from classic surgery, was later praised for rehabilitating certain of its features since once again ‘assistants ... could assist and anticipate surgical steps, and the surgeon again could work 2-handed, *just as in open surgery*’.⁶⁶

There was a general idea not only that surgeons should perform exactly parallel procedures endoscopically, but that their reasons for doing so should persist unchanged: ‘[T]he advent of laparoscopic cholecystectomy has not and must not change the indications for the surgical treatment of gallstones’, insisted Alfred Cuschieri, early champion of laparoscopic cholecystectomy and inventor of the ‘Dundee technique’: ‘In our enthusiasm to adopt this new technology, we must ensure that established and proven surgical principles and doctrine are not abused to the detriment of our patients’.⁶⁷ The most forceful statements to this effect, however, came from Philippe Mouret, who for several years had considered himself the pioneer of laparoscopic cholecystectomy. In 1991, near the height of the MIS revolution, Mouret declared bluntly that ‘laparoscopy must not be considered as the opposite of classic surgery. Indeed laparoscopy is *not* a different type of surgery; it is only another surgical means [which] can be used complementarily with classic surgery’. Mouret concluded his article by noting that again, ‘Laparoscopy is not an independent type of surgery, and its frontiers are those of conventional surgery, and more’.⁶⁸ In these quotations, the perception of disruptive technical change, the idea that an innovation *could* have perilous implications, was grounds for conserving established practices – if the stress on continuity had helped surgeons regain a lost market share, the rhetoric of a frenzied revolution would also prove useful (and, interestingly, to similar ends). This is why historical accounts by surgeons are valuable as primary as well as secondary source materials: in the case of MIS, they employed an image of discontinuous innovation which, by reflecting common anxieties about the efficacy and regulation of new surgical techniques, helped to preserve elements of the traditional approach, shaping the trajectory of the events they set out to describe.

Despite, however, the cultural work of the revolution and continuity narratives, neither was *merely* rhetorical. Philippe Mouret, for instance, did not assert overlaps between old surgery and new simply to gain a

monopoly on the endoscope. Rather, his remarks recall a conscious effort to establish points of continuity through the innovation process, to sustain key elements of the surgical approach (indications, the sequence of a procedure, the organisation of medical labour) while reconfiguring some of its practical aspects (touch, visualisation, the relationship of hands and eyes). If, as James Zetka maintains, surgeons had taken up the endoscope to confront the growing threat of internal medicine, they had done so to preserve a traditional market share, to protect a surgical claim on disease and to maintain an existing division of labour. Even as it transformed aspects of open surgery, MIS had been conceived of as a means to safeguard the surgical approach to disease and its treatment, as well as surgeons' standing in the medical profession.

It should not be surprising, then, that even surgical endoscopy's most brazen enthusiasts did not contemplate the wholesale surrender of open methods. While Wickham envisioned a place for open surgery in cases of trauma and reconstruction, Kenneth A. Forde, second president of SAGES, asked of his audience in the Gerald Marks Lecture: 'Is it not ... time to see how portions of the new technology can blend with some of the old?' He quoted Cuschieri on the matter, who foresaw a path of practical combination rather than technical displacement: 'The current divide between conventional open and endoscopic minimal access surgery will disappear as we adopt and implement the best of both options'.⁶⁹ The ideal of combining old with new was even emblazoned on the SAGES shield, crafted by Gerald Marks, who framed traditional surgical tools (hemostats and scalpel) with an endoscope circling the perimeter.⁷⁰

An over-emphasis on either continuity or revolution can miss other aspects of innovation; for example, geography. That is, the local variations in surgical practice, the persistent tinkering, minor revisions, and partial reinventions that characterise the spread of procedures from place to place, or—as important—the appreciation of innovation as an unfinished, uneven and open-ended process. It is with such questions in mind that the historian of medicine Sally Frampton has argued that innovations and surgical operations are inherently 'unstable, changing entities', reflected in the modifications and persistent variations in procedures as they proliferate, and in the shifting meanings they accrue.⁷¹ Considered in this mutable, unstable sense, the analysis of innovation widens beyond the 'moment' of technical revelation—Semm's appendectomy or Mühe's cholecystectomy—to encompass persistent local adaptations and shifting meanings crucial to the historical analysis of invention. Conceptually, the difference is between innovation as a singular, momentary event on the one hand and a collective, open-ended process on the other.⁷² In the case of MIS, the former approach is belied by 'schools' in laparoscopic cholecystectomy (the Bordeaux School, the Dundee technique⁷³), and by what Perissat referred to as the 'major differences' between the European and US methods, ranging from the position of patients and surgical teams to

specific visualisation techniques (for instance, intraoperative cholangiography for the visualisation of bioducts).⁷⁴ These shortcomings raise the question as to why discontinuity has become such a prevalent theme in the historiography of MIS. The next section will consider what interests and motivations lay behind the picture of a surgical revolution.

PATIENTS AND EVIDENCE

Like all so-called revolutions, the rise of MIS was not unanimously approved. Besides disagreement about the term itself, anxiety set in around the sporadic and unregulated adoption of an un-evidenced, non-standardised procedure by surgeons not trained in laparoscopy. These worries were compounded by the lack of agreement about what ‘proper training’ should involve.⁷⁵ The explosive character of change was a further bugbear, worse still the sense that surgeons were not leading the revolution. Rather, lured by the cosmetic advantages of small scars and the promise of a painless recovery, it was *patients* who exerted consumer pressure that forced surgeons into adopting laparoscopy, evidence regardless. ‘Patient demand’ has since become a staple phrase in the MIS story, especially in the US context where private practice dominates.⁷⁶

While there is little reason to doubt this story, it should be remembered that the image of a patient-driven revolution has been hewn from a *surgeon’s* perspective—and a North American surgeon’s perspective at that. In cases where public healthcare systems prevailed—as in the UK where access to healthcare is predominantly through the state-run National Health Service—the forces of patient consumerism are severely complicated, if not flatly diminished. As for private healthcare contexts, the claim that patients drove the revolution should at the least prompt curiosity about what factors drove patients, what sources informed them, and what resources were invested (where and by whom?) in the marketing of laparoscopic cholecystectomy and other endoscopic procedures. Pressed in interview to explain how patients came to know of laparoscopy, surgeons and executives cited direct-to-patient marketing by instrument manufacturers, highway billboard advertisements, poster displays, information hotlines, and the dissemination (by surgeons as well as family doctors) of medical literature among prospective candidates. Such responses are insightful for researchers. They suggest the ways in which ‘patient demand’ was itself solicited, how the need for a better surgery was defined and vigorously encouraged by professionals with vested interests as much as it was recklessly sought by patients with scant understanding. This in turn spotlights new areas for scholarly investigation: surgical advertising, medical-media relations, the medical-industrial complex,⁷⁷ profit motivation in private practice—a consortium that puts ‘patient demand’ into a web of wider constraints and influences, as well as alongside emergent

historiographies focused on patient agency and autonomy, and, perhaps most relevant of all, the emergence of the patient-as-consumer. According to Dubois and his colleagues, advocating LC in 1989, ‘Cosmetic advantages are evident and are important in young woman’; their article included a line-drawn illustration of a female abdomen indicating the entry points for an endoscope and other instruments, a distant cry from the large incisions of the classic laparotomy.⁷⁸ The extraordinary contrast would have been evident to professional readers, and doubtless made clear to prospective patients. Thinking in terms of gendered marketing is one way to approach the problem of patient demand in the history of MIS.

Another is to pay close attention to the context of claims for a patient revolution. Despite the enthusiasm of advocates like as John Wickham, surgeons often used the term ‘revolution’ in the same breath as words like ‘fanfare’, and ‘wildfire’, and others meant to insinuate an uncontrolled clamour towards therapeutic reform. ‘Revolution’ in these passages was mired in ambivalence, fraught with tensions about technical change, professional autonomy, and the nature of evidential standards in surgery relative to scientific medicine.⁷⁹ The prospect of a revolution unfolding ‘[d]espite the lack of scientific data comparing it [LC] with traditional open operations’ was troubling to many onlookers.⁸⁰ Often declarations of an ‘explosive’, ‘out-of-control’ situation—as common to interviews with surgeons as to their written recollections—presaged plans to reassert control; for example, through proposals for evidential validation of specific endoscopic procedures.⁸¹ There was, according to one study group, ‘unanimous agreement that a new treatment should be introduced in a manner that allows prompt and reliable evaluation of its efficacy and safety. The question is: how to do this promptly and reliably?’⁸² Behind this question lay a widespread discontent that this was a patient-led revolution yet shouldn’t be—it was not (indeed, was never) for patients alone to determine the fate of surgical innovations. Change must depend instead on professional assessment via established, collectively sanctioned evidential criteria.⁸³

But as surgeons liked to point out, in this context as in others, their craft was ill-fitted for the model of the double-blind randomised controlled trial (RCT), the emerging modern gold-standard of evidence-based medicine (EBM).⁸⁴ They raised various objections against the use of RCTs for the assessment of surgical practices. The skill needed for the operation was a first concern: ‘in contrast to medical trials, which are almost independent of any special skill, the results of surgical trials vary according to the skill and experience of the surgeon’.⁸⁵ Then came ethical concerns, particularly the unwillingness of surgeons to participate in trials when they were convinced (albeit by means of evidence whose status was in question) of the superiority of one intervention over others.⁸⁶

These objections were not new. Surgery had long been in conscious tension with evidential norms of medical science, as the historian David Jones explored in his detailed account of controversies around cardiac surgery in the mid- to late twentieth century.⁸⁷ Jones considered various positions in debates about surgical

evidence and RCTs, among them those of the US cardiologist David Spodick, who in comparing medical and surgical trials in the 1970s decried ‘a general double standard’ and ‘special mystique’ surrounding surgical evidence, what he called the ‘sharp cleavage between the criteria for acceptability of report of surgical and medical treatments’.⁸⁸ His remarks appeared in the SAGES’ Gerald Marks lecture of 1992, by which time it was becoming difficult for surgeons to ignore pressure to obtain some evidence in favour of the superiority of minimally invasive procedures.⁸⁹ Interesting for historians is how (some) pioneers of endoscopic surgery were at pains to reconcile their craft to evidential requirements of medical science, a question recently considered in detail in the most recent work on MIS by Cynthia Tang and Thomas Schlich (Canada), and Sally Frampton and Roger Kneebone (the UK).⁹⁰ The former focus on a series of RCTs conducted *after* the widespread uptake of laparoscopic cholecystectomy (and therefore to no discernible effect).⁹¹ Asked why they pushed for these trials despite LC’s global popularity, the surgeons responsible gave ambivalent answers: a quest for proof, a rejoinder to critics—beneath the deepening shadow of scientific medicine, *something* needed to be done. That both desire for and resistance to RCTs arose from a longer history of surgery’s reticent relation to medicine is among the central insights of the latest scholarship on MIS, which foregrounds the long-standing tensions between the two.

That these tensions *were* longstanding adds another layer to the critique of the revolution story: namely, that there was nothing novel about the incongruity between surgical and medical standards, about the lack of scientific evidence for laparoscopic cholecystectomy. If its speed and reach had been unusual, its disregard for evidence was anything but—LC was merely another innovation in a long line to evade emerging standards of scientific scrutiny (a point also discussed by Frampton and Kneebone). In a verdict that would both frustrate and vindicate the likes of David Spodick, the historians Thomas Schlich and Chris Crenner have recently maintained that ‘many innovations in surgery were first used in practice and only later justified by scientific research’.⁹² By normalising the historic inequality between surgery-in-particular and medicine-at-large, this historical context makes it less surprising that MIS was not subject to deeper questioning. At least in part, the revolution narrative was an effort to cast into relief and to quell the imbalance between surgery and medical science, a bid to harmonise MIS with new evidential standards of late twentieth century medicine, and therefore to redefine its practitioners. Whether and to what extent it achieved that aim will be an important question for future scholarship.

CONCLUSION

The present chapter has offered a selective, critical review of literature on the history of MIS, identifying key themes and approaches. With the exception of the most recent contributions in the history of medicine and anthropology, work to date has been characterised by an interest in innovation and pioneers, dominated by rival emphases on continuity and change, and restricted

geographically to events of North America and Europe, with a few key countries dominating the field: Germany, France, the USA, the UK. Many innovations have occurred since the dawn of MIS and the heyday of LC. The mediated visual and tactile sensations of endoscopic methods are now part-and-parcel of surgical residency training, and technological developments have continued in the remote and robotic surgeries.⁹³ The so-called ‘Lindbergh operation’ of 2001, in which surgeon Jacques Marescaux performed a tele-surgical laparoscopic cholecystectomy from New York on a patient located in Strasbourg, has (unsurprisingly) spurred fresh claims of revolution, and the dawn of the age of robotic surgery.

MIS remains of interest in the history of surgery. The large body of information produced by the surgeons provides historians with a rich, varied and still-growing trove of information to mine and re-evaluate. A preliminary task is to complicate the tidy sequence of technological progress favoured in much existing scholarship. There is also an opportunity to generate data, either through established methods of oral history (Tang and Schlich) or through experimental means such as historical re-enactment (Kneebone and Woods). One possibility is for historians to think less about inventions and more about technology-in-use; another to reconceptualise surgical innovation itself, to ask why claims to revolution and novelty occur when they do, and to unravel their broader implications. The payoffs of this research will extend beyond medical history, as current literature demonstrates. This interdisciplinary appeal is a major recommendation for taking MIS as a topic, as is its intersection with other themes in the history of surgery: material culture and instrumentation, for example, or the evolution of surgical space; visualisation and imaging too, the intractable problems of surgical evidence, as well as many other topics reviewed among the chapters of this handbook.

NOTES

1. I am indebted to Thomas Schlich for the invitation to contribute to this handbook, and for his support and guidance throughout the publication process. I would also like to thank Sally Frampton, Claire Jones, David Jones and Abigail Woods for constructive feedback on an earlier draft of this chapter. Finally, I am grateful to Annmarie Adams, Cynthia Tang and other members of the History of Surgery reading group at McGill University for insightful discussions about historiography and source materials.
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