Balakrishnan Kichu R. Nair
Editor

Geriatric Medicine

A Problem-Based Approach

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With love to my wife Usha Parvathy and
my daughters Narayani and Gayatri

Foreword

The specialty of geriatric medicine can trace its origins to London in the 1930s and to the pioneering work of the indomitable and extraordinary Dr Marjory Winsome Warren (1897–1960). When tasked with providing clinical supervision for the several hundred 'inmates' of an old workhouse which formed part of the West Middlesex County Hospital, Dr Warren took the revolutionary step of clinically assessing these people and amazed the medical world when she identified a range of clinical disorders which could be diagnosed and treated. In writing of her work and in inviting others to share in it, the specialty of geriatrics (from 'geron'—an elder) was born.

Following Dr Warren's untimely death in a road traffic accident, the torch for geriatric medicine was carried onwards by a raft of dedicated clinicians (not all of them doctors) who she had taught and inspired. Throughout the latter part of the twentieth century, scientific rigour was added to the art of geriatric medicine, and throughout the western world, the specialty gradually became recognised and even became mainstream. The acceptance of geriatric medicine as a clinical specialty was paralleled by a broader acceptance that sick elderly people were as entitled as any others in society to high-quality health and social care.

In the twenty-first century, the specialty of geriatric medicine continues to evolve. New challenges arise as do new ways of meeting such challenges; these evolving challenges and strategies form the central focus of this text. What, one wonders, would Marjorie Warren make of it all? In the first place, she would surely be familiar with much of what this modern text of geriatric medicine contains. The 'geriatric giants' (immobility, instability, incontinence, intellectual impairment) that were promoted by her acolyte and colleague Sir Bernard Isaacs in the 1960s feature prominently, though Dr Warren would have much to learn about new insights and novel diagnostic and therapeutic approaches to such long-recognised clinical problems.

With her pioneering spirit, she would probably be every bit as interested to read about 'new' clinical problems, paradigms and practices – of modern approaches to the management of such things as atrial fibrillation, depression, heart failure, osteoporosis and stroke – a condition in which she had a particular interest. She could only be fascinated to learn about such things as the concepts of frailty, the application of ethical principles to the challenges of old age and the relevance of advanced care directives to the specialty that she was instrumental in creating. She would surely understand and applaud the sections in the text on the development of better

ambulatory care and residential care services for elderly people and would be pleased to read of the expanding role of palliative care to the challenges of old age. In short, this text would have brought her up to date on the continuing evolution of the specialty of geriatric medicine, on the current challenges that impact on the health of older people and on the strategies that exist or are being developed to deal with these challenges. The text would assure her that the future of geriatric medicine lies in good hands.

Along with all of this, it is likely that Dr Warren would be greatly interested in the problem-based learning (PBL) approach taken in this text – a method of teaching and learning which was introduced into the health sciences some decades after her death. Being a practical person and a keen teacher, she would surely have appreciated an approach whereby each of the topics under discussion is presented and analysed in a specific clinical context, thus ensuring that the information provided is clinically relevant and that theoretical considerations have a practical application. Moreover, she would be pleased by the way in which PBL emphasises the primacy of the individual patient, a major consideration for Dr Warren as exemplified by the following quote which remains relevant today:

> 'in modern medical practice, suffering tends to be reduced to a mathematical equation. We speak of morbidity and mortality rates, incidence of disease, and survival time. Assessment of disease in these terms gives direction to further study and indicates its urgency. But there is a danger of mistaking a calculated solution for a remedy, forgetting that finally we are treating not a disease, but a person'.

Paul Finucane
Consultant Physician in Geriatric Medicine
and Foundation Dean
University of Limerick
Limerick, Ireland

Preface

'There is no wealth like knowledge, and no poverty like ignorance'.
— Buddha (c. 400–500 BC)

We live in a triumphant era of increasing numbers of older people around the globe, thanks to major advances in medicine and public health. Older adults comprise a population of heterogeneous people who need medical care that is tailored to each individual and supported by scientific knowledge. Healthcare providers all over the world are recognising the complexity and vulnerability of older adults, and many are seeking practical and up-to-date information. We hope you will be thrilled with this expertly written, evidence-based compendium of geriatric medicine.

The authors are experts in geriatric medicine from Australia, New Zealand, United States of America, Canada and India who were selected on the basis of their expertise and passion for their topics. Each chapter begins with a problem, discusses the issue and ends with how the problem can be sorted out. The challenges of multimorbidity are explored. It is common, for example, to have atrial fibrillation and dementia. Opportunities to intervene in multiple domains are highlighted and shown to promote wellness and recovery in numerous ways.

The book starts with the epidemiology of aging, followed by physiology, frailty and pharmacology. We then discuss care in varied settings for older patients, including acute hospital, ambulatory and residential care settings. Special sections address common issues like atrial fibrillation, osteoarthritis, systolic hypertension, diastolic dysfunction, dementia and behavioural disturbances in dementia. We draw attention to syndromes that are often under-diagnosed and under-treated such as delirium, falls and incontinence. Important themes such as ethics, palliative care and advance care planning are highlighted.

To treat older people, all healthcare providers need to have up-to-date knowledge about geriatric syndromes, medication effects and the interaction of multiple comorbidities. We hope this book provides a practical and user-friendly way of gaining knowledge and skills in geriatric medicine. We urge you to read the whole book to strengthen your ability to provide the best medical care possible to your older patients. We predict your personal satisfaction in caring for older adults will grow exponentially as you hone your expertise!

I would like to add a 'disclaimer' that the cases mentioned in the book are typical but not 'real' patients and any similarity would be coincidental.

I want to thank the authors for their cooperation and patience with me. I thank Elizabeth Cobbs in particular for her ongoing support and encouragement.

As Francis Peabody said, 'the secret of caring for the patient is caring for the patient'. This book is written for the caring doctors and students by caring professionals.

Newcastle, NSW, Australia
September 2016

Balakrishnan Kichu R. Nair

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About the Editor

Balakrishnan Kichu R. Nair, AM, MBBS, MD (Newcastle) is an internationally respected, award-winning physician in the field of geriatric medicine. He is passionate about medical education, innovation and leadership in medicine. His research has been published in numerous peer-reviewed journals. In recognition of his contributions to medical education, he was appointed a member of the Order of Australia in 2009. He is currently a Professor of medicine and Deputy Head of school at the University of Newcastle, Australia. Additionally, Professor Nair is a senior specialist and the Director of the Centre for Medical Professional Development with the Hunter New England Health.

Our Ageing World

1

Julie Byles

Key Points

- Many people around the world can expect to live well into older age.
- Increased life expectancy is one of greatest achievement of humanities, due to better infant survival, control of fertility and better healthcare throughout life.
- Older people make productive contributions to their families and communities.
- Older people's independence and their potential to contribute to their communities can be limited by preventable disease and disability and by lack of appropriate healthcare.
- Gender is an important determinant of functional capacity and well-being in older age.

1.1 Problem-Based Approach

"As we move through the twenty-first century, development and progress have brought improvements in the overall quality of life and health. With increasing life expectancy, people are living longer resulting in an ever-growing proportion of old people in the general population. This rapid population transition is occurring at a pace and magnitude that is well beyond the scope and capacities of most countries, particularly those in the developing part of the world. The challenges that a society that is ageing encounters are numerous and complex. The traditional norms and patterns of society are undergoing rapid changes, affecting the manner

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in which society had taken care of its older members. Longer life is associated with chronic diseases accompanied by long-term care and end-of-life care, factors that put increasing demands on the existing health and related social and economic-care services."

Poonam Khetrapal Singh [1]

1.2 Introduction

The world is getting older, with increasing proportions of the population aged over 60 years. According to the United Nations Population Division, there were over 900 million people aged 60 years or over in 2015. This number is expected to rise to 1.4 billion in 2030. By 2050, the number of people aged 60 years or older worldwide is expected to be greater than 1.8 billion. The 60 years and over age group will then represent around 21% of the population and will exceed the number of people aged 15 years or younger. The median age of the world's population will increase from 29.6 years in 2015 to 36.1 years in 2050 [2].

Older people are also living longer. Currently around 52% of men and 60% of women born 2000–2005 are expected to live to at least 80 years, and many will live well beyond this age. Global life expectancy is expected to reach 77 years by 2050 (83 years in more developed regions and 75 years in less-developed regions). Life expectancy at age 60 years is projected to increase from 20.2 years today to 23.2 years by 2050 [2].

This pace of ageing is unprecedented, with some of the youngest countries undergoing the fastest rates of population ageing. In this chapter we examine the pace and impact of population ageing in five countries which are undergoing rapid epidemiological and demographic transition. Figure 1.1 shows the percentage of the population aged 60 years or over for these five countries for 1980 and 2015 and projected to 2050. In 1980, India, China, Ghana and Brazil all had very young populations, compared to Italy and compared to the world. By 2015 the proportion of older people in China and Brazil had increased substantially, meeting or exceeding the global population proportion. This figure shows the rapid pace of ageing even in countries that were relatively young in 1980. Over the next few decades, the pace of ageing in these countries is set to accelerate with China's population projected to grow by 71% over the period 2015–2030 [3]. The proportion of older people in India is less than in China, Brazil or Italy, but the pace of ageing in India is rapid with the number of older persons which is projected to grow by 64% between 2015 and 2030. Italy represents a country that experienced an earlier demographic transition but which is still experiencing an extraordinary pace of ageing.

Table 1.1 shows the change in median age for the world and for the five countries: India, China, Brazil, Italy and Ghana. Median age is another way of measuring population ageing. It should be noted that even though a median age of 30 may seem young, this figure reflects a large proportion people in the older age brackets.

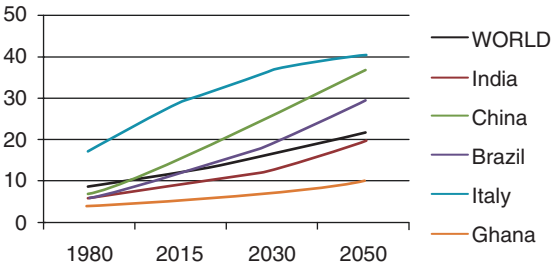

Fig. 1.1 Percentage of the population aged 60 years or over, 2015–2050. *Source:* UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

Table 1.1 Median age of the world population and selected countries, 1980–2050

	1980	2015	2030	2050
World	22.5	29.6	33.1	36.1
India	20.2	26.6	31.2	37.3
China	21.7	37.0	43.2	49.6
Brazil	20.2	31.3	37.4	44.8
Italy	34.1	45.9	50.8	51.7
Ghana	17.0	20.6	22.7	26.8

Source: UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

1.3 Determinants of Population Ageing

Population ageing is the outcome of successful reductions in fertility, gains in infant and child survival and more recent gains in life expectancy at older ages. Fertility rates have declined dramatically across the world (see Fig. 1.2). At least 50% the world's population live in a region in which fertility rates are below replacement level of 2.1 children per adult woman [4]. In India, fertility rates have fallen from 5.4 children per woman in 1970–1975 to 2.5 children per woman in 2015.

In association with declines in fertility and corresponding to better child survival, human life expectancy has also increased dramatically over the twentieth century [5]. More recent gains in life expectancy have been attributed to better survival in adult life, with increases in life expectancy at age 60 and at age 80 years [6]. These increases in life expectancy at older ages further change the structure of the oldest age groups.

In some populations, international migration has also had a role in changing age (and gender) distributions, but generally migration has had less of an impact than reductions in fertility and mortality rates [7].

1.3.1 Life Expectancy

Life expectancy is the average number of additional years that a person at a given age could expect to live, providing age-specific mortality levels remain constant. Table 1.2 contrasts life expectancy at birth, at age 60 and at age 80 for males and females in five different countries. In 2015, the average life

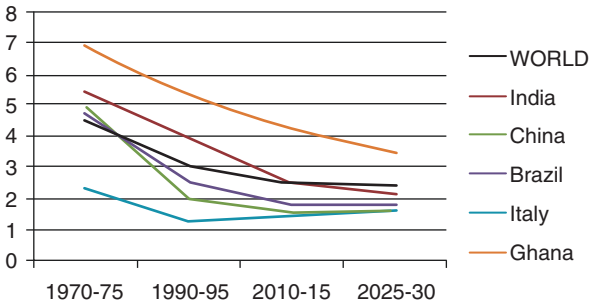

Fig. 1.2 Fertility rates 1970–1975 to 2025–2030. *Source:* UN Population Division 2015. http://www.un.org/en/development/desa/population/publications/pdf/fertility/worldfertility-patterns-2015.pdf

Table 1.2 Life expectancy at birth and at age 60 years

	At birth		At age 60		At age 80	
	2010–2015	2045–2050	2010–2015	2045–2050	2010–2015	2045–2050
World						
Male	68.3	75.1	18.7	21.9	7.3	8.9
Female	72.7	79.1	21.5	24.4	8.5	10.2
India						
Male	66.1	74.1	17.0	19.8	6.8	7.9
Female	68.9	77.8	18.4	21.9	7.3	8.6
China						
Male	74.0	81.7	18.3	23.7	6.6	9.0
Female	77.0	83.4	20.6	25.4	7.4	10.0
Brazil						
Male	70.3	79.7	19.4	23.9	7.4	9.2
Female	77.9	84.5	23.0	27.2	9.1	11.4
Italy						
Male	80.3	85.7	23.0	27.4	8.8	11.2
Female	85.2	90.3	27.0	31.4	10.7	13.8
Ghana						
Male	60.1	65.2	15.0	16.0	4.6	5.0
Female	62.0	68.4	16.0	17.3	4.8	5.3

Source: UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

expectancy for the world population was 68.3 years for men and 72.7 years for women. People who have survived childhood and who achieve "old age" have even greater life expectancies. People who live to age 60 have a further life expectancy of around 20 years, and people who live to age 80 have a further life expectancy of around 8 years. In India in 2010–2015, a male baby has a life expectancy of 66.1 years, but an adult male at age 60 has a life expectancy of another 17 years (total 77 years), and an adult male at age 80 has on average another 6.8 years (total 86.8). Further because this is an average, many 80-year-olds will live well beyond this age. Life expectancies at all ages are expected to increase over the coming decades.

The biggest influences on life expectancy have been reductions in child and infant mortality. In more recent years, there have been improvements in adult life expectancy in a number of countries, largely due to reduction in smoking and better treatments for cardiovascular disease [9]. However increases in life expectancy have not been uniform across the world. HIV/AIDS has been associated with declines in life expectancy in regions such as Sub-Saharan Africa [9].

Within-country differences in life expectancy are observed according to gender, socioeconomic disadvantage, area of residence, occupation and cultural groups. Women have a longer life expectancy than men, both at birth and at 60 years. Globally, women's life expectancy for the period 2010–2015 was 4.5 years longer than men's [3]. These gender differences in life expectancy are most marked in the European Region and the Americas, where life expectancy is generally high and where women's risk of maternal mortality is low. Differences in life expectancy are also particularly high in countries where men face higher health risks due to conflict and violence and due to unhealthy behaviours such as smoking and excess alcohol consumption [10].

Indigenous people tend to have lower life expectancies. Australian Aboriginal and Torres Strait Islander people have a life expectancy approximately 10 years less than that of the overall Australian population [11]. In Canada, life expectancy at age 25 is also shorter among men reporting indigenous ancestry, with remaining life expectancy at age 25 is estimated at 46.9 years for registered Indians, 48.1 years for non-status Indians and 48.5 years for Métis [12]. Socioeconomic status also has a major effect on life expectancy. In Canada, men aged 25 years have a remaining life expectancy of 55.3 years if they are in the highest income quintile, compared with 48.2 years if they are in the lowest quintile [12].

Another way of looking at life expectancy is to examine the absolute risk of death at different ages. Dobson et al. [13] examined the average risk of death for older men and women in Australia. For a man aged 71–73 years, the probability of dying in the next 10 years was 19% if he had body mass index in the healthy range and was physically active, non-smoker with some alcohol consumption. In contrast, the probability of dying in the next 10 years was 29% if he was obese, physically inactive, smoked and did not drink alcohol. Corresponding probabilities for women were 10% and 18%. The absolute risk charts are available online at http://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-12-669.

According to the Global Burden of Disease Study [9], the probability of death between age 50 years and age 75 years ranges from 10.3% for women in Andorra to 76.3% for women in Lesotho. Women in India had around 45% probability of dying between the ages of 50 and 75 years.

1.4 Demographic and Epidemiological Transitions

Population ageing and increases in life expectancy are accompanied by changes in patterns of prevalent and incident diseases. As populations age, countries undergo major transitions in the main causes of illness and burden of disease, with increasing burden of non-communicable disease. According to the Global Burden of Disease

Study 2013, almost 65% of deaths are due to non-communicable disease. Many of these diseases are most common at older ages. However, not all of the change in disease profile is due to ageing. Many countries are also experiencing massive economic development and increasing urbanization, along with substantial changes to lifestyle and increasing prevalence of risk factors including unhealthy diet, physical inactivity, obesity, hypertension and tobacco use [14]. Such epidemiological trends have been observed in India, China, Latin America and in parts of Africa [15]. For instance, it is estimated that nearly 15% of the global burden of diabetes is accounted for by 35 million people with diabetes in India [16]. Where people live in poverty, the onset of non-communicable diseases begins to occur at earlier ages with a pattern of "post-transitional illnesses in pre-transitional circumstances". For these people, chronic disease will dominate their adult lives with likely very high rates of disability at older ages [17]. In addition to the rise of non-communicable disease, many rapidly ageing countries continue to experience high levels of infectious diseases including childhood infections, HIV/AIDS and high infant and maternal mortality rates [15].

Table 1.3 shows the most common causes of death [18]. Globally, the most common causes of death are cardiovascular diseases, cancers and chronic obstructive pulmonary disease.

Table 1.3 Twenty most common causes of death **(000 s)**

Cause	Deaths (000s)	% Deaths	Deaths per 100,000 population
All causes	55,859	100.0	789.5
Ischaemic heart disease	7356	13.2	104.0
Stroke	6671	11.9	94.3
Chronic obstructive pulmonary disease	3104	5.6	43.9
Lower respiratory infections	3052	5.5	43.1
Trachea, bronchus, lung cancers	1600	2.9	22.6
HIV/AIDS	1534	2.8	21.7
Diarrhoeal diseases	1498	2.7	21.2
Diabetes mellitus	1497	2.7	21.2
Road injury	1255	2.3	17.7
Hypertensive heart disease	1141	2.0	16.1
Preterm birth complications	1135	2.0	16.0
Cirrhosis of the liver	1021	1.8	14.4
Tuberculosis	935	1.7	13.2
Kidney diseases	864	1.6	12.2
Self-harm	804	1.4	11.4
Birth asphyxia and birth trauma	744	1.3	10.5
Liver cancer	740	1.3	10.5
Stomach cancer	733	1.3	10.4
Colon and rectum cancers	724	1.3	10.2
Alzheimer's disease and other dementias	701	1.3	9.9

Source: World Health Organization. GLOBAL HEALTH ESTIMATES 2014
Summary tables: deaths by cause, age and sex, by WHO region, 2000–2012. http://www.who.int/healthinfo/global_burden_disease/estimates/en/index2.html

Cardiovascular causes of death include mostly ischemic heart disease and cerebrovascular disease, which are diseases of older adults. Deaths from neuropsychiatric conditions are mostly due to Alzheimer and other dementias. The majority of accidental deaths among people aged 65 years or over are due to falls [19].

1.5 Demographic Fitness and Healthy Life Expectancy

While much attention has been paid to the numbers of older people, what really matters is their fitness. While frail and dependent older people pose a challenge to societies to provide sufficient support and care, healthy active older people are an asset and a strength for their communities.

As well as adding years to life, it is also important to add life to years [20] (JF Kennedy).

Health is not merely the absence of disease but a complete state of well-being. Health involves having the capacities to function across many domains including hearing and seeing, moving around, cognitive abilities, calmness and happiness. These functions depend not only on the persons' own intrinsic capabilities but also the extent to which their physical and social environments support or impede them.

Older people's capabilities are often measured in terms of activities of daily living (ADL) and instrumental activities of daily living (IADL). ADLs are basic functions such as mobility, bathing and toileting and being able to eat. IADLs include higher levels of function such as shopping and cooking, housekeeping and using transport. Disability on ADL and IADL increases with age and is greater in women than in men. Age-associated decline in ADL and IADL is greatest in lower-income than higher-income countries. Also, within high-income countries, the age-related decline in health is much steeper in the poorest quintiles as compared to the richest section of the population with the health of older adults in the poorest quintiles at least one decade behind the richest quintile. In fact, the health of the poorest quintile of the higher-income countries is similar to the health of the upper income sector of lower-income countries. Similarly, people with the least education have worse health, with lower scores for mobility, self-care, pain, cognition, interpersonal activity and vision [17].

Healthy life expectancy (or health-adjusted life expectancy—HALE) estimates life expectancy with an adjustment for time spent with a disability and/or other impairment to good health (Table 1.4).

Comparing estimations of healthy life expectancy and life expectancy tells us whether extra years of life are being spent in poor or good health. If healthy life expectancy increases relative to life expectancy, then people will spend a greater proportion of their life in good health. This scenario is known as "compression of morbidity". Compression of morbidity may be prevailing in some populations where there is evidence that the prevalence of disability at older ages may be decreasing, but other studies find an increase in disability [21].

Conversely, if fatal illnesses are reduced (such as acute myocardial infarction and some cancers), but the prevalence of non-fatal conditions (such as stroke, arthritis, falls, dementia) and the related disability increases, then there is "expansion of morbidity". From 1990 to 2010, global healthy life expectancy increased more

Table 1.4 Health-adjusted life expectancy at birth and at 50 years, for men and women, selected countries, 2010

	HALE at birth, 2010 (years)		HALE at age 50, 2010 (years)	
Country	Men	Women	Men	Women
Brazil	61.1	66.6	21.3	24.5
China	65.5	70.4	22.4	26.2
France	67.0	71.9	23.7	28.1
Ghana	54.5	56.1	19.5	20.7
India	54.9	57.7	17.8	20.1
Japan	70.6	75.5	25.6	30.4
Mexico	64.7	69.1	23.1	25.7
Russia	55.4	64.5	16.6	22.4
South Africa	49.1	52.7	18.7	22.3
United Kingdom	67.1	70.1	23.8	26.4
United States of America	66.2	69.5	23.3	26.0

Source: Adapted from Salomon JA, Wang H, Freeman MK, Vos T, Flaxman AD, Lopez AD, et al. Healthy life expectancy for 187 countries, 1990–2010: a systematic analysis for the Global Burden Disease Study, 2010. Lancet. 2012 Dec 15:380(9859): 2144–62; and the Supplementary appendix to Salomon et al. 2012; Table 2

slowly than life expectancy. At age 50 years, each year increase in life expectancy was accompanied by only 0.75 years of healthy life expectancy for men and 0.77 years for women [22].

Even if the prevalence of disability is increasing as populations age, there is still some good news. It appears that while the prevalence of mild disability is increasing, rates of severe disability are decreasing [23]. Many older adults with mild levels of disability can be supported and enabled to continue to function and participate in their communities and achieve a high quality of life.

1.6 Gender and Ageing

There are more older women in the world than older men. In 2015 there were 86 men for every 100 women aged 60 years and over and 63 men for every 100 women aged 80 years and over [2]. As already noted, women tend to live longer than men, who tend to have earlier onset of some common chronic conditions such as coronary artery disease. Paradoxically, while women live longer, they also experience higher rates of frailty and functional disability. Older women report a higher prevalence of arthritis, osteoporosis, asthma, depression and cognitive loss. These differences partly explain women's higher rates of disability, as men tend to have higher rates of fatal diseases at earlier ages of onset, and women experience higher rates of non-fatal but disabling diseases. Compared to men, women also tend to have higher levels of psychological distress at older ages; however, men have higher rates of substance abuse, antisocial behaviour and suicide.

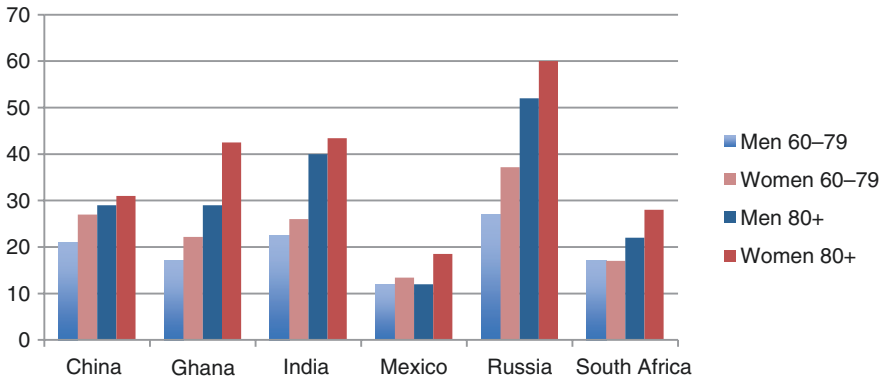

Fig. 1.3 Percentage of men and women with bad or very bad self-rated health, SAGE countries. Note: Small numbers in the 80+ years age group may lead to imprecise estimates. *Source:* WHO Multi-country Studies Data Archive [Internet]. Study on Global AGEing and Adult Health (SAGE), Wave 1 [cited 2015 March 22]. Available from: http://apps.who.int/healthinfo/systems/surveydata/index.php/catalog/sage

An analysis of data from 57 countries in the World Health Survey 2002–2004 also found that women's health was significantly worse than men's [24]. Data from the Study on Global AGEing and Adult Health (SAGE) in six countries—China, Ghana, India, Mexico, Russia and South Africa – also shows differences in self-rated health for men and women (Fig. 1.3). For each age group (60–79 and 80 years and over), women are more likely to report poor (bad or very bad) self-rated health.

These gender differences in disease burden between men and women are changing. For instance, significant advances in preventing deaths from cardiovascular disease among men have contributed to increases in their life expectancy. On the other hand, some fatal illnesses such as lung cancer are increasing among women, while they are decreasing among men.

1.7 Work and Other Community Participation

1.7.1 Dependency Ratios

Dependency ratios are another population metric that is potentially useful to compare the size of the "working" adult population to the size of the population that might be dependent on that workforce. The dependency ratio is expressed as the number of people aged less than 15 years (child) and the number of people aged 65 years or over (old age) for every 100 people in the population. The child and old-age dependency ratios are shown in Table 1.5.

Population ageing can sometimes reduce the total dependency ratio because there are fewer dependent children although this effect is eventually overtaken by an increase in the population aged 65 years and over (see Fig. 1.4). However, it should be noted that not all people aged 15–64 are "independent" and not all people over the

Table 1.5 Old-age dependency ratio per 100 persons aged 15–64

	1980	2015	2030	2050
World	9.9	12.6	18.1	25.6
India	6.4	8.6	12.5	20.5
China	7.6	13.0	25.3	46.7
Brazil	6.4	11.3	19.9	36.6
Italy	20.6	35.1	48.6	67.6
Ghana	5.0	5.9	6.5	9.8

Source: UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

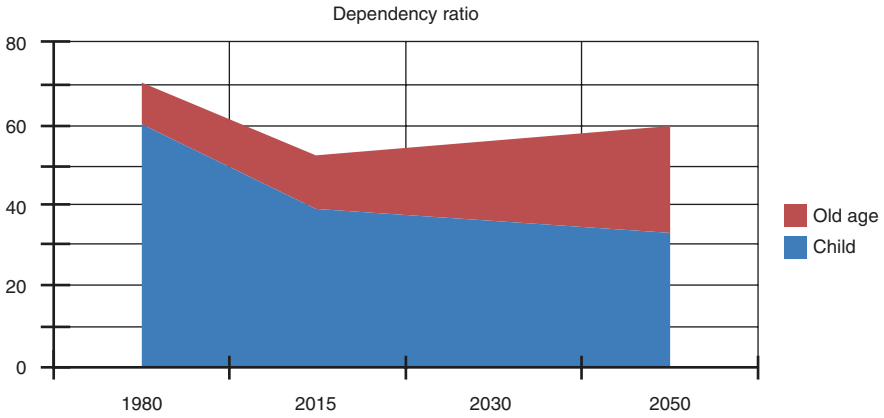

Fig. 1.4 Dependency ratio per 100 persons aged 15–64 (world). *Source:* UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

age of 64 years are "dependent". In fact, most people in this older age group have few limitations on activities, most contribute to their communities and economies and many are in paid work and may be the main breadwinner for their families.

1.7.2 Workforce Participation

In most countries, older people continue to participate in the paid workforce at relatively high rates well beyond age 65, as well as making major contributions in terms of volunteer work, childcare, aged care and contributions to heritage and culture. However the range of workforce participation varies greatly from country to country (see Table 1.6) and according to socioeconomic factors within the country. For instance, older people in rural areas will have higher workforce participation than people in urban areas.

Older people should also be recognized for their unpaid work and contributions:

Table 1.6 Labour force participation at aged 65 years and over (2015)

World	World	India	China	Brazil	Ghana	Italy
All	21.5	26.1	21.9	22.9	50.2	4.7
Males	30.3	43.2	28.2	33.8	59.4	7.5
Females	14.5	11.4	16.1	14.5	42.5	2.7

Source: UN Population Division 2015. http://esa.un.org/unpd/popdev/Profilesofageing2015/index.html

- Much of the care of older people is provided by older people.
- They make valuable contributions to their communities by providing paid and volunteer work and caring for family members.
- They provide education to future generations and have important leadership roles.
- They contribute to food production and domestic life.

Older people are also valuable sources of historical, spiritual and cultural knowledge, traditions and language and can also provide important role models and expert knowledge for younger generations.

1.8 Responding to Demographic and Epidemiological Change

Longer life expectancy at age 60 has great impact on health services and social structures, requiring radical changes to how people learn, work and care for each other across their lives. Consequently, many countries are now seeking policy responses and taking action to better provide for the health and social needs of older people and to promote healthier, more active and independent older age. The WHO Regional Office for South-East Asia framework for healthy ageing (2013–2018) [25] and WHO Western Pacific regional framework for action on ageing and health (2014–2019) [26] have been developed to guide such responses to population ageing. Both frameworks emphasize a life course approach to the prevention of disease and the importance of lifestyle and environmental factors in maintaining health and well-being for older people.

Both regional frameworks also emphasize the need to reorient health systems for older people, with an emphasis on primary care and service integration. Most health systems are designed to treat single acute diseases; however, the greatest burden of illness is from chronic conditions, which are frequently comorbid among older people. Effective healthcare of older people requires integration of healthcare and social services to meet the multiple needs of the older person and their carers, within their social context.

Other key areas for action on healthy ageing include creating age-friendly environments for older people—to promote health and enable their ongoing participation—and developing of systems of long-term care, to help people maintain

functional ability, to support families, to care for people who cannot care for themselves and to ensure dignity and well-being [27].

Many opportunities exist to encourage optimal health and participation by older people and to maximize the potential for future generations to age well. Health services have a very important role to play in preventing disability and providing effective management for comorbid chronic conditions. However the response to population ageing must also go beyond concerns about health, disability and the need for care. Population ageing also has important social, economic, political and cultural implications with ageing representing as much an opportunity as a threat and a triumph rather than a disaster. Older people are a population of survivors who make significant contributions to their families and communities, and they are a significant social and economic resource.

Older peoples' continued participation in society is essential if countries are to meet the challenge of population ageing and reap the demographic dividend. While longer life expectancy provides opportunities for people to continue to participate and contribute to society in older age, healthy ageing is the key for that to happen. We also need to balance the rights and needs of older people to work and to contribute to their communities against their rights and needs for care if they grow frail in their older age.

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Physiology of Ageing

2

William Browne and Balakrishnan Kichu R. Nair

Key Points

- Physiological ageing is a complex process of progressive reduction in function that occurs in all organ systems. This process may be summarized in the expression "homeostenosis".
- Processes influencing ageing include gene variations and differences in expression and environmental factors. The interplay between these elements is not well understood.
- Pathological processes have a major impact on the rate and character of organ changes with age that may not be readily distinguished from "physiological ageing".
- Tissues in all organ systems undergo changes with age including alterations in connective tissue makeup, cell numbers and neurohormonal signalling manifesting as reduced function.
- Understanding the typical physiological changes of ageing improves a clinician's ability to provide care to older patients.

Case Study

Jack, a 92-year-old man, presents to his primary care provider following a brief hospitalization. Jack is a retired soldier and enjoyed an active life until recent years. He lives alone in a two storey home which he previously shared with his late wife. Jack has two adult children. His daughter lives locally with her family

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and his son lives overseas. Today he walks slowly from the waiting room with the aid of a cane. He reports having had an unprovoked fall during the night, following which he presented by ambulance to the local emergency department for care. After several hours he was discharged home with advice to attend your clinic for follow-up. There is a superficial skin tear on his forearm that has been dressed with butterfly closures. He also has a hematoma over his left hip and an abrasion to his ankle. The discharge letter written by the emergency physician describes Jack as being vague during his presentation.

Jack's past health problems include hypertension, type II diabetes mellitus which has been managed by diet and constipation. His current medications include metformin, perindopril, amlodipine and aspirin.

On assessment today he is orientated to place and person, but was unsure of the date or day of the week. He was unable to recall three items at 5 min. His gait is slow but steady and he uses a single point stick for balance. Jack has difficulty getting in and out of your office chair and looks unsteady when turning. Jack's blood sugar was 14 on the clinic glucometer.

Jack's primary care provider was concerned about both the risk of further falls and by what seemed to be a decline in both mobility and cognition.

2.1 Ageing as a Process

Age and disease are closely associated phenomena—in many places the greater proportion of patients seeking the care of a physician are older people. Consequently in both outpatient and inpatient settings, patients resembling Jack are extremely common. Because older people have predictable and progressive changes in diverse physiological processes, understanding these changes is valuable as a means to improve both patient care and outcomes. Such an understanding is invaluable when seeking to ensure safe care. Geriatric medicine refers to the medical care of people in whom the parameters of typical organ function are likely to be different and the ability to compensate for disturbances reduced, when they are compared with those usually seen in the young. Predicting the challenges ahead for the care of a patient like Jack can guide interventions, such as fall reduction, screening, vaccination and prescribing (Fig. 2.1).

2.1.1 Ageing Versus Disease

When discussing the notion of "normal ageing" or "physiological ageing", one generally refers to the process of change that reflects alteration of organ structure and function with time alone and in the absence of supervening disease processes. This is referred to by some authors as primary ageing. Secondary ageing then refers to those aspects of the aged state that are attributable to disease. Disease-free individuals with the purely ageing-related changes suggested by the concept of primary ageing do not, and effectively cannot, in practice exist. Further, many changes in organs with ageing are arbitrarily defined as a disease when they progress to a point where they are recognizable clinically. Distinguishing between the

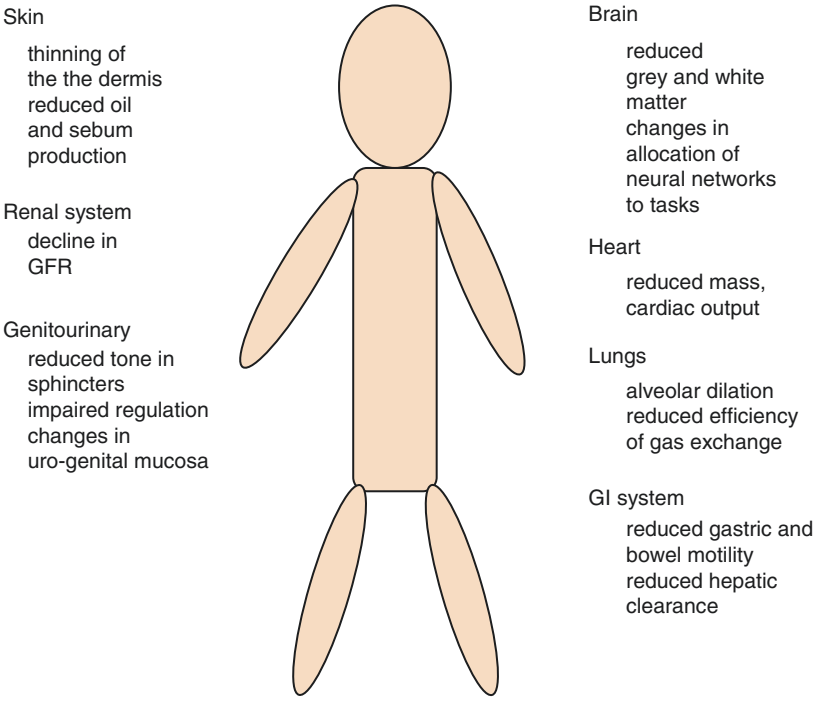

Fig. 2.1 Summary of ageing changes in selected systems

effects of one of these degenerative diseases and "physiological ageing/primary ageing" becomes one of the preferred definitions in many cases.

2.1.2 The Impact of Ageing on Medical Care

Changes in the susceptibility of individuals to disease, as well as alterations in the way older people cope with metabolic disturbance, pathology and surgical or pharmacologic treatments have led to the discipline of geriatric medicine. Changes in physiology with age therefore will be built upon throughout the entirety of this text.

The distinct physiology of ageing can be summarized in the word "homeostenosis". Coined by Walter Cannon, the influential American physiologist, this refers to a progressive loss of physiological reserve [1].

2.1.3 Why Do We Age?

Ageing represents cumulative changes in multiple organ systems. Rather than being a single process, the term is best thought of a reference to the net effects of accumulated degeneration in cells and tissues. A search for mechanisms that underlie ageing has been a focus of some interest in recent decades, and aspects of the biochemical and cellular processes which drive ageing have become somewhat better understood.

While there is no doubt all people experience ageing, there is a marked variability in the apparent pace of this process. This variability contributes to the wide range of lifespans observed across populations and suggests that at least some aspects of the physiological changes of ageing are influenced by an individual's environmental exposures and peculiar genetic makeup.

2.1.3.1 Caloric Restriction and Other Interventions Known to Influence Ageing

Early insights into the potential for certain environmental factors to influence ageing derived from the effects of caloric restriction in rodents and other species in the laboratory [2]. In such studies, animals fed lower calorie diets compared to animals allowed to feed "ad libitum" exhibited longer total lifespans.

Calorie restriction is certainly associated with physiological adaptations including an altered metabolic rate. Sirtuin gene expression is influenced by caloric restriction and may in part be responsible for some aspects of altered physiological activity identified in calorie-restricted animals. While efforts have been made to replicate the effects of caloric restriction observed in the laboratory in humans, the long lifespan of our species and the difficulty of maintaining dietary interventions over long periods remain formidable obstacles to such clinical studies. At best surrogate markers of the effects of ageing are employed.

While the benefits and risks of caloric restriction in humans are unknown, there is compelling evidence for the adverse effects of malnutrition, which remains a major clinical concern worldwide and is prevalent even in developed countries among older people.

2.1.4 Cellular Processes and Ageing

2.1.4.1 Genetic Elements

Genes influence both lifespan and ageing. There is intriguing evidence that certain genes influence cellular senescence, a component of ageing, in many organisms and presumably in humans.

Rare genetic disorders described in humans suggest a prematurely aged state can be caused by mutations of specific genes, a group of disorders referred to as progeroid syndromes. Werner's syndrome and Hutchinson-Gilford syndrome represent two examples of this unusual group of disorders. While these conditions are intriguing, whether they truly represent an acceleration of physiological ageing or merely resemble it remains unclear.

A number of mutations are associated with extended lifespans in laboratory models. Among the most studied of such genes are the previously mentioned sirtuins [3]. Originally identified in brewer's yeast, these genes are now thought relevant to the process of ageing in many species. Sirtuins have been linked to ageing-related changes in the cardiovascular system [3]. Induction of sirtuin gene expression in response to environmental stressors seems to trigger metabolic and cell division changes in cells that are associated with longer usual lifespans in some species.

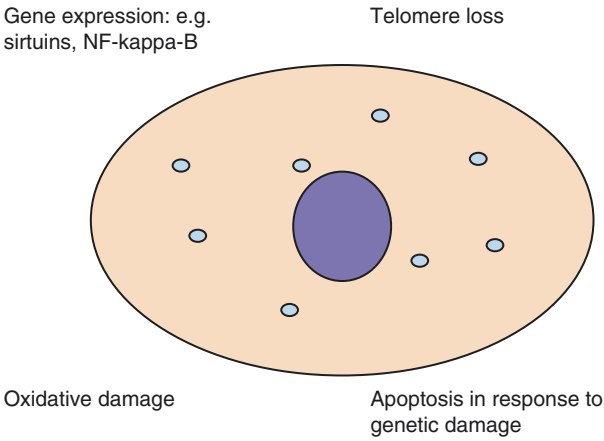

Fig. 2.2 Cellular processes influencing ageing

NF-kappa B influences gene expression both in inflammation and during ageing [4]. This gene may therefore be included among the "ageing" genes, and its expression presumably regulates some aspects of ageing physiology.

The complex relationship between an individual's genetic code and the development of aged characteristics is clearly extremely complicated. To add to the complexity, it has recently been observed that epigenetic factors—that is, changes in the way DNA is regulated which are either somatotopically acquired or transgenerationally inherited and do not rely on DNA sequence—have been suggested to influence some aspects of the physiology of ageing [5].

2.1.4.2 Telomeres and Senescence

Cellular senescence refers to a response by dividing cells to stress. Activation of this state permanently prevents further cellular division and can be triggered by several different assaults on the cell, including telomere shortening and DNA damage [6].

The term telomere refers to sequences of DNA at the ends of chromosomes that progressively shorten with somatic cell division. Eventually this process prevents further divisions by inducing cellular senescence, creating a limit to the number of times somatic cells can divide—the Hayflick limit. This limit is presumed to be a component of ageing, though it is clearly only one factor of many [7] (Fig. 2.2).

2.2 Ageing in Individual Systems

2.2.1 Cardiovascular System

Ageing represents the most important risk factor for diseases of the cardiovascular system. Changes in the cardiovascular system contribute to reductions in exercise tolerance and greater susceptibility to disease. Measurement of "normal function" across the lifespan, as in other aspects of ageing physiology, is hard to distinguish from the effects of clinical and subclinical disease.

Changes may be grouped in the following general categories: structural disease, disorders of function and the presence of disease more prevalent with ageing [8].

With ageing, there is an increase in the size of cardiac myocytes and, due to this, an increase in the relative cardiac wall thickness [9]. At the same time, the loss of numbers of cardiac myocytes results in reduced heart mass. Cardiac hypertrophy is therefore not an invariable result of physiological ageing [10]. As discussed earlier in this chapter, the effects of ageing on the heart and vascular system are influenced to some degree by the effect of sirtuin gene expression.

2.2.2 Respiratory System

Thoracic structural changes with ageing are associated with reductions in lung function. This includes changes in the ribs, spine and musculature. Wall compliance declines progressively in later life, presumably related to calcification of chondral rib insertion and changes in vertebral height. Kyphosis with ageing-related osteoporosis can cause reductions in FVC and FEV1 and an associated increase in AP diameter which effectively weakens the diaphragm.

Reduced gas exchange and increased stiffness of the lung both impact respiratory reserve, which declines progressively as an individual ages. Such changes may be readily demonstrated by use of serial spirometry. Changes in advanced age in the pulmonary parenchyma include alveolar dilatation which reflects changes in connective tissue composition [11].

There is a predictable reduction in lung elasticity with ageing which has consequences for lung function. The alteration seems to relate more to cross-links between collagen and elastin rather than the loss of such tissue from the lungs. The change in connective tissue arrangement produces dilation of the alveoli and the ducts producing a state that resembles emphysema and which is sometimes referred to by clinicians as "senile emphysema". The production and function of surfactant do not seem to alter greatly with age [11].

Ageing-related changes in the properties of skeletal muscle cells, altering myosin production, patterns of fibre type and myocyte numbers all potentially contribute to reduced respiratory function which manifests as reductions in the strength of diaphragmatic contractions.

Disturbance of respiratory function during sleep is a particular problem and often is associated with pathological consequences.

2.2.3 Renal and Urological Systems

The urological system undergoes changes in structure and function with ageing that are expanded in the incontinence chapter of this text.

There is a reduction in the size of the kidney and number of glomeruli with ageing. As in other organs, the changes of physiological ageing are hard to distinguish from those of disease. Hypertension and even elevation of blood pressure in the

normal range are associated with a greater rate of reduction in renal function [12]. Whether a fall in GFR is the normal physiological outcome of ageing or not remains a matter of debate. Renal blood flow in response to renal vasodilatation is reduced with healthy ageing [13]. Because loss of renal function is to some extent predictable by chronological age, this measure is usually incorporated into calculations estimating the glomerular filtration rate, such as the Cockroft-Gault and MDRD formulae.

Voiding difficulty is a common concern among older patients. Advancing age is associated with diminution of bladder capacity. There is an increase in the frequency of detrusor contractions. Despite this the effective expulsion urine falls with age so that the post-void residual increases. Urine flow rate decreases progressively with ageing. There is a detectable increase in neurotransmitter sensitivity in the bladder, accounting for the relatively high rate of adverse effects on bladder function observed with the use of medications acting on neurotransmitter pathways such as cholinergic drugs. There is a reduction in urethral pressure. Bladder ischemia may be an important factor in detrusor function change in some older people. There is fibrosis of the bladder wall which may be a consequence of ischemia. The bladder wall becomes thinner and the amount of muscle it contains diminishes.

The internal and external urethral sphincters are important for maintaining urinary continence. These structures are innervated by the sympathetic and parasympathetic nervous systems in the case of the internal sphincter and predominantly by spinal motor neurones in the external sphincter. Damage or deterioration of these control mechanisms in an older person is one factor resulting in greater risk of incontinence.

In men change in the size of the prostate with ageing frequently results in dysfunction of the lower urinary tract. Most men experience a benign increase in the size of the prostate with ageing which often results in symptoms of urinary retention and incontinence.

Antidiuretic hormone (ADH) is important in regulating fluid balance, and its secretion in the supine position changes with ageing in important ways with respect to the common problem of orthostatic hypotension.

2.2.4 Nervous System

No system is of greater importance to the diseases of ageing than the nervous system. Alterations in neurological function contribute to almost all the major physiologic alterations described in this chapter. Dysfunction of the nervous system is a component of all major geriatric syndromes (delirium, incontinence, falls and frailty). The effect of dysfunction of the brain in particular is a major reason for loss of independence and has a large and increasing effect on society as a whole.

2.2.4.1 Brain

Brain weight and the number of neurons and synapses decline progressively with ageing. This is observable as thinning of the cortical grey matter. Additionally there

are changes in white matter tracts. In physiological ageing this loss of neurone density is in some measure compensated for by the development of new neuronal connections. The brain and other neurological tissues contain stem cells and are able to replace neuronal tissues throughout life. The failure of this compensatory mechanism results in the progressive changes described.

Functional MRI has been able to identify changes in recruitment of brain networks with ageing which are presumed to reflect compensatory adaptations to neuronal loss and impaired function [14].

Some aspects of cognitive function remain preserved with ageing in the absence of disease. Semantic memory, "world knowledge" and emotional regulatory skills would be among these relatively preserved domains [14]. Short-term recall and the learning of new material are thought to be less reliable than in youth.

Alzheimer's disease and Parkinson's disease are important diseases causing degeneration of brain function in multiple domains and will be discussed elsewhere in this text.

2.2.4.2 Spinal Cord

While less is known regarding changes of ageing in the spinal cord, one known issue is the reduced capacity for remyelination with ageing which affects the central nervous system tissues [15]. This loss of ability to repair and replace the myelin sheath is of significance in diseases of the spinal cord and elsewhere, such as multiple sclerosis. Clinically, there are important changes in the function of the autonomic nervous system with ageing which may account in part to the tendency of older people to experience serious autonomic dysfunction.

2.2.4.3 Peripheral Nerves

The reduction in peripheral sensory sensitivity in ageing is widely observed by clinicians. Not surprisingly then, the ageing peripheral nervous system displays changes at multiple levels. These changes were reviewed by Wickremaratchi [16]. There is a reduction in the number of myelinated nerves in the spinal roots. The density of afferent fibres in the fasciculus gracilis is consistent with observed decline in peripheral sensory information appreciated by the patient.

2.2.5 Muscular and Skeletal Systems

Muscle weakness is an important limiting factor for quality of life in older people with a large number of older people at risk of loss of the ability to complete self-care activities due to weakness.

Ageing is associated with a progressive decline in gait velocity [17]. In large measure this reflects degenerative change in the joints (such as arthritis) and muscle weakness (due to sarcopenia and the effects of disuse). Generally these and other changes, such as the development of Parkinsonism, that result in reductions in gait speed can be attributed to diagnosable diseases of the structures in question.

Changes in bone density with ageing are associated with increased risk of fractures and as such contribute to morbidity and mortality in older people. The extent of bone loss varies and is influenced by physiological processes such as hormone changes after menopause and the effect of environmental exposures and disease.

The loss of muscle mass occurs progressively with ageing though the rate and extent are significantly influenced by exercise habits. Sarcopenia refers to the loss of muscle mass that is attributed to the effects of ageing. Likely contributing factors include reduction in the ability of damaged muscle fibres to be replaced, a process that involves recruitment of support cells to replace damaged fibres.

2.2.6 Endocrine Systems

The hypothalamus may influence the general processes of systemic ageing [18], and additionally there are changes in the production of pituitary hormones with ageing which are clinically relevant.

In the later part of middle age, important and predictable changes in the production of sex hormone secretion have important effects on many aspects of metabolic function.

Menopause in woman represents an important physiological ageing process of the endocrine system and has important effects of diverse systems including bone density and urogenital function. The transition to menopause is marked by reduced circulating levels of oestradiol and progesterone.

In men, testosterone levels decline through later life and will occasionally cause symptoms such as fatigue, irritability and loss of libido, and this change likely also contributes to loss of skeletal muscle.

Changes in glucose tolerance are frequent with ageing and have an important impact on the development of disorders of glucose regulation—in particular type II diabetes mellitus. β-Cell function declines as ageing occurs and contributes to this association [19]. In people without diabetes, insulin release in response to glucose declines progressively [19].

Thyroid function changes with ageing include an elevation in TSH levels which may be due to changes in the set point for T4 production and to changes in the sensitivity to TSH [20].

2.2.7 The Ageing Skin

While the changes observed in the skin with ageing are often overlooked by physicians, they are frequently a preoccupation for patients, for whom they represent an important cosmetic alteration and a visual reminder of the progress of the ageing process. Practical concerns consequent on skin ageing include reduced barrier function, the predisposition to malignancies, incontinence and greater risks of infection.

The skin of older people is thinner and drier than in the young. There are changes in the thickness of the dermis, and the ratios of connective tissue. In particular, changes in the extracellular matrix have important implications for skin elasticity and barrier function [21]. Reductions in the numbers of sebum-producing cells may result in dryness.

2.2.8 The Gastrointestinal Tract

The function of some aspects of gastrointestinal tract function declines with ageing.

The number of taste buds declines during later life and is thought to contribute to reduced sense of taste and enjoyment of food in older people [22].

These changes include decreases in bowel motility and gastric emptying which in frail people greatly increase the difficulty of meeting nutritional requirements.

The liver undergoes morphological changes during ageing—in particular a reduction in size that is likely due in part to alterations in its perfusion [23]. The cellular characteristics are relatively well preserved during ageing, perhaps reflecting the considerable regenerative powers of hepatocytes.

Changes in hepatic perfusion, in endothelial cell function, in the extent of drug binding to serum proteins and in the induction of liver enzymes can all potentially reduce hepatic clearance in older people [24] though the extent of reduction in function is quite variable.

2.3 Frailty

Frailty may be considered an end result of the physiological changes of advanced ageing. In practical terms the development of frailty is often influenced by associated pathologies, and this interaction is the subject of the other chapters of this text. In many respects frailty provides a more reliable index of the likely extent of homeostenotic reductions in physiological reserve than chronological age. The impact of the frail state is of such importance that it will be developed in detail in the next chapter of this text.

2.3.1 What Happened to Jack?

You ask Jack's permission to contact his daughter who was unaware of last night's fall. She arranges to stay with Jack in his home for several weeks, and you recommend dietary supplements, reorientation and supervision of mobility. Jack's progress was complicated by a fluctuating delirium which seemed to last several weeks after his fall. His laceration became infected and was treated with a week of oral flucloxacillin with improvement. Jack's blood sugars improved over the week, and a local physiotherapist is arranged to provide a supervised exercise programme.

After several weeks Jack's gait and cognition seemed to have returned to baseline, and he has resumed living independently with daily visits by his family. He and his family are looking at options to relocate him to a single storey dwelling or to come and live with them. He consumes regular nutritional supplements and exercises daily.

2.4 Summary Points

1. Physiological ageing is a complex process of progressive reduction in function that occurs in all organ systems. This process may be summarized in the expression "homeostenosis".
2. Processes influencing ageing include gene variations and differences in expression and environmental factors. The interplay between these elements is not well understood.
3. Pathological processes have a major impact on the rate and character of organ changes with age that may not be readily distinguished from "physiological ageing".
4. The cardiovascular system alters with ageing with reductions in the cardiac size and in the ability of the heart to sustain cardiac output.
5. Respiratory function declines with reduced FVC and FEV1, changes in alveolar size and in lung elasticity resulting in reduced respiratory reserve.
6. Renal function declines resulting in a predictable reduction in GFR.
7. The ageing brain undergoes a reduction in size, and there are modest changes in cognitive function. The peripheral nervous system has many changes, and these are clinically represented by dysautonomia, reduced peripheral sensation and impairment of postural reflexes.
8. The skin and mucosal surfaces are less effective barriers to the environment and tend to be thinner, drier and less elastic.
9. Gastrointestinal changes include loss of taste, reduced gastric motility and reduced bowel motility. Changes in hepatic function have effects of drug metabolism.
10. Understanding the typical physiological changes of ageing improves a clinician's ability to provide care to older patients.

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Frailty in Older People

3

Shahrul Bahyah Kamaruzzaman

Key Points

- No matter which assessment tool is used to detect frailty, they are useful in predicting adverse outcomes in older people.
- Recognition and interpretation of non-specific presentations are central to the management of frailty in older people.
- One or more indicators of frailty should trigger detailed comprehensive geriatric assessment, based on the person's needs and access to healthcare services.
- Consider a different strategy when deciding on treatment and management of chronic disease between the vulnerable frail and non-frail patients as outcomes are different.
- Common frailty presentations in older people such as acute falls, delirium and immobility should be incorporated into the development of pathways for timely and easy access to care.

Case Study

Case 1: The Faller

An 82-year-old man was visiting the wound clinic weekly for dressing of his venous leg ulcers. A bachelor, he lived alone at home, was fairly independent in his personal care and was mobile with a stick. He had no formal caregivers, but had a concerned and helpful neighbour who occasionally looked in on him and provided transport to clinic. Besides occasional falls, his medical history included Parkinson's disease, sensorineural deafness for which he wore hearing aids,

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benign prostatic hyperplasia and high blood pressure. A few months later, his neighbour attended the geriatric clinic to reschedule a missed appointment and also reported that he was unable to attend his regular wound clinic appointments as he had a recent fall, and since then it was difficult for him to venture out of the house. His neighbour was now looking in on him regularly, sending him food and helping to dress his legs at home.

A week later, he had another fall and had to be taken to the local geriatric unit in an ambulance. The multidisciplinary team (MDT) there made a comprehensive geriatric assessment. He showed significant signs of orthostatic hypotension and was treated for cellulitis from infection of his venous ulcers. A review of his medication found that he was taking his prostate, high blood pressure and Parkinson's medication incorrectly. He stayed in hospital for 2 weeks for limb strengthening and balance training. He is now home with no further falls but attends weekly sessions for physiotherapy and continued dressings at the geriatric day unit.

Case 2: The Brittle Patient

A 92-year-old lady presented to the emergency department with a week-long complaint of 'spasms' at the sides of her hips. She was unable to sit up and get out of bed as the spasms only occurred on movement. She had pain in her lower abdomen that occasionally radiated to her back but no fever, nausea or vomiting, and she had regular bowel openings. An MRI spine revealed a recent vertebral fracture at T12. Her past medical history was that of recurrent vertebral fractures 3 years prior that rendered her confined to either the bed or chair. She had been on bisphosphonates prior to these fractures and was subsequently given teriparatide injections for 18 months. During this period, she suffered a below knee DVT, recurrent strokes with hypertension and bilateral carotid artery stenosis as her risk factors. She became incontinent and occasionally suffered recurrent urinary tract infections, which were treated with antibiotics. Her cognition declined in a stepwise progression in the last 3 years prior to this presentation, which may indicate probable vascular dementia. Her caregivers are finding the care of her physical and mental decline more challenging, and a referral to the geriatric unit was made for further assessment and management. During her stay she became delirious and refused to eat or take her pain medications. Efforts at inserting a nasogastric feeding tube failed. Her caregivers were called in to review further steps in her management.

Case 3: The Shrinking Patient

An 82-year-old lady presented to her GP with complaints of feeling tired such that she is unable to carry on with her usual social activities. This was getting her down, and she noticed that she had no appetite for her favourite foods. She added that in the past year, she may have lost a couple of pounds and that her clothes were getting too loose for her. Her past medical history was that of Type 2 diabetes, hypertension and coeliac disease. Her body mass index was borderline low but normal. A review of her medication and diet was made after a full physical examination and blood investigations were found to be unremarkable at that time. Three months later she returned to see her GP. Although she felt less tired, she was visibly thin. She revealed that in the past 1 month she had felt a hard lump in her left breast which was not there before and that it had grown in size.

A referral was promptly made to a breast clinic, and she was diagnosed with a stage three malignant breast cancer. Treatment options were discussed with her and her family where she opted to go for conservative treatment without radio- or chemotherapy. As this was a rapidly growing invasive tumour, she was keen to get her affairs in order and an advanced care plan was conducted between her, the doctors and family member, in anticipation of her future decline.

The three examples show how frail older adults may present to a community setting, emergency services or a medical or geriatric unit. The challenge in identifying, preventing and treating frailty is in communicating a better understanding of this condition. Frail older people have a 'latent vulnerability' which puts them at higher risk of adverse events such as hospitalization, institutionalization and death. These adverse events may occur as a result of sudden changes or challenges to their physical and mental quality of life after what appears to be a minor event, such as a fall, infection or even a change in medication. The aim of this chapter is to provide a strategy on actions which can be taken or solutions to problems in the frail older people and prevent these adverse outcomes in order to ensure them a better quality of life.

We will first look at the conceptualization of frailty and how to recognize frail older people. Recognition of those who are frail will require an understanding that some people with frailty may seem to have an uncomplicated need or problem but instead have a 'latent vulnerability' which puts them at higher risk of adverse outcomes (Cases 1 and 2). Hence their frailty might not be obvious unless actively looked for. Others may have one or more indicators of 'frailty syndromes' which should suggest vulnerability for those individuals (Case 3). Lastly we will explore how frailty can be managed as exemplified by the three cases presented above.

3.1 Introduction

The management of the frail older person has been the core of a geriatrician's existence since the specialty began. Geriatricians have long recognized the heterogeneity of the health status of older people in grappling with the complex care of these vulnerable individuals [1]. However, it has only been in the past few decades that a special population of older adults had become a more prominent 'cause' among public health specialists and policy-makers. They are known as the 'frail elderly' [2]. Identifying who they are, whether on an individual basis or population level, has presented a challenge to the care of older people. The numerous frailty measures published in recent years give an indication of the many approaches to meeting this challenge. However, the drive to provide tangible means of defining this population more accurately arises from concerns about 'population aging' which has seen a demographic shift to higher older populations across the world. Hence, healthcare providers will need to anticipate that in the next few decades, the number of people in the 'very old' category aged 85 years and above will have more frequent hospital admissions, longer lengths of stay and rates of higher bed occupancy in acute care hospitals compared to those in younger age groups [3].

Moreover, older people are more likely to present to physicians with non-specific presentations or frailty syndromes, compared to the more typical presentations observed in younger people. Non-specific presentations of the older people could be due to multiple diseases, disability and issues with communication. Therefore the recognition and interpretation of these non-specific syndromes are crucial, as they may be triggers to adverse events and poor health outcomes in this population.

It is therefore essential to create awareness on the importance of recognizing frailty. This will aid in reducing its risk factors, augment its protective factors and enable the allocation of necessary resources to achieving these measures. This may help delay the onset of frailty and moderate its effects, thus reducing its prevalence and adverse outcomes among vulnerable elders.

3.2 Who Are the Frail Elderly?

The 'language and management of frailty' can be potential barriers to engaging with older adults who may not see themselves, or wish to be characterized, by a term that is often associated with 'vulnerability and dependency' [3]. The 'frail elderly' encompasses a diverse group of individuals who possess 'different expectations, concerns and abilities to cope in addition to having different types and levels of need support' [3].

To a certain degree, general meanings of 'frail' and 'frailty' used in the context of daily living run in parallel to the world of gerontology and clinical practice. The *Oxford English Dictionary* [4] provides a general meaning of the adjective 'frail' and the noun 'frailty':

> *Frail*: adjective: weak and delicate, easily damaged or broken.
>
> *Frailty*: noun: the condition of being frail**,** weakness in character or morals.

The *Webster's Ninth New Collegiate Dictionary* 1985 [5] similarly defined:

> *Frail*: adjective: easily led into evil (~humanity), easily broken or destroyed; fragile, physically weak, slight, unsubstantial.
>
> *Frailty*: the quality or state of being frail, a fault due to weakness especially of moral character.

Other meanings along this negative vein are seen in *Roget's International Thesaurus 4th Edition* [6]:

> *Frail*: slight, delicate, dainty, delicately weak, puny, lightweight, womanish, effeminate; (informal terms): namby-pamby, sissified, pansyish, fragile, breakable, destructible, shattery, crumbly, brittle etc.

A Canadian-based study investigating the viewpoints of English-speaking women on their experiences of frailty reported that older women describe frailty not

only as an observable physical state such as 'looking small and skinny' but also as an emotional experience of vulnerability. As a socially constructed concept, frailty was related to judgments and negative assumptions of powerlessness and dependence [7]. These meanings depict frailty in actual daily use, as a negative state that introduces an inherent social devaluation. It is therefore of no surprise that older adults themselves, by and large, do not equate their health status with this general meaning [7] although accepting of the fact that they are older. This concept of frailty can also mean living with 'loss' which in the context of autonomy, can arise from being dependent on the basic ability to care for one self or, loss of cognitive ability to plan or be in control one's everyday activities.

In clinical practice, the identification and management of the frail older person has been the mandate of geriatricians who have long embraced the complexity of the health status of older adults and perhaps *it is in the management of frailty that the art of geriatrics is best expressed* [8]. However, from a clinical/geriatric perspective, the frailty concept is not an easy one to quantify/translate into a tangible measure/tool. As one author explains, perhaps geriatricians *have not been as good at articulating just how we embrace the complexity of our patients* [9]. This could be due to the fact that frailty does not fit into a particular clinical slot and is often subtle and asymptomatic. Hence, it often goes unnoticed by most medical practitioners.

Older adults and their families tend to relate their physical or mental changes to the normal aging process, and hence result in delayed presentations and inadequate management of comorbid chronic diseases. This is probably because limitations and disease associated with aging are an inseparable part of frailty [10]. As with aging, frailty is an individual and qualitative experience. The indistinct line between normal and pathological aging (age-related disease) could explain why the experience of frailty differs from one person to the next. In fact, the difference between biological and chronological age in any one individual may be explained by their susceptibility to frailty. Hence, it has been suggested that frailty can be used as a criterion for selecting vulnerable older persons for intervention as may be better than selecting those at risk solely on the basis of their chronological age [11].

Over the past few decades, growing uncertainty about the definition of frailty and the underlying reasons for making these measures is certainly reflected by the creation of many measures, scales and indices of frailty. The operational definitions of frailty may vary according to the conceptual framework they are derived from. Those who consider frailty in a wider sense (qualitatively) will include multiple domains of physical, social, cognitive, comorbidity and psychological factors. This type definition was proposed by Rockwood in the well-validated frailty index developed for older Canadians [12]. This concept was replicated using the comprehensive geriatric assessments (CGA) [13]. Others define frailty more restrictively, (quantitatively) as seen in the well-known 'Fried's physical phenotype of frailty' which focusses mainly on muscle performance parameters, such as the measurement of grip strength and gait speed, as well as weight loss, energy intake and physical activity [14]. Other single physical measures of frailty have also been proposed and include the measurements of grip strength [15] and gait speed [16]. Despite their diminished importance over the years, social and psychological domains have

not been totally excluded from the concept of frailty. This made way for the more quantitatively measured definitions of physical frailty, with technological and superficially more objective science of measurement. However, there are those that resist a *frailty equals physical frailty* approach. One recommendation to 'operationalize the definition as a clinical measure includes several features, such as cognitive, functional and social circumstances, that go well beyond just the physical aspects' [17]. This view is in line with the aims of the World Health Organization's International Classification of Impairments, Disabilities and Handicaps (*ICIDH*) 1980, and the current International Classification of Functioning, Disability and Health (ICF) [18]. The ICF classification describes health which consists of several domains related to body functions and structures, activities and participation [19]. The domains are classifications that are based on individual and societal perspectives. As the functioning and disability of an individual occurs within a context, the ICF also has environmental factors. These factors involve the physical, social and attitudinal environment, which would enable people to live and conduct their lives. The 'full health experience is described using all these components whereby an individual's function within in a specific domain is an interaction between the health condition and the associated contextual factors (i.e. environment and personal factors)' [18]. *Disability* (now classified as activity limitation), *impairment*, *participation* and *handicap* (participation restriction) are key entities that form these associations (see Fig. 3.1).

Conceptually, frailty could certainly be incorporated into the ICF framework. As illustrated in Fig. 3.2, frailty in an older individual is the result of interactions within each of the three ICF domains with the health condition and contextual factors. This would suggest that research on frailty return towards the holistic geriatric concept; where the pre-existing ICF could act as a useful guide/template for its definition. In the clinical setting, geriatricians already conduct comprehensive geriatric

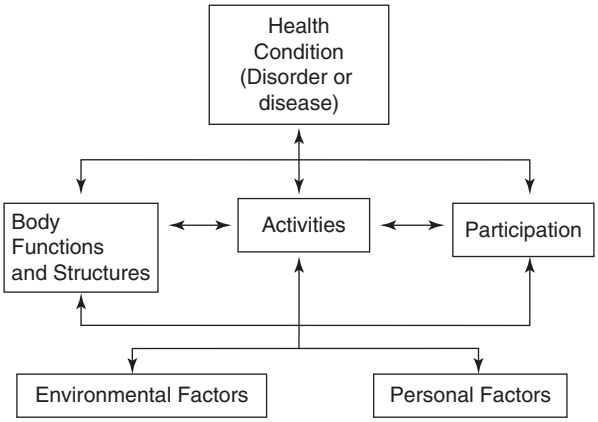

Fig. 3.1 Flowchart of interactions between components of the International Classification of Functioning, Disability and Health (ICF). *Source:* International Classification of Functioning, Disability and Health, World Health Organization; 2001 [18]

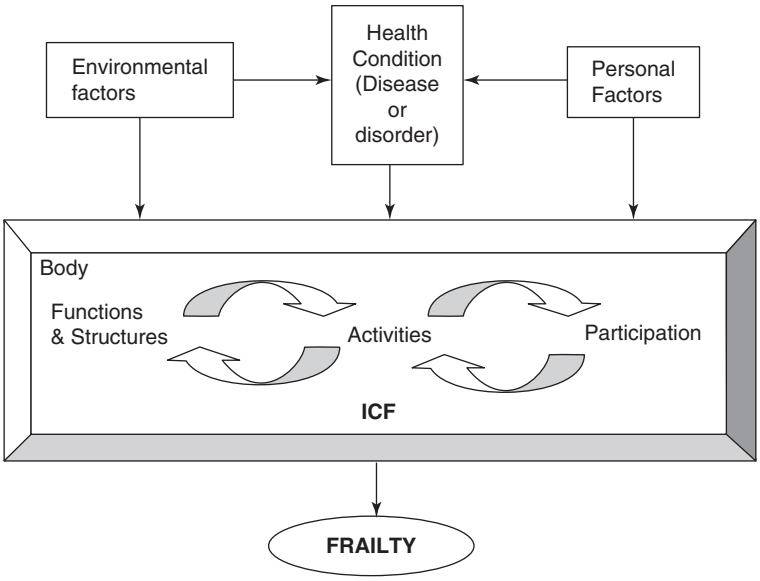

Fig. 3.2 Interactions between the components of the International Classification of Functioning, Disability and Health (ICF) with frailty [18]

assessments on older patients. This incorporates disease-related and other multidimensional aspects of their assessment and treatment. The recognition of frailty in these older patients could provide further refinement of this assessment [20].

In identifying the frail elderly, it is also important that we understand the difference between frailty, multiple morbidity and disability [3]. Those people who have multiple chronic conditions and who often utilize healthcare services may have frailty. Similarly, there are those who may be frail but do not frequently utilize healthcare services until they become acutely unwell, confused or immobile.

By definition, disability is impairments giving rise to functional limitations, which may develop from impairment of just a single system or more. The overlap between frailty and disability could perhaps be greater in older people at advanced ages.

While those people with frailty may also have a disability, those with a disability may not have frailty. Hence, 'frailty could be the cause of disability in some and the consequence in others' [3]. The overlap between these three entities has implications to the management approaches for frail older people.

3.3 Why Focus on Frailty?

Identifying the frail elderly who present themselves to health services or live as part of the population is a challenge. Strategic attempts of identification should focus on their health and social status. This would enable preventive action to be taken to avoid serious consequences at individual and population levels [35]. The challenge

would be to develop a standard frailty measure that could incorporate the different perspectives behind its purpose. These perspectives include a clinical, gerontological research or public health.

A geriatrician's perspective would be for a frailty measure to possibly refine the comprehensive geriatric assessments and further improve the process of decision-making. This is by way of weighing risk and benefit and cost of curative versus rehabilitative/palliative care services in the frail older person.

A research gerontologist would use a measure of frailty to assess the underlying causes of frailty so as to identify a pre-frailty stage and enable its prevention. From a public health perspective, a standardized frailty measure could enable a more cost-effective use of resources through population preventative measures and intervention.

Briefly, there are *three main reasons* why it is useful to measure frailty:

1. *To reduce the healthcare burdens associated with frailty*.
2. *To understand the underlying causes of frailty*.
3. *To target interventions on those who will become frail or those who are* '*high-risk frail*'.

Although systematic screening of frailty among community dwelling populations was an earlier recommendation [21], this may not only prove to be a laborious exercise but also an expensive venture with no evidence for improved outcomes [3]. Not only will there likely be some degree of 'public unacceptability' but not many older persons would consider themselves 'frail'. Some older persons might identify certain periods where they felt 'frail or fragile', but do not view this as having a chronic condition or that this condition defined them [3].

Hence screening for frailty via a case management approach on individuals who may have certain presentations or risk factors for frailty would provide a better outcome that would also be cost-effective.

3.4 Types of Frailty Measures

Figure 3.3 illustrates the pathways to defining frailty in the older population.

'Frailty has been measured using markers such as physical ability; self-reported health indicators and wellbeing, comorbidity, physiological markers' as well as psychological and social factors [35]. 'Despite the efforts to quantify this experience, frailty in older adults remains undefined with no consensus' on its measurement [35]. 'This is evident from the numerous existing frailty measures present, which were driven by a common goal of reducing the burden of suffering that frailty entails' [35]. A standardized definition and method of measurement could target health and social care for older people by enabling early detection and thus reducing not only healthcare costs but also the adverse outcomes of hospitalization [14], falls [22, 23], institutionalization [9, 13] and death [13, 14]. Understanding the pathways that lead to frailty [24] is also valuable as it may lead to discovery of ways to prevent or delay its onset by targeting interventions for the 'pre-frail elderly' or those at high risk.

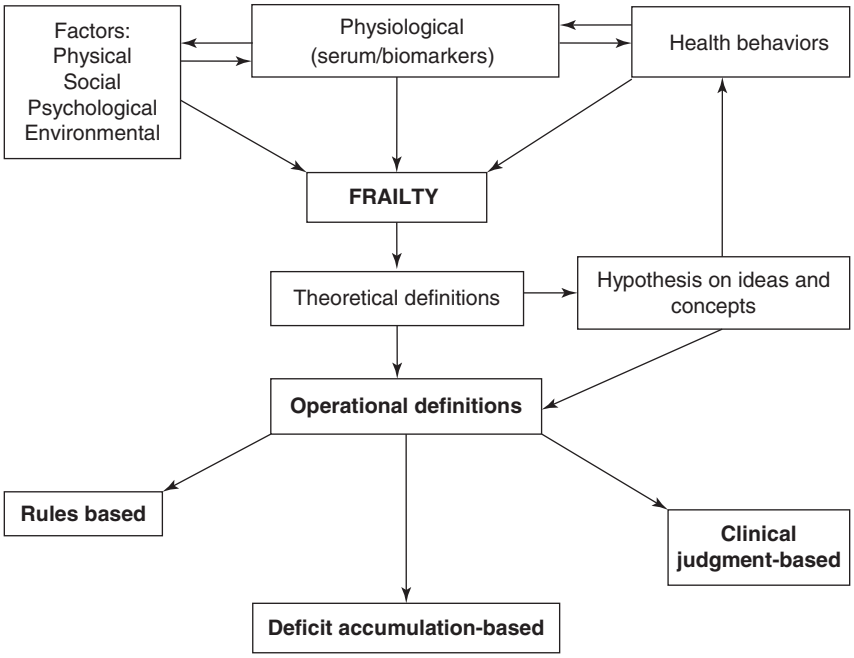

Fig. 3.3 Pathway to defining frailty

Presently, the term 'frailty' has no consensus definition and is measured in multiple ways and for different purposes [25, 35]. This had led to the development of three types of frailty measurement—rules-based, clinical judgement and the frailty index [26, 35]. A rules-based measure such as Fried's frailty phenotype determined that frailty was made up of a set number of criteria which were mainly physical [23, 27, 28, 35]. Other similar measures assume a multidimensional form [11, 17] or a single component of a physical/physiological measure such as grip strength [15, 16], walking speed [14], functional reach [29] and blood markers [30, 31, 35]. Frailty measures that rely on clinical judgement to interpret results of the individuals case history and physical examination are unlikely to be duplicated and will vary between different clinicians, rendering them of little use for research or audit [8]. The third measure, the frailty index, was based on a proportion of deficits accumulated in relation to the individual's age [32, 35]. This measure was based on the assumption that all variables were *unweighted* and deficits such as 'cancer' and 'arthritis' were of equal importance to one another in defining frailty. In large indexes (40 or more variables), a smaller subset of items selected at random were similarly associated with the risk of adverse outcomes as the whole set of items [32, 35]. This suggests that when a higher number of variables are considered, there are greater problems of measurement error and missing data. Despite its reproducibility [33], and high correlation with mortality [32, 34], the frailty index is time-consuming and not widely used clinically [35]. Additionally, all three types of measures may not be measuring frailty alone but other

entities that may overlap with frailty such as morbidity or disability. Another published model of frailty, the British frailty index (BFI) proposed the use of latent variables as a means of data reduction to represent or make meaning of a wide range of attributes/variability among observed variables on a smaller number of dimensions or factors [35]. These latent variables are not 'directly observed but rather inferred (through a statistical model) from directly observed or measured variables' [35]. This model attempts to mirror the concept of frailty as a *latent vulnerability* in older persons, presenting frailty as subtle, often asymptomatic and only evident over time when excess vulnerability to stressors (e.g. acute illness) reduces their ability to maintain or regain homeostasis [1, 35]. This model's advantage over other types of frailty measures is in its internal validity as it accounts for measurement error and assigns relative weights in the association of each variable with frailty [35].

In summary, no matter which frailty measure was used, there was general agreement that it was useful in predicting adverse outcomes and identified frailty as 'an increased vulnerability to stressors due to impairments in multiple, interrelated systems' which could lead to decline in the older person's homeostatic reserve and resilience [36, 37].

3.5 Management of Frailty in Older People

The capacity to recognize and interpret non-specific presentations is central to the frailty management in older people [3]. The presence of one or more indicators or presentations of frailty in an older person should prompt a comprehensive geriatric assessment, either in the person's own home, in community healthcare centres or in the hospital, in accordance to their needs, available facilities and their access to services. Table 3.1 lists the frailty presentations with examples, which are essentially giants of geriatrics and are associated with poor outcomes in older people.

The gold standard, the application of management and care of frailty in older people, is the comprehensive geriatric assessment (CGA). The CGA identifies a

Table 3.1 Frailty presentations

Instability or falls	May be syncopal or non-syncopal
Immobility	'Off legs' may indicate a sudden change in mobility and may cover a range of diagnoses from vertebral fractures to end-stage Parkinson's disease or dementia
Incontinence	An atypical acute presentation or a sudden change or worsening of urine or faecal continence
Intellectual impairment (dementia, delirium, depression)	Acute confusional state or sudden change or worsening in cognition in someone with underlying dementia Caregiver history is important to detect any recent cognitive change; delirium is common in those with underlying dementia Depression may present as change in cognition and poor concentration
Polypharmacy	An acute emergency in a frail older person should prompt a review of medications

person's health, social and environmental needs. This allows for planning of the most suitable interventions to address these needs [3]. This holistic and multidimensional assessment of an individual by healthcare professionals from various disciplines related to the older person's health has demonstrably improved outcomes in a variety of settings [38].

The three case histories provide examples of patients who present at various stages of the whole care trajectory within any given healthcare service. The delivery of care services needed for the management of these frail older people will vary according to their needs, available resources and the policies across various settings. The speed of delivery of these services within the settings of an emergency department, an acute medical unit or the community would depend on local infrastructure and strategies that are put in place. Trigger factors or warning signs that should set certain strategies in motion are discussed via the case histories provided.

In case 1: the faller; a CGA identified several frailty presentations which warranted a multidisciplinary team assessment. He had instability, which caused him to fall. A medication review detected polypharmacy, which was appropriate for his multiple medical conditions. However, a misunderstanding with the timing of his Parkinson's medication as well as orthostatic hypotension caused by his antihypertensive and prostate medications contributed to his risk for falls. Another contributing factor was the delay in getting the venous ulcers on his legs dressed regularly. This resulted in infection causing swelling and inflammation (cellulitis) surrounding his leg ulcers.

His first fall should have triggered an option that could have prevented the leg infection and subsequently his second fall. A referral to a geriatric day unit or 'day hospital' would obviate the need for his hospital admission, as it would have provided rapid access reviews by a geriatrician and multidisciplinary team services with access to inpatient geriatric and rehabilitation beds should it be required for a vulnerable older person [3]. In this case, dressings of his venous ulcer would have resumed. In addition, a physical and medication review would better manage his orthostatic hypotension, and physiotherapy would be needed to improve his leg strength and balance.

In case 2: the brittle patient; we presented a new onset fracture in a clearly vulnerable patient with multiple comorbidities and frailty presentations of immobility with incontinence as well as intellectual impairment from probable vascular dementia. The complexity of her present and cumulative frailty conditions warranted an inpatient multidisciplinary team management following a CGA to identify her needs and other priority areas of management.

These physical challenges in terms of pain management, nursing care as well as rehabilitation following the new onset fracture required coordinated efforts between the physician, nurses, occupational therapist and physiotherapist and her caregivers. The change in her cognition in addition to her pre-existing dementia provided further challenges in her inpatient care. Identifying the cause of her delirium would be the first step. These could range from her increased risk from having pre-existing dementia to the pain of the fracture as well as the pain medications given earlier. An underlying UTI may also contribute to her change in cognition and needs to be screened for and treated.

An advance care plan was also drawn up in full consultation between the physician, nurses and her caregivers. They all agreed that although she previously did have ability to make an informed decision about her care, the current situation with her delirium posed certain dilemmas. An escalation plan to provide contingencies on what to do in event of further deterioration was proposed. Her delirium eventually settled with a combination of antipsychotics, painkillers and antibiotics for her underlying UTI. Discharge planning saw her discharged 3 weeks later. This hospital admission presented an ideal opportunity to discuss an advanced care plan which would need to be updated regularly. The immediate plan was home nursing, a hoist for transfers as well as other adaptations to her environment that would ensure support of her frailty conditions and to her caregivers till the end of her life.

Case 3: the shrinking patient; presents a patient who was relatively well and independent but had unexplained tiredness with subjective and later objective complaints of weight loss. The 'latent vulnerability' here was in the form of an aggressive breast cancer that saw her initially present with what was seemingly a straightforward clinical presentation. An advanced care plan is not always possible without the patient's understanding of its role and goals attached to it. In this case, the rapid onset and sudden change in her health status rendered her frail. There will be different considerations to be made on treatment and management of chronic diseases or even cancer between frail and non-frail individuals. For example, a frail patient with cancer may be more susceptible to adverse outcomes of the cancer itself and its treatments, compared to non-frail individuals.

Hence, in anticipation of her rapid decline in the face of clear decisions on opting for conservative management of her aggressive tumour, a consultation between her, the physicians and close relatives or caregivers detailing an immediate and long-term care and support plan was conducted.

The plan would outline all that is required on a daily basis to help her remain independent. These include a medication, nutritional and exercise plan that she would need to observe. There was also an end of life plan, which outlined the things she would or would not wish for should she take a turn for the worse. This greatly reassured her that she would not be a burden to her family and allowed her to focus on quality time she had left.

3.6 Recommendations for Managing Frailty in Older People

- A comprehensive geriatric assessment (CGA)-based approach incorporating a multidimensional review of physical/medical, functional and psychosocial needs.
- Treatment of multi-morbidity as well as single or reversible conditions that would identify contributing factors to the development of frailty.
- There are differences to be considered when planning treatment, goals and management of chronic diseases between frail and non-frail patients as their outcomes are different.

- Refer to geriatric-trained physicians frail older persons who present with complexity in diagnosis, uncertain outcomes or challenging symptom control or changes in behaviour or cognition.
- The negative effects of polypharmacy (obligatory or nonobligatory) can be reduced among frail older persons by regular medication review of the number and type of medications [3].
- Initiate an advanced care plan with regular reviews which documents treatment goals, plans for regular management and acute emergency care when and if required. It may include end of life care plans where appropriate [3].
- Develop pathways of timely and easy access to care for frail older people, which incorporate common frailty presentations such as acute falls, delirium and immobility.
- Develop support systems that fulfil all health and other care needs which provide a suitable and safe environment for frail older people to experience aging in place.

Conclusion

Frail older people have a 'latent vulnerability', which puts them at greater risk of an adverse outcome. These outcomes may occur as a result of sudden changes or challenges to their physical, mental or even social wellbeing. Recognition of frailty in older people is complex as there are a wide variety of tools which may not be measuring frailty alone but rather comorbidity or disability as these entities overlap.

However, early and accurate recognition allows for initiation of optimized treatment and management strategies for frailty. The gold standard management of frailty in clinical practice in a variety of settings is the comprehensive geriatric assessment (CGA). This provides the basis for a comprehensive care and support plan for the frail older person and their caregivers, along their whole frailty experience and care trajectory.

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Pharmacology

4

Jennifer H. Martin

Key Points

1. Most therapeutics have no evidence on safety, efficacy and dose in the older age groups.
2. Changes in physiology with age and the added burdens of comorbidity and concomitant medications affect the way drugs are handled in the body.
3. These changes also affect how drugs work in the body.
4. Non-pharmacological interventions should be considered first, if possible.
5. Starting with the lowest dose possible and increasing only if efficacy has not been achieved and higher doses are tolerated.
6. A consideration of deprescribing (including dose reductions) should be undertaken at every visit by every doctor managing health problems in the older age groups.

4.1 Introduction

Mrs. NG, an 82-year-old obese woman, living at home alone and with a long history of hypertension, atrial fibrillation and angina presents to hospital with a fall.

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Her medications on arrival are:

Atorvastatin	40 mg	Daily
Escitalopram	20 mg	Mane
Frusemide	40 mg	BD
Metoprolol	50 mg	BD
Paracetamol	1 G	TDS
Temazepam	10 mg	Nocte
Warfarin	1 mg	Nocte
OxyContin	5 mg (short acting)	TDS
Allopurinol	50 mg	Every second day
Isosorbide mononitrate	60 mg	Mane
Esomeprazole	20 mg	Mane
Nitrolingual spray	1 puff	PRN
Ramipril	1.25 mg	Nocte
Cetirizine	10 mg	Nocte
Digoxin	62.5 mcg	Mane
Metoclopramide	10 mg	½ h before meals

The family voices concern about her mortality risk and requests assessment for nursing home. The patient however requests to stay at home for 'as long as is possible'. The examination was notable only for slight deafness; a large heart clinically, postural systolic blood pressure drop of 50 mmHg (causing symptoms); and a mild sensory peripheral neuropathy.

This case is a typical presentation seen by general, internal medicine and geriatrics practitioners. Although the history of the presenting complaint and detailed past history are not given, the medical list and its relationship to the presenting complaint raise a large number of concerns. Specifically this case highlights a number of issues around prescribing in the elderly including polypharmacy, possible compliance issues and communication issues between patient, specialists and general practitioners (GPs). There are specific pharmacokinetic (PK) and pharmacodynamic (PD) parameters that change in the elderly generally and which are likely to cause symptoms and impaired quality of life in this patient specifically. These changed PK and PD processes are not all or nothing processes, but a continuum across age, gender and comorbidity. Thus this chapter will focus on general principles for prescribers to consider when prescribing in the elderly.

It should be noted that most drugs used in clinical practice have never had their PK of PD studied in the elderly, specifically not in the over 75-year age group or in those with additional comorbidity. It is not a requirement of regulatory authorities to do so; thus most studies tend to enrol patients under 70 and without the comorbidity commonly coexisting in the elderly and which causes altered PK and PD.

Although not providing information on *existing* agents in clinical use and although not mandating actual geriatric data, the ICH/European Guideline Clinical Investigation of Medicinal Products in Geriatrics[1] gives some guidance to industry around the

[1] http://www.ema.europa.eu/docs/en_GB/document_library/Scientific_guideline/2009/09/WC500002875.pdf.

registration of *new* active substances that are likely to have significant use in the elderly, either because the disease intended to be treated is characteristically a disease of aging or the population to be treated is known to include substantial numbers of geriatric patients or if there are reasons to expect that conditions common in the elderly (e.g. organ impairment, concomitant illnesses or medications) may alter the geriatric patient's response (with regard to either safety/tolerability or efficacy) compared with that of the non-geriatric patient. In this 1994 document, it is stated that geriatric patients should be included in the Phase III database (and in Phase II, 'at the sponsor's option') in meaningful numbers. However many 'new' therapies, for example, cancer therapies, may come to registration on Phase II data only. In practice, the geriatric data may be 'simulated' from other populations or translated from healthy geriatric volunteers rather than actual data from a geriatric population with common comorbidity. Further the PK data, if available, is usually based on single or short-term dosing, in distinction to the long-term use and with concomitant therapies, usual in the elderly.

In addition to the often limited trial data of these drugs in the elderly, it can be difficult for investigator-initiated studies, such as post-marketing pharmacovigilance studies in the elderly, to receive nonindustry funding to provide the much needed evidence. This may be because of the complexity of both the pharmacology issues and the heterogeneous population which can span a 40-year time period (ages 60–100 years). These studies would require large numbers of otherwise homogenous older people to reduce confounding. It can even be difficult to conduct large industry-sponsored randomized controlled trials in elderly patients as side effects and withdrawals are likely to be much larger than a younger healthier population, potentially threatening registration. Further many elderly patients have several different diseases and take many different medications that cannot be discontinued so that a patient can participate in a drug study. Therefore listing is more likely (and the clinical trial size much smaller) for a sponsor if the clinical studies focus on a homogenous, healthier and younger population likely to better tolerate the drug.

4.2 Pharmacokinetics

Pharmacokinetics describes how a person processes a specific drug after its administration. Route of administration route is very important as although there is often knowledge about the population relationship between plasma concentrations after, e.g. IV or oral dosing, the ratio may differ in a particular elderly patient depending on other comorbidity including gut function, type of diet, concurrent medication that affects gut transit time (such as prokinetic agents) and chemical issues such as concurrent PPI administration. Timing and frequency can also affect target drug concentrations.

In addition, every therapeutic has a pharmacokinetic profile based on specific parameters such as age, sex, weight, body mass index, hepatic function and renal function, inter alia. The effect of sex may actually be more related to body composition than sex; however sex can be the important covariate to understand if body composition parameters are not available.

Overall the pharmacokinetics of most medications in elderly adults has not been studied in enough detail to recommend use or at least correct dose in the elderly or

very elderly. Therefore having enough knowledge of the principles of pharmacokinetics (absorption, distribution, metabolism and elimination) in general and in the particular patient in front of you can help make reasonable predictions about likely pharmacokinetics to support a decision about dosing and timing.

4.2.1 Absorption of Oral Medications

Changes in the elderly gut that affect the actual or the time to peak concentration. This can affect efficacy (e.g. in drugs that need rapid achievement of high Cmax).

These changes are:

1. Reduced GI motility increasing absorption
2. Reduced GI blood flow reducing absorption
3. Increased extent of absorption of drugs that undergo first pass metabolism, as seen with nitrates and the lipophilic beta blockers (e.g. metoprolol)
4. Reduced gastric acid secretion causing more alkaline gastric pH reducing drug absorption
5. Swallowing difficulties leading to erratic drug absorption
6. Poor and inconsistent nutrition leading to altered absorption of both lipid and water-soluble drugs
7. The use of (per enteral or nasogastric) feeding tubes affecting rate and extent of absorption
8. Medication use may contribute greatly to these changes e.g. concurrent use of antacids and overuse of proton pump inhibitors

The net effect of these changes is difficult to predict and may vary depending on the nature of the drug being prescribed.

4.2.2 Distribution

This is the site of drug distribution after the drug is either injected (for intravenous) or absorbed and passed through the liver (for oral medication). It is estimated using a parameter named the apparent volume of distribution of a drug. This is calculated as the amount of drug in the body divided by the concentration of drug measured in a biological fluid.

$$\text{Volume of apparent drug distribution } (\text{L}) = \frac{\text{amount } (\text{mg})}{\text{concentration } (\text{mg/L})}$$

Some drugs are widely distributed into tissues, body fluids using diffusion, active transport using pumps such as the P-glycoprotein pumps and other energy-dependent pumps as seen in the gut, kidney and brain, for example. Drugs that need to distribute into the brain for activity such as opiates must cross the blood–brain barrier.

The volume of distribution (Vd) of a drug is affected by the lipid or water solubility of a drug and the amount and proportion of water and fat present in that particular elderly subject. Standard population volume calculations are provided by the drug sponsor during the regulatory process. However these are usually derived in healthy and young people. Most elderly patients have a Vd different to younger people due to different body composition. Within the elderly group itself, Vd is also changeable, for example, in people with liver or renal impairment or heart failure. Estimating the volume using basic pharmacology principles however enables a more appropriate dose to be chosen, assuming the desired concentration at the site of action is known.

Even in the 'healthy' elderly, changes occur in the body composition of water and fat. Depending on the physiochemical factors of the drug (e.g. whether it is lipophilic or not), this can affect how a drug is distributed. In both men and women, as the body ages, muscle mass declines and the proportion of body fat increases. Thus drugs that are fat soluble may be relatively more widely distributed compared with a young person. For drugs distributed in the blood, the volume of distribution may be reduced. This effect is observed with many fat-soluble benzodiazepines, requiring dosing reductions in the elderly.

The aging process also is associated with a theoretical reduction in total body water, which can affect the volume of distribution of water-soluble drugs. Older adults in general produce less albumin, which binds drugs in the blood. Reduction in protein binding (e.g. from low albumin) can result in an increase in free drug concentration. As the free drug concentration increases (compared with bound drug), more drug becomes available to bind to receptors or cross membranes, thus increasing the pharmacologic effect in an elderly individual. However, in those situations, an increase in free fraction results in increased excretion, so over a dosing interval, the free fraction should return to its normal concentration; the lower total amount (which is often what is measured in automatic laboratory assays) reflects this. This is supported by well-conducted clinical pharmacology on the clearance of free phenytoin in the elderly—showing that although there is a trend towards reduced clearance of free phenytoin in the elderly, it was not significant [1]. This also shows the importance of measuring free concentrations of drugs that are highly protein bound.

All of these effects can influence how a drug is distributed and the resultant plasma concentrations achieved. Without a resultant change in dose to account for this, volume of distribution thus determines whether a pharmacologic or adverse effect can occur. As an example, if the volume of a drug is reduced, then the loading dose that is necessary to achieve a desired concentration is reduced and the half-life of the drug (the time it takes for the blood concentration to decline by 50%) may be altered. Failure to take these changes into consideration can result in drug toxicity, as is sometimes seen when a standard loading dose of digoxin is used. Changes in the half-life of a particular drug also will determine the specific dosing regimen for a patient. If the Vd of a hydrophilic drug (e.g. heparin) is increased, e.g. in heart failure, then the opposite effects occur.

$$t1/2 = \frac{0.693 \times Vd}{\text{clearance}}$$

Consideration of how a drug's volume of distribution may be altered in an elderly patient is an important component to help determine the proper drug dose for an individual. Drugs that have undergone study in elderly patients to determine how the volume of distribution will change because of aging, of which there are very few, can be dosed more precisely in this population. For drugs lacking such information, the dose should be started low and increased slowly to a clinically relevant target or to a well validated surrogate of a specific effect.

i.e. START LOW GO SLOW

4.2.3 Metabolism

The majority of drug metabolism occurs in the liver. A small amount occurs in the gut wall, the renal cortex and other organs such as heart and lung. Thus changes to these organs directly and indirectly via changes in blood flow, particularly the liver will have significant effects on drug metabolism.

Effects on the liver are multifactorial as the liver synthesizes proteins to bind to drugs, synthesizes enzymes to reduce or oxidize drugs to metabolize them and adds variety of water-soluble chemicals to lipid-soluble drugs to enable renal clearance. The effect on drug liver clearance is determined by the blood flow through the liver (*Q*) reflecting drug delivery to the liver, the fraction of drug in the blood that is free or not bound to plasma proteins and capable of interacting with hepatic enzymes (*f*) *and* the intrinsic ability of hepatic enzymes to metabolize the drug, which is commonly referred to as 'intrinsic clearance' (Cl_{int}). Intrinsic clearance is the ability of the liver to remove drug in the absence of flow limitations and binding to cells or proteins in the blood, both of which can be affected with synthetic impairment and liver cell integrity.

$$\text{Hepatic clearance}: \mathrm{Cl(h)} = Q\left[\left(f \times \mathrm{Cl}_{\mathrm{int}}\right)/\left(Q + f \times \mathrm{Cl}_{\mathrm{int}}\right)\right]$$

4.2.3.1 Importance of Synthetic Function

Synthetic ability reduces with age even regardless of comorbidity. It reduces even further with the development of chronic liver disease. In this state, reduced protein binding leads initially to high free fraction of a drug, which is the active moiety of the drug and the aspect that can cross membranes such as the blood barrier or in the kidney for the fraction excreted. However as discussed above, for most drugs the higher the free concentration, the more the amount that is renally cleared. However, the increased filtration is not instant; therefore elderly people are at short-term risk for toxicity from higher free fractions of drugs if the synthetic capacity of the liver is impaired.

4.2.3.2 Importance of Hepatic Metabolic Process

The liver undertakes various reactions to complete the metabolic transformation process, which can be impaired in liver impairment. Oxidative reactions (Phase 1)

may occur via oxidation, reduction, hydrolysis or other types of chemical conversions and create both active and inactive metabolites. Thus a drug activity can be increased or decreased if the Phase I machinery is impaired. Phase 1 reactions typically involve cytochrome P450 monooxygenase (CYP450) enzymes, of which there are various types that have a role in drug metabolism. The majority of these enzymes are in the liver; however there are little pockets of them throughout the body, in the kidney, gut, brain and lung. The CYP450 system is also where many drug–drug interactions occur, because various drugs can act as inducers or inhibitors of other drugs undergoing metabolism causing higher or lower concentrations than expected. Some drugs must be converted via the liver to the active form of the drug (prodrugs).

Phase 2 reactions are conjugative. Products of conjugation reactions have increased molecular weight and are usually inactive, unlike Phase 1 reactions, which often produce active metabolites. Some drugs undergo both Phase 1 and 2 metabolisms.

Alteration of the normal metabolic process can significantly affect the pharmacokinetics of a drug. If the normal route of metabolism is slowed in any way, then the half-life of the drug may be prolonged such that the concentrations increase (particularly if the dosing interval stays the same, whilst the elimination time is increasing). If the process is sped up in some way, then the half-life of the drug is reduced, and the effectiveness of the drug will be reduced, unless the dosing frequency increases.

Metabolism is affected not just by organ dysfunction but also by other changes that occur with aging. These include diet (alcohol and nutritional status), sex and the presence (or absence) of interacting drugs including cigarettes. They are also caused by aging itself, such as a reduced hepatic blood flow, liver mass and intrinsic metabolic activity (includes the CYP450 enzyme system). Phase 1 reactions are affected much more than are Phase 2 reactions. With a reduction of blood flow to the liver and a reduction in metabolic activity, the metabolic process is significantly reduced in older adults. This means that active parent drugs have a reduced clearance if they are predominantly liver cleared.

All of these effects are variable. Thus it is difficult to measure the extent of hepatic function reduction and then quantitate this effect so that doses can be calculated based on this. Because age, sex, genetics and other variables play such major roles in metabolic capacity, any formula for dose calculation based on hepatic function alone would be inaccurate. This is different to renal impairment where serum creatinine can be used to estimate clearance of renally cleared drugs. Having stated that no precise formula can be established based on liver function, the doses of hepatically cleared drugs in elderly patients should be reduced. Although the exact amount of reduction needed is unknown, the dose should be titrated to a known therapeutic range, if known, or to measurable efficacy or adverse effects.

4.2.4 Excretion

Elimination of drugs from the body occurs primarily via renal excretion and in the faeces. As most drugs cleared faecally are already metabolized to an inactive

metabolite, clinically significant reduced excretion with age is predominantly due to changes in liver physiology (covered above) and renal function. The renal decline is the result of several physiological changes including a reduction in blood flow to the kidneys, a decrease in kidney mass and a reduction in the size and number of functioning nephrons. Unlike hepatic effects, these changes are consistent from one patient to another and can be estimated using the Cockcroft–Gault equation, an equation validated for muscle mass, based on age, weight and sex.

$$\mathrm{CrCl(CG)} = \left[(140 - \mathrm{age}) \times \mathrm{wt\,(kg)} \times F \right] / (\text{plasma creatinine in } \mu\mathrm{Mol} \times 0.8136)$$

where $F = 1$ if male and 0.85 if female.[2]

The Cockcroft–Gault equation remains the gold standard after almost 40 years, despite inaccuracies that arise from variations in body composition among patients. The calculation still remains better than estimated GFRs (eGFR) for drug dosing generally; however [2] for the elderly specifically, due to the incorporation of actual weight, age and gender and fraction of drug excreted unchanged, all correlates of drug clearance. Cockcroft–Gault can be used to estimate functioning kidney function and therefore a guide as to how much dose reduction needs to occur. It can be seen that serum creatinine is important to include in this formula as in elderly adults a low serum creatinine concentration is not indicative of normal renal function due to lower muscle mass. For patients in whom serum creatinine may not be an accurate indicator of renal function, an actual 24 h creatinine collection may be necessary.

Some drugs have a high fraction excreted unchanged, i.e. without metabolism to become inactive. Thus impaired renal function with these drugs will lead to high concentrations and the risk of toxicity if the dose is not reduced or the dosing interval increased. Commonly seen toxicity in the elderly from this route includes enoxaparin, digoxin, gentamicin, some ACE inhibitors and morphine. As with metabolism, the half-life of drugs is increased as renal function is reduced.

The effect of reduced renal clearance of predominantly renally cleared medications with age can be very clinically significant, e.g. with allopurinol which has a fraction excreted of 100%. Many drugs are completely or partially excreted by the kidneys unchanged (i.e. not metabolized in the liver to a non-toxic compound). Other drugs are metabolized, and these metabolites are then excreted renally. If these metabolites are active then renal impairment can cause significant toxicity, e.g. as with morphine. Thus an awareness of which drugs are excreted predominantly renally and understanding how to adjust the doses of those drugs in patients with renal impairment are imperative to ensure safe and effective drug dosing in all patients, but particularly in the elderly.

In summary, altered pharmacokinetics is observed in most older patients, even when healthy. This significantly affects the particular pharmacokinetics of a drug, the clinical relevance of which depends on whether the drugs are lipophilic, hydrophilic and/or predominantly renally cleared unchanged. These changes are

[2] Nephron 1976;16:31–41.

Table 4.1 Summary of changes in PK processes as people age

	Lipophilic	Example	Hydrophilic	Example
Absorption	Increased	Metoprolol	No change	Amoxycillin
Distribution	Reduced	Diazepam	Increased	Enoxaparin
Metabolism	Reduced	Alcohol	No change	Gentamicin
Excretion	Unchanged	Atorvastatin	Reduced	Allopurinol

Relative importance of the changes depends on the size of the drug, the lipophilicity of the drug and the physiological state of the patient. There may be multiple competing processes going on for each PK parameter concurrently and multiple comorbid conditions which affect the below processes

summarized in Table 4.1. Overall, in terms of the pharmacokinetic parameters ADME, drug absorption is probably least affected by aging; however additive concomitant medications that alkalize the gut or slow transport time can have significant clinical effects.. It can be difficult to calculate the doses of drugs that are cleared by the liver, or measuring liver function (as is done with renal function), so reducing the dose and closely monitoring the patient both clinically and through drug concentrations if appropriate and available is often prudent. Drug doses are more easily adjusted for drugs excreted renally based on current drug information. Renally excreted drugs must be monitored closely and their doses adjusted when needed.

4.3 Pharmacodynamics

Pharmacodynamics is the study of the effect of a specific drug on the body. This includes the effect of the drug on receptors, cell signaling pathways or other specific or non-specific targets. Aging may induce more or less sensitivity to particular medications depending on their target and location. This is clinically more obvious for drugs that affect the cardiovascular and/or central nervous systems, probably due to the smaller therapeutic index than other drugs such as antimicrobial drugs. This process may be caused by the effects that certain drugs have on receptor sites. The number of receptor sites also may change over time, particularly in the central nervous system, affecting efficacy.

However predicting the rate and extent of pharmacodynamic changes can be difficult due to multiple systems and the process of aging itself, changing at different rates.

Further some pharmacodynamic effects are attenuated or exaggerated depending on concomitant drugs and other variables. However because the elderly can have significant morbidity, whenever drugs are started, pharmacodynamic interactions should be actively looked for. Further the drug should be started at a low dose and titrated slowly. This enables an understanding of whether a new symptom is a new illness (which may encourage a new drug to be started) or rather a side effect of current therapy (which may encourage drug reducing or ceasing).

i.e. START LOW GO SLOW

An example of this would be starting beta blockers, metformin, or first dose of some ACE inhibitors. The elderly should be advised of the possible side effects and to take appropriate precautions such as sitting down when commencing new therapies.

4.3.1 PD Changes That Cause Adverse Drug Effects

As the receptor density and downstream signaling affect changes with age, the elderly can be at high risk for certain drug adverse effects (ADEs). Symptoms in the central nervous system, including dizziness, sedation, seizures and confusion, are commonly provoked by medication with anticholinergic, histaminergic, dopaminergic and opioid effects, which includes many pain relievers, antidepressants and 'behavioural' medications (such as low-dose antipsychotics). These effects pose particular problems for elderly patients, who can be extremely sensitive to any drug-induced action on the central nervous system. Often also, the drugs have not been formally tested in the elderly, so the relative benefit and risk in this group have often never been measured. Drugs that commonly cause PD adverse drug effects are those with anticholinergic or antihistaminic activity—these frequently cause urinary retention and confusion in the elderly. The elderly may have stiff arteries; therefore drugs that reduce afterload abruptly may result in significant coronary or cerebral arterial symptoms.

Other drug induced pharmacodynamic effects manifested by aging include drug-induced renal toxicity, which can be a major issue, especially in elderly patients who already have renal problems.

Receptor sensitivity may also wane with age; e.g. beta blockers are known to have a diminished cardiac effect in some older people, possibly because of a loss of binding affinity with the receptor. However higher doses can cause noncardiac (e.g. vascular) toxicity. Thus gradual titration of doses and patient monitoring will ensure that the correct starting dose is prescribed.

4.3.1.1 Adverse Drug Reactions (ADRs)

ADRs are considered the sixth leading cause of death in Australia. The risk for developing an ADR is much higher in elderly adults than in the general population, and this increased risk translates into greater mortality for elderly patients. The overall risk for developing a *serious* ADR is estimated to be 6.7% of hospitalized patients [3], and the risk for *any* ADR is higher. The risk of ADR in the elderly is likely to be higher still, with *severe* ADRs accounting for 15–24% admissions in the elderly [4].The majority of ADRs requiring hospitalization are likely to be preventable. The total annual direct medical cost of medication-related problems in the United States is estimated to be $104.2 billion. Much of this cost occurs in elderly patients.

In developed countries, approximately 30% of patients aged older than 65 years use five or more prescription medications per week [5]. The sheer number of medications used by elderly patients contributes much to the development of ADRs [6].

ADRs that affect functional status are frequently observed in elderly patients. The following reactions are common:

- Anticholinergic symptoms
- Mental status changes
- Orthostatic hypotension
- Mood and behaviour changes
- GI tract disturbances (constipation or diarrhoea)

A common cause of adverse drug reactions in elderly patients is exaggerated effect. For example, many patients, e.g. taking older antidepressants, have some postural symptoms. However younger people can generally compensate for these symptoms; therefore the phenotype of the ADE is much more significant for older people.

4.3.1.2 Drug Interactions

Another common cause of adverse drug reactions in the elderly is drug interactions. This is not surprising considering that the number of medications taken by many elderly patients is high. Various studies have documented a direct correlation between number of medications and the risk of an adverse drug reaction [7]. The reasons are multifactorial but include:

1. Each drug has its own adverse effect profile—both due to known and exaggerated effects on the receptor or pathway being blocked.
2. Multiple enzymes or pathways being blocked in the same system (e.g. blocking all of serotonin, histamine, cholinergic systems in the CNS can have exponentially additive side effects—these are called pharmacodynamic adverse effects).
3. Pharmacokinetic adverse effects usually whereby one medication induces or inhibits the metabolism of another drug, thereby raising or reducing concentrations by a clinically relevant amount.

Further, many medications induce problems because they can aggravate a specific disease state whilst treating another problem. Although this issue is not confined to the elderly, it is observed much more frequently in the elderly because of the lower threshold for tolerating side effects and because the elderly patients have various comorbidities so the likelihood of interaction is much higher.

4.3.2 Polypharmacy and Hyper-polypharmacy

Polypharmacy may be defined as the number of medications (e.g. using a large number of different medications prescribed by different providers), the necessity of the medications that are prescribed or the complexity of a patient's problems. Whatever the definition, polypharmacy is an important issue in elderly patients. Hyper-polypharmacy, defined as more than ten medications, is even more of a problem due to the exponential risks of drug interactions.

Causes of polypharmacy are numerous, but most revolve around the absence of a clear plan of treatment and up-to-date communication with the patient's primary care provider [6]. This is particularly a problem if that patient has been seeing a specialist for a long period of time for an acute illness which has subsequently developed into a chronic phase, not requiring specialist oversight anymore.

Lastly, effective communication between all of patient's healthcare providers, including allied health that are prescribing in some countries, is key to eliminating this problem. One simple recommendation is to ask every patient to bring all of his or her current medications to each doctor's visit so that the physician can thoroughly review the medications being taken. A key decision maker over medicines has to be able to scrutinize the decisions that are contentious in line with patient wishes and plans for future healthcare.

4.3.2.1 Compliance

Compliance with the care that is recommended to a patient is a significant barrier to realizing healthcare outcomes with medicines generally, but more so with the elderly due to issues around understanding, communication, language barriers, social and cultural issues, monetary problems and occurrence of side effects which are not always relayed to the medical practitioner.

Poor compliance in elderly adults also may be a product of health literacy. Studies have shown that as health literacy declines in older people, mortality increases. Several issues related to health literacy affect older adults, including declining vision, poor education, language barriers and mental health issues (e.g. dementia, depression and anxiety). All of these should be considered and addressed. Involvement of family members is pivotal to the communication and understanding, particularly with the elderly.

4.3.3 Appropriate Medication Decision Support

Doctors can use a number of tools to make appropriate medication decisions for their elderly patients. There are recent algorithms with points for practitioners to consider when making decisions to start or stop therapies [8]. Beers criteria are a list of medications that, based on the drugs' pharmacology (e.g. mechanism of action, pharmacokinetics, adverse effect profile), may cause adverse effects in older people. The list was initiated in 25 years ago, and the American Geriatrics Society completed an update in 2012 [9].

However as all drugs can cause side effects when used inappropriately and prescribers find it difficult to memorize lists of drugs, more general guidance is probably more appropriate.

Similar to these tools, the screening tool of older persons' prescriptions has been used in a number of settings. Rather than a simple checklist of medications, it links the use of a drug with a specific patient who has specific comorbidities. However the risk benefit of a specific drug and the patient-requested goals or care are independent and individual decisions that must be considered for every patient and reviewed regularly.

Whichever tool is used, the primary purpose is to prescribe medications to all elderly patients with care and consideration, which ensures that each older adult patient is provided with the appropriate medication for them in their current situation.

4.4 Summary

On review, the benefit of most of the therapies on the medication list of the 82-year-old frail women with diastolic heart failure and stable angina on presentation was unknown. Specifically, the benefit of a highly potent statin used well above the ED50 was unknown but likely to be more on the side of harm than benefit [10]. After stopping her opiate for which she was taking for back pain, she was quickly responsive to physiotherapist-designed exercise programme; citalopram was also considered no longer needed.

Stopping the opiate also appeared to improve cognitive function and movement initiative in the ward. The diuretic was continued. Paracetamol was also ceased. As her blood pressure showed orthostatic changes common in the elderly, and aware of the presenting complaint being a fall, metoprolol was gradually weaned back to 25 mg BD. The atrial fibrillation rate remained controlled at this dose. Discussion was with the general practitioner regarding stopping of the digoxin and gradual weaning of temazepam over time. INR was monitored in hospital and whilst unstable initially with intermittent oral (food/drink) intake stabilized at 2 mg daily. ISMN was left unchanged at 60 mg with a note to reduce if postural hypotension became a future issue. Allopurinol dose was increased to every day due to improved renal function post-ceasing medication and the reported compliance difficulty of a dose every second day.

Esomeprazole was weaned and stopped gradually over 2 weeks; a lower pH would help absorb other medications in the manner studied in drug clinical pharmacokinetic studies. Ramipril was continued. Cetirizine was ceased; the patient concurrently had functional improvement and reduced nausea after that time. Although a specific cause was not found, with ceasing the above medicines, the patient's food enjoyment returned and she was able to stop the metoclopramide. A peripheral neuropathy was diagnosed; work up was positive only for a folate deficiency. The cause of the falls was put down to postural hypotension and cognitive dysfunction due to polypharmacy. The finding of proprioceptive deficiency was also a contributor.

A review for the GP was organized for 2 weeks. At that point, a discussion was held with the patient regarding goals of therapy. The patient requested symptom improvement and reported a fear of future falls. The regular cardiology and rheumatology (for gout) reviews were therefore cancelled. Although no more falls had occurred and the patient's postural blood pressure drop had reduced to 15 mmHg, the warfarin was ceased on request of the patient. The patient agreed to return in 3–6 months for review of the temazepam, ramipril and folate.

Follow-up medication chart

Frusemide	40 mg	BD
Metoprolol	25 mg	BD
Temazepam	5 mg	Nocte (reducing)
Allopurinol	50 mg	Daily
Isosorbide mononitrate	60 mg	Mane
Nitrolingual spray	1 puff	As needed
Ramipril	1.25 mg	Nocte
Folate	5 mg	Mane

Overall ensuring patients have the appropriate medication for them in their current situation will result in patients who have their diseases managed better, are happier, have less polypharmacy and fewer adverse drug effects, and whilst not specifically discussed, lower healthcare costs will be evident due to less ADEs, improved community engagement and volunteer work opportunities, less nursing home requirements and less costs of unnecessary drugs. An understanding of the complex physiological and pharmacological changes that are occurring as people age is also mandatory for anyone prescribing in the elderly.

Glossary

ADE	Adverse drug event
ADR	Adverse drug reaction
BD	Twice daily
Cl	Clearance
e.g.	For example
GP	General practitioners
i.e.	That is
PD	Pharmacodynamic
PK	Pharmacokinetic
PPI	Proton pump inhibitor
PRN	As needed
t1/2	Half-life
TDS	Three times daily
Vd	Volume of distribution

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The Problem of Delirium in the Elderly

5

Suzanne Wass

Key Points

- Delirium in the elderly is common and all elderly people presenting with confusion should be presumed to have delirium until proven otherwise.
- Delirium in older people is multifactorial. Particular attention should be made to identify all precipitating factors, and targeted treatment should be given for reversible causes.
- First-line management for the symptoms of delirium should focus on non-pharmacological strategies.
- Sedative medication should be used as a last resort and reserved for those with severe agitation or distressing symptoms, whose behavioural disturbances may pose a risk to themselves or others.
- Delirium screening and prevention strategies should be maintained throughout the patients' journey to minimize the long-term risks of increased mortality, cognitive and functional decline and the psychological impacts that are associated with an episode of delirium.

Case Study

Mr. R is an 86-year-old gentleman, living in a regional Australian town. He was previously independent with activities of daily living (ADLs), driving a car and caring for his wife who has significant physical disability and not known to have underlying cognitive impairment. He was admitted to a tertiary hospital under the surgical team with scrotal cellulitis, dehydration and mild renal impairment. Staff on the surgical ward initially noticed he was withdrawn and asked repetitive

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questions but put this down to his age and failing memory. One week into his admission, his behaviours escalated. He became agitated and impulsive and fell on the ward. He had complete reversal of his sleep/wake cycle and became intrusive to other patients. At this point the surgical team asked for a geriatrician consult and joint care was organized. Delirium was diagnosed (using the CAM) and staff initiated non-pharmacological management of his delirium. He was moved to a quiet room; a clock and communication board were organized. Extra nursing supervision ensured he was hydrated, with adequate pain control, and nursing staff initiated management of constipation. Unfortunately he continued to be intrusive to other patients and became agitated and distressed when redirected. Therefore his behaviour was mapped so that the geriatrics team were able to initiate low-dose-targeted antipsychotic medication (in this case risperidone). After a few days, his agitation settled, but he continued to have a disturbed sleep pattern and impulsive behaviours and required assistance with ADLs. After discussion with his family, he was discharged into a residential facility with outpatient geriatrician follow-up and a plan to wean him completely from the antipsychotic medication. This was achieved 8 weeks later, and after 3 months his delirium had resolved to a point that he was able to return home.

Delirium is a geriatric syndrome, also known as acute confusional state, organic brain syndrome, postoperative or ICU psychosis and acute brain failure [1]. It is often the first sign of acute illness in the older person and constitutes a medical emergency. Delirium is characterized by acute onset of confusion, over hours or days, with fluctuating levels of consciousness, distractibility and inattention. It has many causes and is potentially reversible with early detection, multicomponent management strategies and direct treatment of underlying causes. Delirium is common, affecting 10–40% of medical inpatients, with increased prevalence in certain populations such as postoperative patients (30–50%), ICU (up to 80% in ventilated patients), oncology and palliative care units [2, 3]. The point prevalence of delirium in the community is 1.1% in those over 55 years, raising to over 14% in the over 85 age group, with a reported incidence in residential aged care facilities to be above 60% [4, 5]. Delayed diagnosis can have serious consequences such as increased length of hospital stays, increased mortality and increased risk of placement into residential care [6]. "The cost to the healthcare system is substantial. Estimated direct healthcare costs in the US are around US$ 150 billion per year (Leslie and Inouye), and in Australia costs exceed AU$ 150 million per year (AIHW)"

(Leslie DL, Inouye SK. The Importance of Delirium: Economic and Societal Costs. J Am Geriatr Soc. 2011; 59(Suppl 2): S241–S243. doi:10.1111/j.1532–5415.2011.03671.x. Australian Institute of Health and Welfare. Dementia in Australia. Canberra: Commonwealth of Australia, 2012).

5.1 Definition, Classification and Clinical Features

The definition of delirium, as described by The American Psychiatric Association in the fifth edition of the *Diagnostic and Statistical Manual*, DSM-V, is as follows [7]:

- A disturbance in attention and awareness. For example, reduced ability to direct, focus, sustain and shift attention.
- The disturbance develops over a short period of time (usually hours to days), represents a change from baseline and tends to fluctuate during the course of the day.
- There is an additional disturbance in cognition. For example, memory deficit, disorientation, language, visuospatial ability or perception.
- The disturbances are not better explained by another pre-existing, evolving or established neurocognitive disorder and do not occur in the context of a severely reduced level of arousal, such as coma.
- *There is evidence from the history, physical examination and laboratory findings that the disturbance is caused by a medical condition, substance intoxication or withdrawal or medication side effect.*

Delirium can be classified according to aetiology; however, it is more useful to classify delirium into three clinical subtypes [8–10]:

Classification according to aetiology:

1. Delirium according to a general medical condition
2. Substance intoxication delirium (drugs of abuse)
3. Substance withdrawal delirium
4. Substance-induced delirium (including prescription medication)
5. Delirium due to multiple aetiologies
6. Delirium not otherwise specified.

Classification according to subtype:

1. Hyperactive delirium (30%): patients present with increased agitation, repetitive behaviours, wandering, hallucinations or aggression. These patients are difficult to manage in the community and often require admission into hospital.
2. Hypoactive delirium (25%): patients present with reduced psychomotor activity, reduced levels or consciousness or appear quiet and withdrawn. Hypoactive delirium is more difficult to detect and are associated with poorer outcomes due to delays in diagnosis.
3. Mixed pattern delirium (45%): this is the most common clinical presentation. Patients present fluctuating behaviours and levels of consciousness, are drowsy and withdrawn at times and hyper alert at others. The hyperactivity often follows a “sun downing” pattern with aggressive behaviours and wandering more common in the later afternoon and evening.

Other clinical features associated with delirium can be seen in Table 5.1. Delirium is a clinical diagnosis; there is no single laboratory test or investigation that will confirm the presence of delirium. Careful attention must be given to obtaining a history from carers, family and other medical practitioners who may have been involved in the person’s care. Delirium is often preceded by a prodromal illness of 1–3 day duration. Subsyndromal delirium resembles full delirium but with less

Table 5.1 Clinical features of delirium

Essential features	Variable features
Acute onset	Perceptual disturbance
Fluctuating course	Hyper/hypoactive
Inattention	Altered sleep/wake pattern
Disorganised thoughts/speech	Emotional disturbance
Fluctuating consciousness	
Confusion	
Potential examination signs	*Autonomic dysfunction*
Dysarthria	Tachycardia
Dysnomia	Hypertension
Dysgraphia	Sweating
Aphasia	Flushing
Nystagmus	Dilated pupils
Ataxia	
Tremor	
Myoclonus	

Adapted from: Inouye SK. Delirium in Older Persons. N Eng J Med 2006; 354 (11): 1157–1165

severity and has a core feature of inattention [11]. The patient may have subtle changes in personality or mood, become restless or appear anxious, develop urinary incontinence or act out of character (for instance, refuses to seek medical attention). This prodromal illness is often reported in hindsight by family or carers but can be very difficult to detect clinically.

5.2 Causality and Pathophysiology

The pathophysiology of delirium is poorly understood. Proposed mechanisms have included deficiency of acetylcholine, dopamine excess and other neurotransmitter changes, inflammatory processes, metabolic derangement, electrolyte disorders and genetic factors [12]. However, the hypothesis that uncompensated central anticholinergic activity can precipitate delirium is considered the most important. Raised levels of serum anticholinergic activity have been demonstrated in patients with postoperative delirium and are thought to be precipitated in response to acute physiological stress, fever, infection or medication. Patients, who are unable to compensate for the raise in anticholinergic activity in the brain, for example, those with underlying cognitive impairment or dementia, develop the clinical signs of delirium [13]. Reduction in serum anticholinergic activity has been demonstrated with resolving delirium symptoms. Neuroinflammation is also implicated in delirium, with elevated levels of interleukin-1B, and consequently, cortisol, found in the CSF of patient's post-surgery for hip fracture [14]. The inflammatory cascade is thought to disrupt the blood brain barrier, causing cytokine activation and neurotransmitter deregulation. This type of CNS insult may explain why not all episodes of delirium are fully reversible [15].

Delirium in the older person is often multifactorial (see Tables 5.2 and 5.3). A person is at risk when underlying cognitive impairment or dementia is present, or with increasing age, functional dependence, multiple comorbidities or multiple medications. When admitted to a hospital, patients at risk of delirium should be identified and multicomponent prevention strategies should be implemented (see Table 5.4). These strategies should focus particularly on hydration (oral, intravenous or subcutaneous fluids and assisted feeding programmes if necessary), correction of sensory impairment (visual aids, portable amplifying devices, modified equipment such as

Table 5.2 Common risk factors for delirium [16–19]

Non-correctable	Correctable	Potentially correctable
Age	Malnutrition	Uraemia. Blood urea >10
Male	Dehydration	Depression
MCI/Dementia	Low albumin	Acute CVA
Parkinson's disease	Social isolation	Prolonged hospital stay, >9 days
Renal and hepatic disease	Sleep deprivation	Severity of acute illness
History of CVA	Hospital environment	Urinary incontinence
History of falls and poor mobility	Physical restraint	
Previous episode of delirium	Indwelling medical devices (IDCs, cannulas)	
Previous functional dependency	New addition of three or more medications	
	Polypharmacy	
	Sensory impairment	

Table 5.3 Common precipitants of delirium [1, 10]

1. Medications: polypharmacy, addition of new medication, withdrawal of prescription medication, benzodiazepines, anticholinergics, OTC and herbal medications, substances of abuse
2. Alcohol intoxication or withdrawal, nicotine withdrawal [25]
3. Sepsis, systemic illness, hypotension
4. Hypoxia, hypothermia, hypoglycaemia
5. Dehydration, anaemia
6. Electrolyte disturbance (calcium, sodium, phosphate, magnesium)
7. Nutritional deficiencies (thiamine, B12, folate)
8. Acute liver or renal failure. Acute cardiac events have not been shown to be associated with delirium [15]
9. CVA, seizures, vasculitis, encephalitis, meningitis
10. Pain and analgesia
11. Constipation, urinary retention
12. Surgery, especially cardiac and orthopaedic. ICU admission and ventilation
13. Cancer and terminal illness, brain metastasis
14. Exposure to the unfamiliar hospital environment and multiple moves around the hospital [26]

Table 5.4 Prevention strategies [20–24]

Patient targeted:
• Correction of sensory impairment
• Hydration, nutrition
• Orientation to time, place, person (provide a clock)
• Monitor, investigate and treat pain, including the use of non-pharmacological pain management
• Enablement plans to maintain function and mobility
• Maintain continence with regular toileting, monitor bowels
• Avoid physical restraint and indwelling medical devices such as urinary catheters and intravenous cannulas
• Have awareness and respect for cultural and religious sensitivities
Environmental:
• Orientation to the hospital environment and reduce the number of room moves around the hospital
• Provide personal items (i.e. photographs) familiar to the patient
• Minimize noise
• Maintain sleep/wake cycle
Medication:
• Review medications and de-prescribe if possible
• Identify high-risk medication (such as benzodiazepines, anti-cholinergics)
• Monitor for potential medication withdrawal
Identify and treat reversible medical problems:
• Dehydration, malnutrition
• Electrolyte abnormalities
• Hypoxia, hypotension
• Renal impairment
• Urinary retention, constipation
• Depression, emotional distress
Education:
• Education across all staff to promote awareness and early detection of patients at risk
• Development of local best practice guidelines
• Identify “champions” to lead implementation of prevention strategies

large print information booklets), enablement and mobility, maintenance of the sleep/wake cycle (noise reduction, relaxation techniques), cognitive stimulation (communication boards, reorientation, cognitive stimulating activities such as word games or discussion of current events), medication (avoidance and review) and avoidance of unnecessary indwelling medical devices such as urinary catheters and intravenous cannulas [16]. Multicomponent intervention strategies are effective and have been shown to reduce incident delirium in hospitalized patients by 30% [22, 23], with similar results shown in patients offered with proactive comprehensive geriatric assessment [24].

5.3 Detection

Despite validated tools to detect delirium and more awareness of the syndrome, 30–67% of delirium in medical inpatients remains undetected, leading to potential complications and prolonged inpatient stays [9, 27]. Gold standard for diagnosis would be with comprehensive geriatric assessment and use of the DSM-V diagnostic criteria for delirium. However, this is time-consuming and not always practical in an acute setting. The Australian and New Zealand Society for Geriatric Medicine [28], the American Geriatrics Society [29] and the British Geriatric Society [30] all recommend the confusion assessment method (CAM, see Table 5.5) as a validated screening tool to detect delirium in elderly patients. The CAM, unlike the MMSE or clock-drawing test, was designed specifically to detect delirium and is user friendly but requires initial training. It has a pooled sensitivity of 82% in medical and post-surgical patients and a specificity of 99% [31]. The original CAM has also been adapted into over ten languages and validated for use in other settings [32], such as the CAM-ICU (for ventilated patients), CAM-ED, nursing home CAM and the family CAM for carers of elderly people living in the community [33]. Interestingly, reasonable sensitivity and specificity in detecting delirium have been obtained through simple screening questions aimed at family and carers. The single question in delirium [34], "Do you think [name] has been more confused recently?" demonstrated a sensitivity of 80% and specificity of 71% in small trials of oncology patients. It has potential as an initial screening tool, particularly in "time poor" environments such as the ED or GP surgery, but should be followed up with further screening and assessment if positive.

Table 5.5 Confusion assessment method

1. *Acute and fluctuating course*
• Is there a change in cognition from the baseline?
• Does this fluctuate during the day?
2. *Inattention*
• Does the patient have difficulty focusing attention?
• Do they seem distracted?
• Is concentration poor?
3. *Disorganized thinking*
• Does the patient have disorganized thinking, rambling speech, or are they incoherent?
4. *Altered level of consciousness*
• Is the patient hyperalert? (i.e. wandering, agitated, aggressive)
• Is the patient hypoalert? (i.e. drowsy, lethargic, stupor, coma)

Answer YES to questions 1 and 2, plus either 3 or 4 = indicates delirium

Adapted from: Inouye SK et al. Clarifying the confusion: the Confusion Assessment method. A new method for the detection of delirium. Ann Intern Med 1990; 113: 941

5.4 Differential Diagnosis: Delirium, Dementia and Depression

The clinical overlap between delirium, dementia and depression is complex and can present a diagnostic dilemma to the clinician. Forty-two percent of patients referred to specialist psychiatry services with suspected depression actually have delirium [35], with similar percentages of medical inpatients suffering from depression [36]. Like delirium, depression in the elderly is a common syndrome, with reported point prevalence of major depressive disorder over 9%, increasing to 37% when subthreshold or minor depressive symptoms are included [37]. In a similar way to delirium, risk of depression is increased with multiple comorbidities such as Parkinson's disease, cerebrovascular disease, cognitive impairment and dementia. Conversely, depression in later life doubles the risk of developing dementia [38]. The clinical features of all three overlap considerably, and a careful history must be obtained from family, carers and other medical practitioners to allow accurate diagnosis (see Table 5.6). The range of presenting features for all three conditions can include agitation, depressed mood, cognitive disturbance, anger, euphoria, hallucinations and delusions. In particular hypoactive delirium with psychomotor retardation can be extremely difficult to differentiate from a major depressive disorder. The rate of onset of symptoms and their pattern of fluctuation throughout the day can give a clue to their aetiology, with acute presentations and rapid fluctuations of symptoms more likely to indicate delirium as the primary diagnosis. Disturbances of mood are likely to be more sustained with depression. Once again, sleep disturbance can be a feature of delirium, depression and dementia, but whereas delirium and dementia can cause complete reversal of the sleep/wake cycle, depression tends to precipitate as initial or late-onset insomnia. Characteristics of psychosis also differ between the syndromes. Typical psychosis of delirium features simple delusions, often related to the environment (i.e. belief that nurses are poisoning them or that they are in prison, not hospital), and visual and tactile hallucinations such as insects on the skin. Psychosis in depression is more complex, often with its roots in reality, and featuring themes of guilt and worthlessness. Persistent thoughts of death and self-harm also occur in over 50% of patients with delirium and are not always a defining symptom of depression [35].

The clinical overlap between delirium and depression is unsurprising when you consider the pathophysiological pathways involved. Both delirium and depression are linked with alterations is neurotransmitters, abnormal inflammatory responses (as shown by inflammatory markers in the CSF) and abnormal response to acetylcholine activity [38]. In addition, high levels of plasma cortisol, and the failure of dexamethasone to suppress endogenous cortisol production, occur in delirium, depression and severe dementia [39] and may represent a prolonged stress response in these syndromes.

Of course, these conditions do not occur in isolation, and it is quite likely that a majority of patients are suffering from coexistent conditions. Both delirium and depression are potentially reversible, and some patients may benefit from treatment of both disorders. If pharmacotherapy for mood disorder is required, antidepressants with high anticholinergic burden should be avoided, so as to not exacerbate the symptoms of delirium. Although there are case reports in the literature of ECT use

Table 5.6 Delirium, dementia and depression

	Delirium	Dementia	Depression
Onset	Acute	Insidious	Variable, insidious
Course	Fluctuating	Progressive	Diurnal variation
		Increased agitation in evenings	
		(sundowning)	
Consciousness	Clouded	Clear	Clear
	Lethargic, stupor, coma	May become clouded in later stages	
Attention	Distractibility	Normal	May be poor
	Inattention		
Memory	Poor STM	Poor STM	STM usually normal
		Variable cognitive deficits depending on pathology of dementia	
Thinking	Disorganised, incoherent	Difficulty with abstract thought	Intact
			May have thoughts of low worth, guilt or
			hopelessness
Perception	Misinterpretation	Hallucinations and delusions more	Complex delusion
	Simple hallucination/ delusions	common in later stages, or with	Paranoid psychosis
		Lewy body pathology	
Sleep pattern	Reversal of sleep/ wake cycle	More common in later stages	Initial or late onset insomnia
		reversal of sleep/wake cycle	
Cognitive testing	Distracted	Attempts to comply and find answers	Poor motivation
	Unable to complete MMSE		"I don't know"
Physical symptoms	May indicate underlying cause	Non-specific	Fatigue, poor appetite, weight loss
		In later stages, fatigue, weight loss,	
		anorexia	

Adapted from: Milisen K, Braes T, Fick DM, Foreman MD. Cognitive assessment and differentiating the 3 Ds (dementia, depression, delirium). Nurs Clin North Am 2006; 41: 1–22

in delirium, routine use cannot be recommended due to insufficient evidence. It does, however, remain a treatment option for treatment-resistant depression [40]. Coexistence of delirium and depression has a significant impact on prognosis and care needs, with a fivefold increase in mortality and nursing home placement and a threefold risk of functional decline at 1 month post discharge, when compared to either syndrome in isolation [41].

5.5 Investigation and Non-pharmacological Management

Extra attention should be given to identifying all potential causes of delirium (see Table 5.3), and targeted treatment should be given to any reversible causes. A comprehensive history from family, carers and the general practitioner should be obtained as soon as possible and should include details on the patient's baseline function and cognition, including any previous formal cognitive testing. A full medication review, aimed at rationalization and de-prescribing, should be performed on all patients. Baseline observations, such as pulse, BP, oximetry, BSL, ECG and urinalysis, should also be performed in all patients, with further investigation targeted to any suspected causes. Routine workup also includes full blood count, electrolytes and renal function, calcium, thyroid function, urine culture, liver function tests and chest X-ray (see Fig. 5.1). A CT brain is strongly indicated where there are focal neurological findings, a history of falls, anticoagulation or signs of meningism. Consideration should be given to a subsequent MRI brain in patients with prolonged delirium (and no obvious precipitant), a history of cancer and suspected cerebral metastasis or focal neurological signs [28]. A lumbar puncture is indicated in patients with headache, signs of meningism or pyrexia of unknown origin. It is worth remembering that older people often do not present with the classical symptoms of meningitis or encephalitis, and acute confusion may be the only presenting symptom. Clinicians should weigh up the indications for lumbar puncture, with the risk and benefit to the patient, bearing in mind that delayed investigation will reduce the likelihood of accurate diagnosis [42]. Routine EEGs are not recommended and have a low accuracy for detecting delirium in the elderly but may be useful in diagnosing suspected seizure disorders causing delirium. In the delirious patient, EEGs show non-specific findings of global slowing, loss of posterior background rhythm and intermittent delta activity, particularly in the frontal region. However, these findings may be useful in differentiating patients with delirium superimposed on dementia and those with dementia alone, where positive EEG findings are not seen [43]. It may also assist in differentiating non-convulsive status epilepticus from catatonic depressive episodes, which may clinically resemble hypoactive delirium [44].

First-line treatment of the symptoms of delirium should be with multicomponent management plans (see Fig. 5.2) along similar lines to prevention strategies. Whereas prevention strategies have shown a reduction in delirium incidence in several clinical trials, once delirium develops, intervention programmes are less effective. Study results have been varied. Some have shown improvement in the severity of delirium symptoms after nurse-led comprehensive delirium programmes [45, 46] and a reduction in falls and trend towards a reduced length of stay [47], but others have failed to show a reduction in hospital mortality, 6-month mortality and admission into residential care [48, 49], nor have they shown an impact on the frequency or recurrence of delirium [20, 21]. Positive outcomes and reductions in mortality have been seen, however, in specialized units such as close observation units [50] (designated areas on general medical wards, with increased nurse-to-patient ratios and comprehensive management programmes), orthogeriatric units

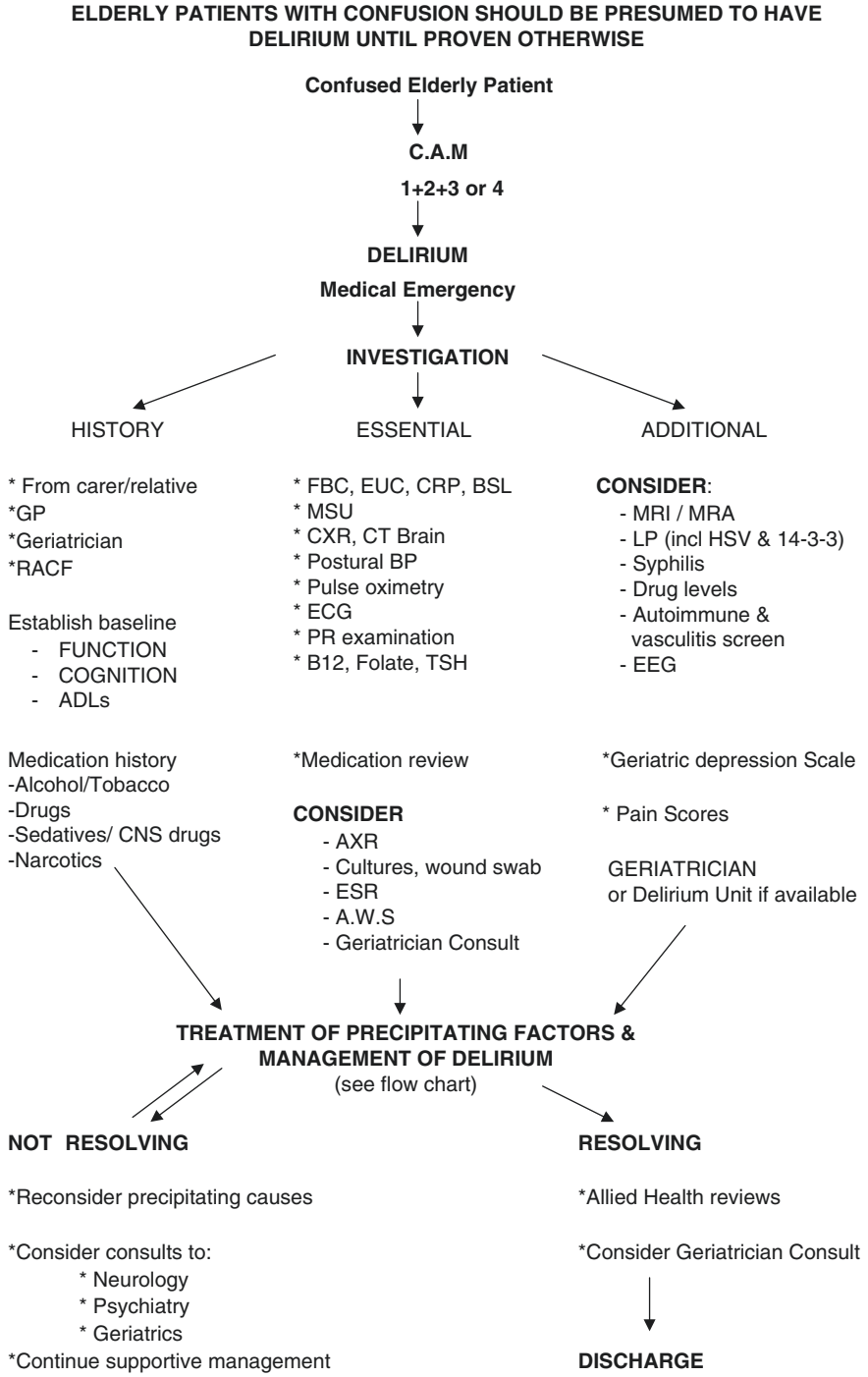

Fig. 5.1 Delirium investigation flow chart

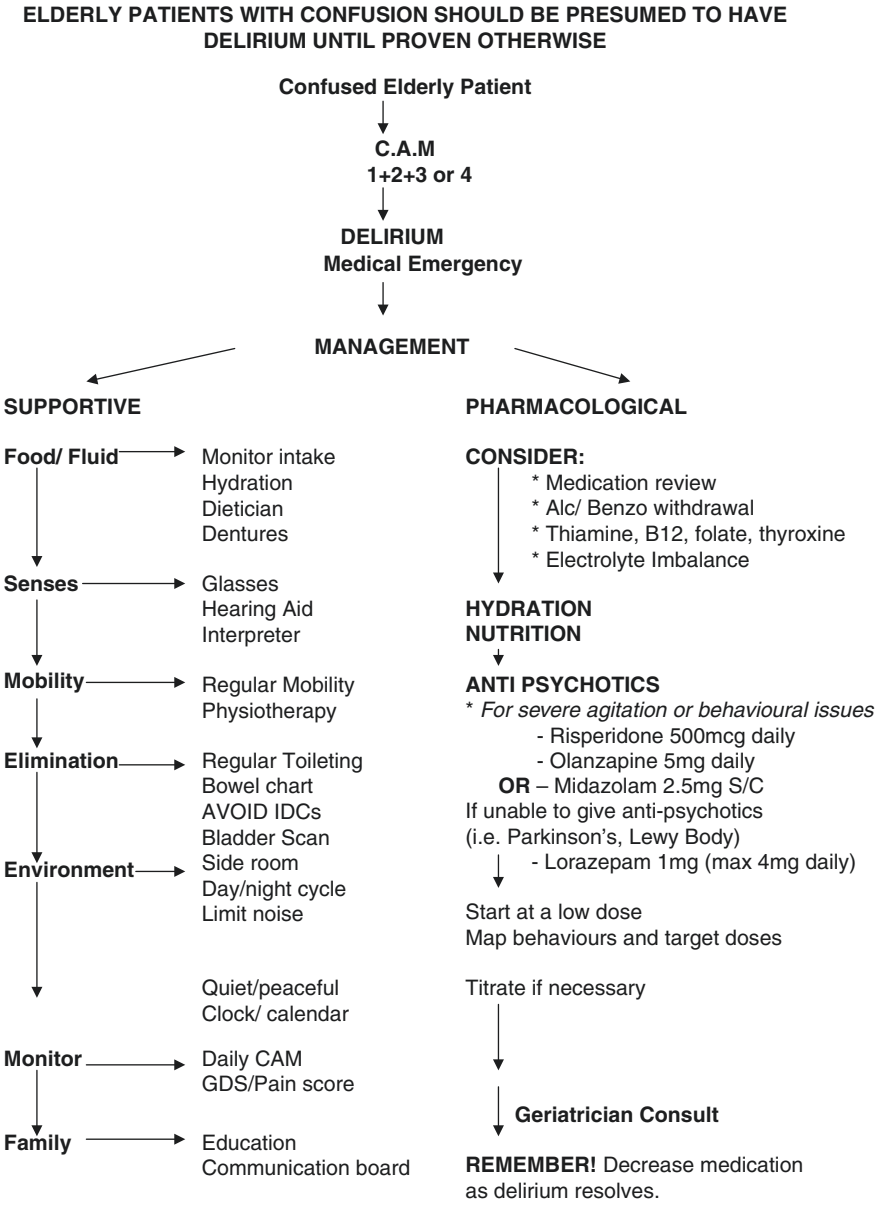

Fig. 5.2 Delirium management flow chart

and joint medical and mental health units [51]. Despite a need for investment to develop such units, they have been shown to be cost-effective and have significant impact on improving patient experience, carer satisfaction and improving staff attitudes [52].

5.6 Pharmacological Management (See Fig. 5.2)

Pharmacological management of the symptoms of delirium is a controversial but widely adopted practice. Sedative medication, such as benzodiazepines and antipsychotics, are the most commonly prescribed medication and are associated with significant risk to the older person. There are no medications licensed specifically for use in delirium, and none have been shown to reduce the severity, length or recurrence of delirium. Sedative medication should be reserved for patients with severe agitation or aggression, distressing hallucinations or delusions or whose behavioural disturbances pose a risk to themselves or others. Patients with hypoactive delirium should not be prescribed sedative or antipsychotic medication. Traditionally haloperidol has been the agent of choice [53], based on the lack of alternative trial data with second-generation antipsychotics (such as quetiapine, olanzapine or risperidone), rather than a substantial base of evidence supporting its efficacy. Haloperidol has poor sedative properties at low doses, and a previous publication from the *Cochrane Database for Systematic Reviews* found that higher doses of haloperidol are associated with higher risk of extrapyramidal side effects when compared to olanzapine and risperidone [54] and found there was a lack of robust trial data to support its use. A more recent meta-analysis [55] supported these findings, showing that second-generation antipsychotics are associated with a shorter time to respond and a lower incidence of extrapyramidal side effects when compared to haloperidol. Current clinical guidelines *do not* recommend the use of haloperidol for either prevention or management of delirium in the older person [56]. What's more, the use of haloperidol has been associated with a 5% increase in risk of developing delirium in ICU patients [57]. However, second-generation antipsychotics are not without their risks and poor prescribing can lead to over-sedation, falls, urinary incontinence and hospital-acquired pneumonia and is associated with an increased mortality in patients with underlying dementia [58].

Shorter-acting benzodiazepines, such as lorazepam, oxazepam or midazolam, are proven treatments for alcohol withdrawal delirium [59] and may have a role for patients in whom antipsychotic medication is contraindicated (e.g. Parkinson's disease and Lewy body dementia). Once again utmost caution should be taken when prescribing benzodiazepines as risks include severe sedation, falls, urinary incontinence, hospital-acquired pneumonia and worsening delirium [60]. Despite the theory that there is disruption of cholinergic activity in the brain during delirium, there is no evidence that acetylcholinesterase inhibitors have any role in the treatment of delirium, and their use cannot be supported [61, 62]. Other therapeutics which have failed to show convincing results in small population (<100 participants) clinical trials include melatonin agonists [63] and mood stabilizers [64], and their use cannot be recommended in delirium.

When choosing to use pharmacological treatments for delirium, the following prescribing principles should be considered:

- Reserve sedative and antipsychotic medication for patients with severe agitation, aggression or severe behavioural disturbance causing a risk to themselves or others.
- Start with a low dose of the appropriate medication and titrate as necessary.
- Do not use multiple agents; this increases the patient's risk of over-sedation and associated complications.

- Map the patient's behaviour and response to medication using a behavioural mapping tool. Time medication to target increases in behaviours such as sundowning.
- Medications are best used in supervised environments such as acute care, residential facilities or with carer supervision in the community.
- Reduce and stop the medication as soon as possible. Over 60% of elderly patients with delirium are inappropriately continued on antipsychotic medication after a period of in-hospital delirium [65].

5.7 Special Circumstances

5.7.1 Postoperative Delirium

Postoperative delirium is the most common postoperative complication affecting older people, with detection rates up to 50% [66]. Risk factors for postoperative delirium include advancing age, past history of delirium, cognitive decline or dementia, sensory impairment, lower perioperative haemoglobin, open surgery (versus laparoscopic procedures), emergency procedures (versus planned procedures), longer times under anaesthetic and preoperative use of benzodiazepines [67–69]. Postoperative delirium is associated with increased stay in the ICU (2 days longer) and length of stay in the hospital (7.7 days longer) [67]. There is also an association between postoperative delirium and in-hospital falls, increased need for physiotherapy and functional decline resulting in discharge into residential facilities or discharge with home care services [70, 71]. Once again, postoperative delirium is preventable. Risk screening should occur at perioperative assessment if possible, with baseline cognitive screening and use of validated screening tools. Multicomponent prevention and management strategies should be in place on the surgical wards as previously documented. Reducing the depth of anaesthesia may reduce the risk of postoperative delirium, as demonstrated in three small, nonrandomized clinical trials [72–74], but evidence is not robust enough for the American Geriatrics Society to recommend this as routine practice [75]. Adequate postoperative analgesia, including the use of regional anaesthesia for certain procedures such as knee replacement surgery [76], has been shown to reduce the incidence of delirium. As with other clinical settings, sedative medication and antipsychotics should be used with extreme caution and reserved for patients with severe and distressing agitation. There is insufficient evidence to recommend the routine use of antipsychotics to prevent postoperative delirium [75, 77, 78].

5.7.2 The Intensive Care Unit

Delirium is endemic in the ICU, occurring in 30–60% of patients with critical illness, with up to 80% of mechanically ventilated patients experiencing one episode of delirium during their stay [79]. The CAM-ICU was adapted to detect delirium specifically in ICU patients and has a sensitivity of 95% and specificity of 89%,

making it as validated tool for delirium detection in the ICU [80]. Adaption of multicomponent delirium prevention strategies can be difficult in the ICU environment; however basic steps can be implemented and have been shown to reduce the incidence of ICU delirium. Strategies include structured education to improve detection [81], early mobilization, reorientation, communication boards, exposure to natural light and medication de-prescribing [82–84]. More recent studies have found prophylactic use of dexmedetomidine is associated with a reduction in delirium prevalence and severity [85]. Dexmedetomidine is a sedative with analgesic and anxiolytic properties and a short half-life (<2 h) that allows mild sedation with less risk of respiratory depression when compared with benzodiazepines. Prevention of delirium in the ICU is critical, as its presence is associated with increased length of stay in the unit and is an independent risk factor for in-hospital mortality and mortality at 6 months, even after controlling for the severity of illness precipitating the delirium [86–88].

5.7.3 The Emergency Department

Delirium is evident in up to 17% of older people upon presentation to the ED [89]. Given the dramatic increase in delirium (up to 50% of patients) on medical and surgical wards, it seems prudent to begin delirium screening and prevention in the emergency department in an attempt to reduce overall hospital incidence. Delirium is missed by ED physicians in over 80% of cases [90], and many patients with undiagnosed delirium are discharged from the ED leading to a threefold increase in mortality at 3 months [91]. All elderly patients presenting to ED should be screened for delirium and potential risk factors, using a validated tool such as the ED-CAM. Prevention strategies should focus on orientation, sensory improvement, pain control, mobilization, avoidance of indwelling devices such as urinary catheters and cannulas, rehydration, avoidance of physical restraints, de-prescribing and avoidance of medication that may precipitate delirium [92]. Environmental strategies may be useful to reduce the noisy, crowded and often threatening emergency department environment. Although they are often perceived as too difficult to implement in the ED, simple environmental strategies can reduce the poor outcomes associated with persistent delirium during hospitalization [93].

5.7.4 Palliative Care

Delirium is highly prevalent in palliative care settings, with up to 88% of patients experiencing delirium in the last few days or hours of their life [94]. Symptoms, particularly those of hyperactive delirium, can be distressing for not only the patients but their family, carers and healthcare staff, who are attempting to facilitate end-of-life comfort care [95]. Up to 50% of delirium episodes in palliative care settings are reversible [96]; however the decision whether to investigate and treat precipitating causes will depend on the patient's prognosis and goals of care. Drug-induced

delirium is common due to the increased use of opiates, benzodiazepines, anticholinergics, corticosteroids and antipsychotic medication and may be easily reversible with medication rationalization and opioid rotation for pain relief; however sedation is frequently required for distressing symptoms in the terminal stages [97]. As with other clinical settings, non-pharmacological multicomponent prevention and management strategies remain first-line management but are often underutilized [98].

5.8 The Community and Residential Facilities

Few rigorous studies exist that examine delirium in the community and the potential impact of multicomponent prevention strategies in these settings. Population studies estimate that up to 20% of older people over 85 years will have delirium at any one time, with the prevalence increasing with age [99], and in patients with coexistent vascular dementia or Lewy body dementia [100]. Residents of long-term care facilities are at significant risk of developing delirium due to the high frequency of comorbid conditions and coexistent dementia seen in this population, and they are also at risk of inappropriate prescribing of sedative and antipsychotic medication. Multicomponent prevention and management strategies, in particular medication rationalization and environmental modification, have been shown to reduce delirium severity and decrease the risk of hospitalization in small studies, but further research is needed [101, 102]. Further evaluation is also required to investigate the role of the hospital in the home programmes and the community geriatrician in the management of delirium in these settings.

Conclusion

Delirium has serious consequences for the patient, carers, family and to the healthcare system. Not only are there ongoing physical manifestations in terms of cognitive and functional decline and increased mortality, as described in the chapter, the psychological impacts of delirium are increasingly recognized. It is reported that up to 50% of patients remember their confusion and feelings of fear, anxiety and distress experienced during a delirium episode [103] and that postoperative delirium is an independent risk factor for post-traumatic stress disorder 3 months after surgery [104]. Family, carers and staff experience levels of stress and anxiety when caring for patients with delirium, particularly in palliative care settings. Clinicians should continue to strive for best practice care in their clinical setting including establishing staff education programmes and implementing multicomponent prevention and management strategies such as the Agency for Clinical Innovation Confused Hospitalised Older Persons (CHOPS) programme [105]. With the take home message that “Prevention is better than cure”, delirium screening and prevention strategies need to start at the front door of the hospital, be present throughout the patient’s journey and continued in the community.

5.9 The Case Follow-Up

Unfortunately 12 months later, he remains cognitively impaired, scoring 22/30 in his MMSE and 65/100 in his Addenbrooke's Cognitive Examination, leading to an underlying diagnosis of Alzheimer's dementia and a trial of cholinesterase inhibitors.

This case highlights how delirium could have been prevented on an acute surgical ward. Mr. R showed clear signs of subsyndromal delirium, but this was not detected by the clinical staff. Nor was appropriate delirium risk screening in place on his admission through the emergency department. Fortunately Mr. R responded well to pharmacological and non-pharmacological management, many of the strategies were nurse initiated, and ward staff were able to individualize the management plan to Mr. R's needs. However, this episode of delirium left him and his family, with the psychological distress of his delirium and placement into a residential facility. The effects were persistent at 12 months, and although he could return home, he was no longer able to drive and the family required extra assistance from home care providers.

Glossary

ADLs	Activities of daily living
BP	Blood pressure
BSL	Blood sugar level
CAM	Confusion assessment method
CNS	Central nervous system
CRP	C-reactive protein
CT	Computerized tomography
CVA	Cerebrovascular accident
CXR	Chest X-ray
ECG	Electrocardiogram
ECT	Electroconvulsive therapy
ED	Emergency department
EEG	Electroencephalogram
EUC	Electrolytes, urea and creatinine
FBC	Full blood count
GP	General practitioner
ICU	Intensive care unit
IDC	Indwelling catheter
LFT	Liver function tests
LP	Lumbar puncture
MCI	Mild cognitive impairment
MMSE	Mini Mental State Examination

MRI	Magnetic resonance imaging
OTC	Over the counter
STM	Short-term memory
TSH	Thyroid stimulating hormone

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Dementia: Making a Diagnosis and Managing Behavioural and Psychological Symptoms

6

Brendan Flynn

Key Points

- Making a diagnosis of dementia can provide a degree of certainty about the future and allow for important personal, social and legal arrangements to be addressed.
- The diagnosis of dementia rests on the clinical history, corroborative information, cognitive examination and evidence of functional decline.
- The diagnosis is a clinical one—confirmation is only available by microscopic examination of neural tissue.
- Person-centred care is an important principle in dementia care.
- Non-pharmacological interventions should be tried first when treating behavioural or psychological symptoms of dementia.

This chapter considers two common clinical problems in dementia care—making the diagnosis and the management of behavioural and psychological symptoms of dementia (BPSD), with an emphasis on the behavioural symptoms. These are important and common clinical problems faced by geriatricians, psychogeriatricians, general practitioners and sometimes neurologists. Whilst each discipline may have a different perspective (including the psychogeriatric perspective of this author), dementia care is a truly multidisciplinary field of medicine, so effort has been made to emphasize the commonalities. There is also a focus on the older patient; thus much of the approach below may need modification in patients under, perhaps, 65 years of age. Similarly, younger onset dementia is not discussed here.

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Definitions of dementia vary slightly, but the most recently updated criteria for clinical use come from the *Diagnostic and Statistical Manual of Mental Disorders* fifth edition, known as the DSM–5 [1]. This publication has replaced the term dementia with major neurocognitive disorder. This terminology remains unfamiliar to many clinicians and patients. The diagnosis is made when there is (1) significant cognitive decline in one or more cognitive domains (complex attention, executive function, learning and memory, language, perceptual-motor or social cognition) based on concern by the individual (or informant) *and* objective impairment on a cognitive assessment instrument (2) functional impairment and (3) no co-existing delirium or other psychiatric disorder.

Worldwide, 47.5 million people have dementia, and there are 7.7 million new cases every year [2].

Case Study

Audrey, 74, is a retired pharmacist who is referred for specialist assessment. Her general practitioner is concerned about increasing difficulties that Audrey has had recalling her medication regime (for osteoporosis), some recent missed appointments and her increasingly repetitive conversations. She is otherwise well but does appear more anxious of late. There is no history of mental health problems. No immediate informant is available. Audrey's only child, a computer engineer, lives overseas, though he speaks regularly with her by phone. He has had his own family issues in recent months and whilst he has not visited for a whilst, he has indicated by phone that he has no concerns, except for worrying his mother may be lonely. Audrey was widowed 4 years ago.

6.1 Diagnosis of Dementia

Before considering the diagnostic process itself, it is worth reflecting on the value of it. Historically, therapeutic nihilism has surrounded a diagnosis of dementia. As a result, some patients with the syndrome may never have been formally diagnosed. These patients may not have had an opportunity for reversible pathology to be excluded, which, whilst not frequently detected, can prevent significant morbidity. Further, making the diagnosis can, of itself, have therapeutic value. Being able to provide individuals and carers with a likely cause and prognosis, whilst often distressing in the short term, can provide a degree of certainty about the future and allow for important personal, social and legal arrangements to be addressed.

6.1.1 Taking the History

The key aspects when taking a history of apparent cognitive impairment relate to the nature and duration of the cognitive, physical or psychiatric symptoms, looking for evidence of functional decline and obtaining a corroborative history.

The medical history should focus on general physical health and symptoms that suggest a neurological, endocrine, metabolic or nutritional disorder, some of which can present with cognitive decline. Risk factors for dementia should be explored. It

is important to note that classic vascular risk factors including dyslipidaemia, smoking and hypertension also increase risk for Alzheimer's pathology [3].

Family history is relevant. The lifetime risk of dementia if a first-degree relative is affected with dementia is 20%, compared to 10% baseline population risk [4].

Current medications should be reviewed, particularly with reference to agents that can impair cognitive performance, such as anticholinergic medications and benzodiazepines. Cognitive assessment should be delayed if these can possible be weaned.

Psychiatric history is usually orientated around evaluating the likelihood of an explanatory (or comorbid) mood and anxiety disorder. Both can be seen when individuals are first referred for evaluation of a cognitive concern. Psychosis can be seen secondary to dementia, though this is usually at the moderate to advanced stage. Visual hallucinations are a characteristic feature of dementia with Lewy bodies.

Taking a cognitive history is essential. The task is to evaluate subjective concerns around problems with memory, problem solving or function. A useful (but not universal) principle is that early deficits due to (non-frontal) cortical pathology are often accompanied by awareness of the problem by the individual—with associated anxiety, embarrassment and attempts at minimizing the symptoms. Subcortical pathology often results in executive deficits—characteristic of which is a loss of insight, including awareness of one's own cognitive changes. As a result, patients with the latter are frequently brought to a clinic by a relative or carer.

Asking the individual about short-term memory concerns often yields an answer that may recognize but minimize the concerns ('yes, but doesn't everyone at my age?'). Enquiring about how tasks such as banking, keeping track of appointments, computing, and password recollection are achieved, including the degree of assistance that is required, is useful. More marked amnestic deficits will result in a reduction in the number of people whose names are quickly remembered, difficulties with describing accurately an extended family structure and becoming lost in a locality previously well known. If these deficits are more advanced, individuals may have problems naming direct family members or becoming disorientated at home.

Finally, an awareness of functional abilities and decline is essential. An initial estimation must be made of premorbid function and comparison made with the present. If there is a deterioration in skills and abilities, the range of these needs to be explored. This includes personal hobbies; work within or outside the home; complex tasks such as driving or operating machinery; care tasks for dependents or animals; cooking, cleaning, gardening, and routine errands including shopping; and personal tasks including showering and using the toilet.

An important consideration for all of the domains above is the onset (insidious or acute) and duration of the symptoms. Characteristic patterns are commonly described, though clinical presentations are often not as clearly delineated. *Insidious onset*, with months to years of symptoms and increasing carer concerns is common in neurodegenerative disease. *Acute onset* is most often related to a significant cerebrovascular event. *Episodic cognitive impairment* may be less likely to be due to dementia and raises the possibility of periodic pathology such as transient ischaemia or seizures. The classically described '*stepwise*' pattern of deterioration in multi-infarct dementia may be useful. This is the notion of a period of stable cognition and function (usually over some months) separated by identifiable episodes of deterioration. However, this can be misleading when informants who only have

intermittent exposure to a person with progressive decline also describe the same pattern. It is also worthwhile being mindful of *superimposed delirium* that can temporarily worsen symptoms and give a false picture of rapid decline. A particularly *rapid decline* may be seen in neoplastic or prion disease.

Corroborative history is critical when assessing possible dementia. The informant should be familiar with the person pre-morbidly and given the opportunity to speak individually with the clinician, if consent is provided. The history can be clarified or confirmed. Carer stress should be explored, as well as issues relating to safety (such as driving, becoming lost or cooking with gas) or difficult behaviours. Clinicians should be mindful of the potential vulnerability of older people to elder abuse, including potentially from an informant.

6.1.2 The Examination

Physical examination is conducted to look for signs of endocrine or metabolic causes (such as thyroid disease) and for any evidence of focal neurological signs. Primary reflexes imply frontal pathology. Parkinsonism (present in Parkinson's disease dementia or dementia with Lewy bodies) is important to note, as is psychomotor slowing, which may be present in a major depressive disorder.

The Mental State Examination is useful for detecting anxiety, mood and psychotic symptoms. These can be related to independent psychiatric problems that may explain subjective memory concerns in a cognitively intact patient, or indeed these symptoms could be secondary to a neurodegenerative process. Sometimes both explanations may co-exist, an example being clinically significant anxiety. Certain speech phenomena are seen with temporal lobe pathology including semantic and phonemic paraphrasias. Aphasia can also be seen in the rarer frontotemporal subtypes.

6.1.3 Cognitive Screening and Assessment

Clinicians commonly undertake brief cognitive testing which is probably best termed cognitive screening. A complete cognitive assessment usually requires a neuropsychologist, though this assessment is not always required in order to make a diagnosis of dementia. Neuropsychological testing is very important in situations of diagnostic uncertainty, particularly with serial testing being able to clarify progress over time.

Cognitive domains including orientation (to time, place and person), the ability to name common objects, memory (registration, spontaneous and cued recall), attention, visuospatial and language abilities must be assessed. Frequent assessments of cognitive function involve the use of validated tools such as the Mini Mental State Examination [5], the Addenbrooke's Cognitive Examination III [6] or the Montreal Cognitive Assessment [7]. Clinician preference may vary with experience, local custom or copyright access rights. It is important for clinicians to familiarize themselves with not only the administration and scoring of the instruments,

but both the limitations of each and the typical scoring profile one would expect in the commoner dementia subtypes. A sense of what alternate explanations for poor performance on cognitive testing (other than cognitive impairment) is also useful. An example is deficits on cognitive examination during a depressive episode, so-called pseudodementia [8].

It is important to consider whether the instrument being employed offers an assessment of executive function, as this is not always the case. Executive function includes some cognitive aspects that are readily assessable to testing (such as letter fluency, motor sequencing, response inhibition and sequencing tasks) and other abilities that may be best assessed by observation alone. These include social inhibition (tact), personal care and, to some degree, the capacity for empathy.

6.1.4 Investigations

In looking for a reversible cause for the impairment, it is worthwhile checking for anaemia, renal or hepatic impairment, thyroid disease and calcium, magnesium or phosphate abnormalities. Checking for vitamin B12 and folate deficiency may reveal a cause or effect of the problem. Syphilis and HIV serology may also be indicated.

Brain imaging ideally would include an MRI series with FLAIR images to demonstrate white matter pathology as well as coronal views allowing for an estimation of hippocampal volume. Some radiology services provide volumetric analysis of the hippocampi, which is clinically valuable. Lesions including stroke, tumours or those relating to previous trauma may be detected on a brain CT scan, but this information will likely be obtained also from the MRI.

The diagnostic gold standard for dementia remains post-mortem brain tissue analysis.

6.1.5 Diagnosis

Diagnosis of subtype of dementia is necessarily provisional without tissue examination. It is also made difficult by ongoing controversies about classification. To complicate the issue, there known relationships between subtypes—for example, between Alzheimer's disease and vascular dementia—which share common risk factors [3]. Further, these two pathologies co-exist commonly at autopsy [9]. A recognized clinical picture that reflects this is termed 'mixed dementia' [10]. Subtyping dementia is important as it guides therapy; however, it will become much more important should effective disease-modifying agents for Alzheimer's disease become available. After some years of progression, the subtypes tend to be harder to distinguish from each other.

Common outcomes in assessment of individuals who present with early cognitive impairment include:

1. *Mild cognitive impairment* (MCI). Thought to affect 10–20% of those over 65 years [11, 12], MCI has been defined as an intermediate state of cognitive function between the changes seen in aging and those fulfilling the criteria for dementia [13]. It presents as concern from a patient or informant about cognitive decline and objective impairment in one or more cognitive domains, including memory, executive function, attention, language or visuospatial skills. The key aspect is that there is no functional impairment [14]. Subtypes have been described, denoting those more likely to go on to Alzheimer's disease (amnestic MCI) and non-amnestic MCI. Between 12% and 20% of patients with MCI are recorded as converting to dementia annually [12], though other studies report the conversion rate as considerably less [15].
2. *Alzheimer's disease* (AD) is the commonest cause of dementia, accounting for 50–56% cases in a clinical series at autopsy [16]. It is postulated to be caused by accumulated protein abnormalities: beta amyloid plaques and neurofibrillary tangles (abnormally phosphorylated tau proteins). AD is the prototypical cortical dementia, as the cerebral cortex is vulnerable, with temporal lobe (particularly hippocampal) deficits prominent in the early stages. Early symptoms include forgetfulness, repetitive conversation, word finding difficulty and language deficits, such as paraphrasias. The neurological examination may be normal. Cognitive testing may reveal poor orientation, poor object naming and some visuospatial deficits. The characteristic deficit, however, is *rapid forgetting*. A list of words can be registered well—increasing over a number of trials—and spontaneous recall impaired. However, cues do not assist the patient at delayed recall, suggesting the information was never encoded in the hippocampi. In fact, the individual may confidently suggest the wrong words. When cues do assist retrieval, this suggests processing difficulties (which can be reflected in requiring multiple registration attempts to learn the list of words). Vascular dementia (below) can present in this way, with apparent forgetfulness, without *rapid forgetting*. Routine pathology can be entirely normal in AD. MRI may be normal, but global atrophy and disproportionate hippocampal atrophy are common—the latter very suggestive of AD. Amyloid imaging using PET (positron emission tomography) is likely to be increasingly used, though availability is limited [17]. Cerebrospinal fluid analysis of beta amyloid levels can be valuable, particularly when the diagnosis is less certain [18].
3. *Vascular dementia* is a broad and controversial concept. Because of a lack of agreement about whether the cause extends from chronic subcortical ischaemic change to large cortical stroke, there are varying epidemiological figures provided in the literature. It is described consistently, however, as the second most common contributing pathology in dementia. A cortical stroke presenting with 'stepwise' cognitive decline is the classical description (multi-infarct dementia); however, it is apparent that subcortical vascular pathology accounts for more cases of dementia [19]. In the latter, symptoms accrue slowly with a gradual decline in processing speed, executive skills and sometimes personality change. Language is often preserved. The presentation can resemble a depressive episode, though this may be comorbid. Short-term memory concerns may be prominent

but in the 'purer' vascular presentations, rapid forgetting is less likely to be present. Examination may show focal neurological signs, restricted affect and psychomotor slowing—so-called vascular Parkinsonism [20]. Brain MRI usually reveals extensive subcortical (or one or more cortical) vascular lesions; however, these are not always associated with dementia. Dementia appears associated specifically with multiple lacunes, strategic infarcts, substantial white matter lesions or a combination of these [21].

4. *Dementia with Lewy bodies* (DLB). McKeith et al. [22] proposed a new clinical subtype after 10–15% of patients with dementia at autopsy were demonstrated to have diffuse Lewy body disease. This pathological entity may be best conceptualized along a continuum of synucleinopathies, including idiopathic Parkinson's disease (PD) and multiple systems atrophy. On history, patients with DLB will present with cognitive and functional decline with temporally related development of Parkinsonism. The close onset of the two syndromes (technically within 12 months) differentiates DLB from *Parkinson's disease dementia* where the cognitive changes occur much later after PD diagnosis. The classic triad is fluctuation in symptoms, Parkinsonism and recurrent visual hallucinations. Supportive features for the diagnosis include REM sleep disorders, antipsychotic sensitivity, falls and autonomic dysfunction.
5. *Frontotemporal dementia* (FTD) is a clinically and pathologically heterogeneous group of dementias characterized collectively by relatively selective, progressive atrophy involving the frontal or temporal lobes, or both [23]. A disproportionately high number of those who present with a younger onset dementia have FTD. As a result, patients may be well served attending a specialist neuropsychiatry or behavioural neurology clinic for diagnosis and management. Clinical presentation includes those where behavioural changes predominate (such as disinhibition, emotionality or apathy) or where language deficits are prominent (primary progressive aphasia). The picture can mimic other frontal pathology, subcortical vascular pathology, psychiatric disorder or atypical AD. Aetiologies include cellular inclusions (both tau protein abnormalities and TDP-43: transitive response DNA-binding protein43) and significant genetic contributions. This includes both autosomal dominant inheritance and specific gene mutations [24].
6. *Other dementias*. There are multiple rarer causes of dementia. In atypical or younger onset presentations, care should be taken making a diagnosis without neurological opinion. Examples include normal pressure hydrocephalus, Huntington's disease, Prion disease, alcohol-related dementia, subdural haematoma, Wilson's disease and limbic encephalitis.
7. *Non-dementia diagnosis*. Examples would include hypothyroidism, B12 deficiency or a psychiatric disorder. Anxiety disorders can cause excessive subjective memory concern, and depressive disorders may mimic executive impairment.
8. *No diagnosis*. This is not uncommon in a memory clinic setting and can occur particularly in relatives of people with dementia, who have become worried about their own memory. This concern may indeed worsen their perception of their cognitive abilities.

6.1.6 Management

Management of dementia can be divided into general principles that apply to all found causes and specific treatment by disorder. When considering making and sharing a formal diagnosis, the importance of language cannot be overlooked. Clinician language and attitude should reflect the principles of patient-centred care. Conversations around diagnosis, including the use of the term dementia itself, are very powerful and if not handled sensitively have the potential to cause significant harm. The complexity of dementia care means that a multidisciplinary approach is essential.

General principles include:

1. Disclosure of diagnosis. This is often complex. Historically, some clinicians have been reluctant to disclose the diagnosis; however, most people with dementia favour it [25]. The emotional response of the individual must be also considered, with the conversation occurring where supports are available.
2. Education and support for the individual and their carer/family is critical. As mentioned, sometimes the act of making a diagnosis itself can allay significant uncertainty both about understanding current problems and considering the future. Ensuring access to high-quality information about dementia (including supports available for carers) is essential. Providing contacts that can advise about optimizing services (such as home meals and home nursing) is useful. Future entry to residential care may need discussion. Carer stress can be significant. The loss of (and mourning for) a loved one's memory and sense of identity can be profoundly difficult. Constant physical care can be exhausting. Sensitive exploration of respite options must be considered.
3. Vascular protection is important given the shared risk factors for the two most common subtypes of dementia. Thus identification and treatment of hypertension, dyslipidaemia, diabetes mellitus and atrial fibrillation is important. Smoking cessation should be encouraged and consideration given to anti-platelet therapy.
4. Sensory impairment should be treated or optimized.
5. Reviewing medication that could worsen confusion (particularly anticholinergic medications).
6. Legal aspects of a dementia diagnosis must be addressed. These include assessment of capacity in situations such as the signing of new legal documents or determining when it may be appropriate to enact pre-existing agreements, such as enduring powers of attorney. If a person has capacity to make legal arrangements (such as a will or powers of attorney) and these have not yet been completed or require revision, they should be finalized promptly.
7. If a patient wishes to continue to drive, this must also be addressed. Driving is a complex, multidomain cognitive and physical skill. Whilst a diagnosis of dementia does not automatically preclude driving, consideration must be made of factors including which aspects of cognition are impaired, to what degree, the patient's insight and the legislative requirements on practitioner's within

their own jurisdiction. Whilst it is not possible to give universal advice, if a patient is considered a possible candidate to continue driving, it is common that they undergo on road and neuropsychological testing, and the local licencing authority is aware. Other licences or permits used for operating heavy machinery, boating or aircraft should be discussed.

8. Consideration of risk around potential issues such as cooking safety, becoming lost, financial or physical vulnerability and development of comorbid psychiatric problems should occur. Patients who have access to firearms should, ideally, also have this reviewed.
9. A diagnosis of dementia can often raise issues for younger family members, and the issue of the need for genetic counselling and/or testing may be raised. Inherited (Mendelian) forms of dementia are rare, and most individuals with a first-degree relative do not require testing. However, a strong autosomal dominant picture of inherited young onset dementia is an indication for testing [4].
10. Vigilance for emergence of the behavioural and psychological symptoms of dementia (see below) is important, with appropriate management commenced.

Specific therapies for dementia at this stage target symptom reduction rather than disease modification.

For *mild cognitive impairment*, evidence supports aerobic exercise, mental activity and cardiovascular risk factor control [26]. It is not unreasonable to extend this advice, if possible, to patients with established dementia.

Licenced treatments for *Alzheimer's disease* include the cholinesterase inhibitors (donepezil, rivastigmine, galantamine) and memantine. Evidence-based guidelines recommend the cholinesterase inhibitors for mild and moderate AD [27]. Adverse effects include gastrointestinal upset, bradycardia, sleep disturbance, muscle cramps and fatigue, leading some patients to discontinue them due to poor tolerance. Caution is required if the individual has a history of asthma, peptic ulcer, cardiac conduction delay, falls or seizures. Severe renal and hepatic impairment is a contraindication for some members of this class. The use of a monitoring tool is recommended, but defining response is complex and can encompass a variety of different outcomes [28]. Memantine is an NMDA receptor antagonist that decreases glutamate levels, the elevation of which may be implicated in impaired neuronal function. It is recommended for moderate to severe AD or for those unable to tolerate cholinesterase inhibitors [27]. Combination memantine and cholinesterase inhibitor therapy has some support in the literature [29], though there have been concerns raised previously about the quality of the data available in an earlier systematic review [30].

There is no convincing evidence for a specific therapy for *vascular dementia*, other than paying close attention to risk factors for further cerebrovascular damage, as described above.

Quality evidence for the pharmacological treatment of *dementia with Lewy bodies* is scarce, though donepezil and rivastigmine for cognitive and psychiatric symptoms is beneficial [31]. Perhaps the most important principle of medication management is avoiding (usually typical) antipsychotic therapy and using dopaminergic medication for Parkinsonism with caution, as these agents can worsen

psychosis, a common component of the DLB syndrome [32]. The common practice of using low-affinity dopamine antagonists for DLB-related psychosis (such as quetiapine) is not supported by high-level evidence [31].

There is no specific pharmacotherapy that has demonstrated effectiveness in slowing progression of *frontotemporal dementia*; however, medication may be used for behavioural and psychological elements of the syndrome (see below).

Finally, ongoing review of any patient with subjective memory concerns, MCI or established dementia should focus on the extent of progression (serial cognitive testing is valuable) and reviewing the general and specific points of management outlined above.

Behavioural and Psychological Symptoms of Dementia

Returning to Audrey, the history obtained supports an insidious decline in cognition and function, though this information needed to be sourced from a friend whom the GP was unable to speak with. Driving has declined and there have been two recent 'near misses' with pedestrians; her friend now drives her, and Audrey wants to sell her car. The friend has noticed some deterioration with cooking and cleaning and marked forgetfulness. Money is still managed at the bank with a teller. Further history and examination does not identify any other medical or psychiatric explanation for the decline. There is no family history of dementia. On cognitive testing, Audrey is moderately disorientated to time (but not place), has some difficulty naming everyday objects and, whilst able to learn a list of seven words, had difficulty with delayed recall, even when clues were offered. Premorbid intelligence was assessed as likely above average, which may explain why Audrey did seemingly well on annual basic cognitive screening. There was no marked executive impairment, but language deficits were identified. Brain MRI was reported as minor global atrophy. Routine pathology testing was unremarkable. A likely diagnosis of Alzheimer's disease was made. An appointment with Audrey and her son was arranged to disclose the diagnosis and discuss the disorder, prognosis, treatments and supports available. A trial of donepezil 5 mg nocte was commenced. Moderate hypertension was identified and treated. Important legal documents and plans for future incapacity have fortunately been finalized some years previously. Audrey and her family are linked in with a community dementia service for review of her functional ability and what assistance may be required.

Kate is a 73-year-old woman with advanced Alzheimer's disease, who has been a resident in a nursing home for 2 years. The diagnosis was made around 4 years ago. There is no prior psychiatric history and, apart from mild hypertension and gastro-oesophageal reflux disease, she remains well. She is treated with omeprazole, irbesartan and donepezil (10 mg). Over the past 18 months, she has been increasingly agitated at the facility. Originally this started with exit seeking but this has slowly developed into intrusiveness (going into other

resident's rooms) and engaging in verbal aggression towards both staff and residents. Most recently, there have been two episodes of physical aggression towards staff. The general practitioner has performed a delirium screen that was negative and commenced risperidone 0.5 mg twice daily a couple of weeks ago with some effect. The facility staff has asked for (either) a geriatric medicine or psychogeriatric review in the hope that the risperidone dose may be increased.

6.1.7 Assessment

Behavioural and psychological symptoms of dementia (BPSD—a term originally described by Brodaty et al. [33]) are a common reason for carers, general practitioners and aged care facilities requesting specialist input. This chapter focuses on the behavioural component of BPSD. Often, specialist care in this area is shared between geriatric medicine and psychogeriatric services. The situation is frequently perceived as very challenging, with limited expertise available given the demand and often limited resources for supporting evidence-based strategies. Additionally, the behaviour of concern may place the individual and others at risk of physical harm. Brodaty et al. [33] proposed a seven-tiered model of BPSD—the moderate levels and above usually being the focus of specialist services.

A reasonable approach to managing BPSD requires finding out some crucial background information in the first instance. Most importantly '*Who is the person with dementia*'*?* This requires finding out the person's likes and dislikes, their cultural background and values and what provides meaning for the person and who is important in their life. Knowing a person's story is not only likely to provide clues to the most useful interventions for BPSD but is essential in addressing the risk that a person with advanced dementia is somehow reduced to a collection of 'difficult' behaviours—a profound and dehumanising failure of understanding. The advent of person-centred care is an important and welcome development in this context.

The other essential information is finding out if the pattern is consistent with BPSD. The behaviours are usually long term and occur in the context of an established dementia syndrome. Because individuals with dementia are particularly at risk of a comorbid delirium, any acute change in behaviour should be investigated and treated as a delirium initially. Similarly, pain, sensory impairment, dehydration and constipation are common and reversible factors that should immediately be addressed. A medication review may also identify agents that may be contributing to the problem (e.g., aakathisia from antipsychotic treatments).

The evidence base for managing BPSD reflects the fact that non-pharmacological interventions are very valuable, and, as a result, an assessment of contributing factors in the patient's environment is important. Assessing whether appropriate stimulation, lighting, access to outdoors, personal items and reorientation measures are in place is a priority, as is observing the person with dementia interacting with their carer or facility staff.

An assessment of the behaviours themselves is next, noting what the behaviours are (intrusiveness, agitation, aggression, disinhibition, sexually inappropriate behaviour, etc.) and if they are continuous or triggered by certain situations—for example, assistance with personal care.

An 'ABC approach' has been proposed for the assessment of the behaviours themselves (NSW Ministry of Health [34]). This involves identifying the antecedent, the behaviour itself and the consequences.

6.1.8 Management Strategies

Useful principles to keep in mind include:

1. Non-pharmacological interventions should be tried first and continued, even if medication commences. These interventions need to be informed by knowledge of the person with dementia.
2. Carer and family involvement is central to the success of BPSD interventions.
3. Evidence for pharmacotherapy is limited, and the use of psychotropics often carries significant risk.
4. Some behaviours are minimally amenable to pharmacotherapy at all (such as vocally disruptive behaviour).
5. BPSD is often self-limiting, and ongoing treatment may not be required as the dementia itself progresses.
6. Probably more important than concentrating on drug specifics is emphasizing the context of the prescribing, what the expectations are, identifying the risks and benefits and deciding on the role of long-term treatment.

Carer and facility staff education is very important, often addressing the concerns that the behaviours are somehow premeditated or deliberate. Carer stress or poor premorbid relations can exacerbate BPSD (International Psychogeriatric Association [35]).

Meaningful activities (such as art or music tailored to the person's preferences), the use of essential oils during massage, simulated presence therapy (such as family tape recordings) and physical activities all have an evidence base supporting their use [35].

Environmental considerations are important. Whilst it is difficult to achieve change in the short term for any one individual, in the longer term such strategies may reduce the impact of BPSD in residential care. Examples include single rooms, minimizing the number of doorways and ensuring outside access. For the person at home, reducing the risk of becoming lost by wearing an identity bracelet and arranging alternatives to gas cooking in the kitchen are important considerations.

Non-pharmacological strategies include specific interventions based on the 'ABC approach'. An example would be a person with dementia who becomes aggressive only when showering with assistance. The antecedent includes the environment (removing clothes, temperature changes, possibly unfamiliar staff); the behaviour itself is physical aggression—in this example only when the person is being directed

to the shower (not during it)—and the consequence is that often another carer is called to assist with getting to the bathroom. An alternative approach could be taken—to cue the person with dementia that it is shower time (turning the water on, placing soap in their hands, etc.) and then waiting for the person to commence the task themselves. This may take longer but could minimize the aggression.

Pharmacological interventions depend on the type of behaviour itself [35]. Persistent aggression may respond to an atypical antipsychotic such as risperidone. Atypical antipsychotics are also of some benefit in agitation, as are SSRI's, short-acting benzodiazepines and carbamazepine. SSRIs are also useful for both disinhibition and apathy. Anticonvulsants have often been used; however, there is little evidence to support the use of sodium valproate. Apart from agitation, carbamazepine can also be used for disinhibition, though the issues of needing to monitor liver function and sodium levels may limit its use in practice.

A major issue in recent years has been the emergence of a prominent discourse around the risk of psychotropic use in dementia. The prototypical example is atypical antipsychotic use in BPSD. In 2005, the US Food and Drug Administration issued a 'black box warning' for risperidone (extended to all antipsychotics in 2008). The warning was based on a meta-analysis of 17 trials demonstrating an increased relative risk of death (1.7). A significant increase in the risk of ischaemic stroke was also noted. Retrospective studies [36] suggest that a similar increased risk of death also exists for typical antipsychotics.

There are also other side effects with this class that include postural hypotension, falls and extrapyramidal side effects. These problems may be more marked if the dementia syndrome is due to a synucleinopathy. Given these risks, this class of medications must be used prudently, and the risks and benefits discussed with the appropriate decision maker as a part of the informed consent process. Despite these issues, atypical antipsychotics still have a role in the management of BPSD if caution is exercised and the patient monitored. It is important to note that dosing is typically significantly lower than when these agents are used to treat a primary psychotic disorder, such as schizophrenia. Antipsychotics should not be prescribed indefinitely. Kleijer et al. [37] demonstrated that in over half of a group of patients being treated with an antipsychotic for BPSD were stable (or improved) 6 months after stopping it.

Returning to Kate, an assessment revealed that Kate was a teacher throughout her adult life, and a mother of three children. She particularly enjoys books. When she was a younger woman, she was assaulted within a relationship, which has made her wary of being physically isolated. She had a pet Border Collie and dislikes loud music. Her husband visits frequently (after doing errands in the morning), and she generally finds this reassuring. The behaviour is confirmed as described; however, the physical aggression has occurred only during the morning shower, where a male care worker has recently assisted her. Reversible problems including constipation and the possibility of untreated pain are excluded.

A management plan was developed which involved making sure Kate is showered by at least two staff (or one female staff member) and, if possible, assisted by her husband who will now visit in the morning before his errands. The visiting pet therapy corgi (Betsy) will specifically spend time with Kate, preferably as late during her visit to the facility as possible, as the exit seeking has been more marked in the afternoons. The staff is now aware of Kate's dislike of loud noises, though there is little that can be altered at the moment in that regard. Books will be offered at the times that Kate is most agitated. A measurement tool of agitation (such as the Brief Agitation Rating Scale, Finkel et al. [38]) will be used to map response. Either when there is improvement (or after a 12-week period), the risperidone will be weaned. The donepezil will remain unchanged as ceasing it can worsen BPSD [39]. An SSRI could be considered if required.

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Diagnosis and Management of Depressed Mood in the Older Person

7

Brendan Flynn

Key Points

- Depressive symptoms are not synonymous with a depressive disorder.
- There is a wide range of explanations for depressive symptoms, many of which are not related to psychiatric illness.
- The presence or absence of melancholic symptoms is a core diagnostic distinction, particularly in the older individual.
- Effective treatment of a major depressive episode includes pharmacological, social and psychological strategies.
- The evidence for differential efficacy of antidepressants is modest.

Referrals from geriatricians to psychogeriatric services are common. This is a good thing. Geriatric medicine services are well placed to take a holistic view of a patient's predicament. Attending to mental health issues, including seeking further advice if required, is an essential part of this task. Clinicians, families or carers of a patient (and sometimes the individual themselves) are often unaware of potentially reversible psychiatric morbidity. Erroneous ideas that link the ageing process itself to inevitable psychological distress or decline may underlie this.

The purpose of this chapter is to provide clinicians in geriatric medicine with a guide for confidently approaching a topic of frequent concern: diagnosis and treatment of depressed mood in the older person. Depression in older people is associated with significant morbidity and poor physical health outcomes [1]. Individuals over 70 years have the highest rates of suicide globally [2]. There is not scope here

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Harry is a 73-year-old retired train driver who lives in a rural area with his wife. He is being assessed by a geriatrician, as his general practitioner is concerned both about functional decline and increasingly difficult to control diabetes. Harry is an ex-smoker with poorly controlled hypertension for many years. Six years ago he was diagnosed with type 2 diabetes; he has been on oral hypoglycaemic agents but his glycaemic control is poor, and he may soon require insulin therapy. He had coronary artery stenting 2 years ago for ischaemic heart disease. There is no history of previous psychiatric problems, and he has only used alcohol very occasionally. His partner reports a history over the past 2 years (though it may be longer) of increasing lethargy and social withdrawal (he has stopped playing darts and attending an exercise group). He appears sad and flat. Around a year ago, his general practitioner commenced sertraline. The dose is now 100 mg mane. His wife feels he is slowly worsening. She is immensely frustrated that he sits on the couch watching television all day, initiates little conversation, shows minimal interest in family affairs and needs prompting to tackle tasks such as washing the dishes or lawn mowing. Harry himself is unconcerned, and is grateful when a meal is prepared for him. Because he has not responded to the sertraline, the geriatrician requests a psychogeriatric review.

to cover other important and related issues, such as depressive symptoms in the context of established dementia or assessment of the patient with suicidal thoughts, the latter being an indication for specialist referral.

7.1 Diagnosis of Depression

Does Harry have *depression*? Because of multiple meanings, the word itself can be problematic. In a clinical setting, use of the term *depressive symptoms* may be more useful. This reflects an awareness that multiple medical and psychiatric disorders present with depressed mood, as do non-pathological reactions to the vicissitudes of later life. Bereavement, later life existential distress, executive dysfunction and physical illness need to be considered. A common diagnostic classification system such as the *Diagnostic and Statistical Manual of Mental Disorders* 5th edition, known as the DSM-5 [3], includes multiple psychiatric disorders that present with depressed mood. It should come as no surprise that psychiatrists are particularly interested in assessing for major depressive episode (MDE—as part of either a unipolar major depressive disorder or bipolar disorder), as missing this common and largely treatable disorder leads to increased morbidity and mortality. This should not, however, imply that subsyndromal depressive symptoms require no attention—these are common and not only cause significant morbidity but are a risk factor for development of MDE [4]. Further, comorbid psychological problems are also common. For example, a subset of the bereaved develops a mood disorder.

'Depression' is commonly understood by the medical community to mean a MDE (a depressive episode), and as this is a major focus of an initial psychogeriatric assessment, diagnostic issues around a MDE will be emphasized here.

Because of the wide differential diagnosis and risks of inappropriate (or non) treatment, it is important to attend carefully to the diagnostic process. This is particularly salient given the increasing awareness of the risks of antidepressant medications in the elderly [5].

Initially, physical causes must be addressed and excluded. This is almost always done when referral from a geriatrician is made. Importantly, however, these problems do not preclude psychiatric comorbidity, so an 'exclusion' approach is of limited value. An important exception is delirium. Florid, hyperactive delirium is rarely mistaken for depression; however, the less common presentation of a hypoactive delirium can present similarly to a MDE. If there is a history of very recent onset changes in the context of physical illness (or even if no cause has been identified), caution should be taken in diagnosing a depressive episode—particularly as antidepressant therapy can worsen a delirium from its own adverse effects, such as anticholinergic activity or hyponatraemia.

A full history is necessary, with emphasis on presenting psychiatric symptoms, previous mental health problems as well as the developmental history. The latter informs the assessment in terms of personality traits and identification of risk factors for psychiatric disorders and allows for cautious speculation as to why these particular symptoms may be presenting now. Often the information that contributes to understanding the genesis of symptoms that can mimic a depressive illness, such as chronic suicidal ideation, can be found here.

Screening for MDE symptoms using a classification such as the DSM-5 paying attention to duration, impairment of function and a relatively recent departure from baseline is helpful. Chronic depressive symptoms are less likely to indicate a MDE and suggest that other possibilities, such as dysthymia or personality disorder, need to be explored.

It is worthwhile here to comment on diagnostic classifications, and other assessment tools, as their strengths and limitations must be understood before they can be used properly. Disagreements about the diagnosis of depression between medical practitioners are often based around this issue. Psychiatry, as a rule, treats syndromes rather than diseases with identified pathology. Like many other aspects of medicine, it uses consensus-derived definitions of what is 'pathological' to define a disorder, such as the DSM-5. Because we are using symptom descriptors rather than measured values, the diagnostic process can appear at times to be particularly subjective. However, if a clinician is trained in both eliciting psychological symptoms and descriptive phenomenology, it is possible to make a reasonably robust diagnosis. Indeed, the DSM itself is an exercise in improving diagnostic reliability, rather than validity. Whilst such diagnostic criteria offer a reliable starting point, they often cannot account for the existence or absence of comorbid psychological symptoms, and they can make no attempt to appreciate the patient's real predicament. The reason why the individual is unwell now, what meaning these symptoms may have for the patient and what role the patient's personality may play, both in the genesis and treatment of the problem, is not captured in a psychiatric diagnosis.

A checklist approach to diagnosis, whilst useful for reliability in research and as a clinical heuristic, is simplistic and often of limited value.

As will be discussed below, there is a particularly useful diagnostic distinction to make for older patients, even when a MDE has been diagnosed. This is the concept of classification *within* MDE, namely, the notion of melancholic depression, which is a MDE specifier within DSM-5 [3]. The core distinction is that, in melancholic depression, vegetative symptoms (such as early morning waking, diurnal mood variation and psychomotor changes—either slowing or agitation) predominate. Anhedonia (total loss of pleasure in usual activities) is also frequently present. Thus, if a patient meets the requirement for MDE, some consideration should be given to whether the clinical picture is weighted in this regard.

Depression screening instruments and rating scales are useful for identifying who is likely to have a psychiatric illness and for tracking response to treatment, but they are no substitute for an assessment by an experienced clinician. These often detect symptoms without clinical weighting or reference to duration and severity, which risks exposing individuals with real psychological distress, but no psychiatric disorder, to treatments that are very unlikely to be effective and have real risks. A high score on the Geriatric Depression Scale denotes psychological distress and depressive symptoms but is not a diagnosis of a clinical mood episode. Rather, it is a *screening* instrument [6].

Risk for developing a depressive episode should be considered. Risk factors for developing late life depression include physical illness or disability, a personal history of depression, loss of spouse, subsyndromal depression, sleep disturbance and comorbid anxiety [7].

The corroborative history is crucial to determine the time course of change, premorbid personality and for the risk assessment.

The Mental State Examination (MSE) may reveal features supportive of a diagnosis of MDE, such as slow and monotonous speech, a restricted affect, pervasive low mood and suicidal ideation. However, there are multiple possible explanations for each of these, and none is pathognomonic for a particular psychiatric syndrome.

Cognitive screening is of limited use for making or refuting a diagnosis of a mood episode. It is well known that a depressive episode can compromise cognitive abilities, but this is not always the case. It could be argued that if clinical suspicion of a mood disorder is high, it is best to delay testing altogether, as an impaired performance can be misinterpreted by future readers of the medical record as an argument for a longstanding cognitive deficit, which may well not be the case.

Routine depression screening should also include checking for anaemia, infection, renal or hepatic failure, malnourishment and thyroid disease. A ‘subclinical’ thyroid disorder is often detected, as mood disorders themselves can alter thyroid function [8].

Brain imaging remains useful for excluding (rare) reversible causes such as a space-occupying lesion. MRI is preferable as the FLAIR sequence provides valuable information about subcortical pathology (particularly white matter disease) which is implicated in executive dysfunction—a common explanation for apparent depressive symptoms.

7.2 Clinical Reasoning Around Depressive Symptoms

Having now progressed through history taking, examination and investigations, this information, as in general medicine, must be interpreted as a whole. Because estimating the likelihood of a reversible psychiatric syndrome is a fundamental task of the initial consultation, the following questions should now be considered.

1. *Are the symptoms a departure from the individual's usual ('baseline') state?* Many patients are referred with chronic low mood, hopelessness or intermittent suicidal ideation—often stretching back decades. In this situation, the diagnosis is unlikely to be a mood episode, as, by definition, this involves episodic symptoms—lasting weeks, months or longer, *but interrupted by asymptomatic periods.* If the patient has a personal history of a mood disorder, then an episodic history is usually obtained. This is a crucial point as, whilst longer-term problems such as a personality disorder can be often effectively treated, this is often done without medication. The risks of antidepressant use in the elderly are high enough for the clinician to need to be confident that their use would likely be of significant benefit.
2. *Is there functional impairment?* Similarly to diagnosing dementia, a mood episode cannot be diagnosed on symptom collection alone. All psychiatric disorders require that the individual's symptoms result in impairment in function, such as social, occupational, interpersonal or personal care abilities.
3. *What is the patient's mood?* A MDE is characterized by a diminishment of pleasure in usual activities. Further, mood is pervasively low, and the patient will often report feeling sad, flat or low. Descriptions of the patient's usual activities, the enjoyment derived from them and mood itself need to be sought. Again, a departure from usual with an identifiable point in time is very helpful. Often, patients who have attracted a diagnosis of depression are describing subjective states other than low mood. A common example is a late life existential distress or crisis in meaning. Often such a patient describes feeling that their life has been lived and, as there is little more to achieve, life has no purpose. However, when asked about the ability to achieve pleasure from usual pursuits or a favourite meal, this is often not diminished.
4. *If there is an episodic pattern to the depressive symptoms and a MDE seems likely, is there evidence of vegetative symptoms* (early morning waking, weight loss, psychomotor change, etc.)? This will assist in making a distinction between melancholic and non-melancholic depressive episodes.
5. *Is there a recent bereavement?* As this is common amongst older people, it is always worth considering. Comorbid depression is possible, but often low mood in an uncomplicated bereavement occurs in 'waves' often precipitated by a reminder of the lost loved one, such as a song or photograph. The ability to enjoy some activities is generally preserved. Psychotic and suicidal ideation is rare in bereavement alone; though hallucinations of the lost individual are common and do not, of themselves, imply psychiatric illness.

6. *Is there a pre-existing neurodegenerative process?* The particular issue here is that the insidious onset of executive impairment can also mimic a depressive episode, particularly in a cross-sectional encounter. The patient will likely have a restricted affect, prominent apathy and impaired insight. Individuals with an apathetic syndrome secondary to executive dysfunction are very unlikely to initiate activity but will respond to prompting. An individual with a depressive episode is less likely to be able to respond to external activity planning. A second issue is the difficulty in making a diagnosis of MDE when there is already advanced dementia (from any cause). An empirical approach (making the diagnosis by assessing response to treatment) is difficult to justify in light of safety findings regarding the most commonly used antidepressants [5]. An instrument for assessing depressive symptoms in dementia, such as the Cornell Scale [9], may be useful in this situation.
7. *Is there a personal history of a depressive disorder?* This raises clinical suspicion of a MDE diagnosis and could be persuasive in a decision to treat when otherwise the picture is not entirely convincing. A family history of depression is not as helpful as the term is commonly used in different ways, and even if a MDE is clearly present in a first-degree relative, the increase in relative risk is modest compared to other psychiatric disorders [10].
8. *Is there a history of mania?* This is suggestive of bipolar disorder and has treatment implications for the depressive episode. Referral to a psychiatrist in this situation is advised.
9. *Is the situation urgent?* The presence of suicidal ideation or plans and severely impaired oral intake are two indications for referral to psychiatric services. This may also have treatment implications, as faster acting treatments such as electroconvulsive therapy (ECT) may be preferred if the diagnosis of MDE is likely.
10. *Is the Mental State Examination consistent with a diagnosis of a major depressive episode?* Whilst there are alternate explanations for each finding, it would be usual to expect a degree of psychomotor symptoms, poor eye contact, slow and/or monotonous speech, pervasive low mood and nihilistic themes. Psychotic or suicidal ideation may also be present. The individual with a MDE often has preserved insight, though this is unusual in executive impairment alone.

We can now return to the case of Harry. From the vignette, clinical suspicion is already raised for a MDE by the fact that Harry is socially withdrawn, his wife is concerned, this appears to be a departure from usual and he appears sad and flat. There is functional impairment. Against this diagnostic argument, however, is the fact that Harry himself is unconcerned (this is less usual for a depressive episode), he has not responded to a trial of treatment, his appetite is preserved and he responds to prompting (often not the case in MDE). Further he has plausible aetiology for significant executive impairment—in this case a high risk of subcortical ischaemic pathology given his medical history.

Applying the above principles, the following is established on further history. There is a departure from baseline, though it is insidious and this is unusual for a depressive episode. Harry's mood is explored—he does not actually feel sad or low, he just 'can't be bothered'. He enjoys the TV he is watching, loves seeing his grandchildren and enjoys his wife's famous chocolate cake. Regarding vegetative symptoms, Harry says he sleeps poorly (but always has, as he was a shift worker) and he has a good appetite. If a meal is put before him, he enjoys it. There is no recent bereavement. There is no personal or family history of depression or mania, and the situation is not urgent.

The MSE findings include restricted affect and mild psychomotor slowing, but no change in speech, no evidence of low mood and no hopeless or nihilistic ideation. Restricted affect can occur in subcortical vascular disease, 'vascular parkinsonism' [11] as well as MDE, so this finding is not discriminatory.

Brain MRI demonstrated significant deep white matter (and extensive periventricular) pathology.

In summary, the preservation of mood reactivity, sleep and appetite patterns make a diagnosis of MDE unlikely. The insidious onset, multiple risk factors for cerebrovascular disease, lack of insight and prominent apathy mean that executive impairment is the more likely explanation for Harry's symptoms.

7.3 Treatment of a Depressive Episode

For depressive symptoms outside of a major depressive episode (such as dysthymia or personality disorders), there are effective treatment options available, but they are outside the scope of this chapter. For a presentation such as Harry's in the case above, neuroprotective options (smoking cessation, aspirin, etc.) along with activity planning and education for the patient and carer are often valuable in minimizing further decline and optimizing coping. Monitoring cognition for the development of a possible vascular (or other) dementia is important.

If a diagnosis of MDE is made, treatment options include psychological interventions (such as supportive psychotherapy or cognitive behavioural therapy—CBT), biological interventions (such as pharmacotherapy and ECT) and social interventions—including activity scheduling, exercise and optimizing social supports.

Psychological therapy alone may be adequate for mild to moderate depression [12]. This is a very important principle in treating elderly patients as avoiding medications is prudent if possible. It is important to note that for therapies which have a robust evidence base—such as CBT—the therapy should be performed by a trained clinician (usually a psychologist or psychiatrist), and the patient needs to be grossly cognitively intact to gain maximum benefit. This approach is different from what is

commonly offered which is supportive therapy. This work can be useful (e.g. in assisting with problem solving, psychoeducation and validating emotional states); however, the evidence base for this alone is less robust.

Geriatricians will often be called on to make decisions regarding pharmacotherapy. Options include antidepressant use (monotherapy and combination therapy) and augmentation (with agents such as lithium or mood stabilizers, atypical antipsychotics or thyroxine). As combination and augmentation approaches usually involve psychiatric input, only an approach to antidepressant monotherapy is covered here.

There are some important principles to consider.

Firstly, if the depressive episode is occurring in the context of bipolar disorder ('bipolar depression'), specialist psychiatric advice should be sought.

Secondly, the known risks when using antidepressants in the elderly (and their limited evidence base in mild and moderate depression) imply that older patients with a lack of vegetative symptoms should, ideally, try non-medication approaches first. These risks vary with each medication but include falls, hyponatraemia and, for some agents, all-cause mortality. These risks are usually higher in the month after either starting or stopping the antidepressant.

Third, the evidence for differential efficacy between agents is modest [13], and it is reasonable to select on the basis of previous effectiveness, side effect profile and tolerability. An example may be the selection of mirtazapine, the side effects of which (often immediate sedation and appetite improvement) may be advantageous for patients with poor sleep and weight loss. This is distinct from the antidepressant effect itself, which may take some weeks to occur.

Reserving pharmacological therapy for older patients with severe depression will mean that many (if not most) will have a melancholic picture. In specialist practice, it is rare to meet a patient with depressive symptoms who has not already been treated with a selective serotonin reuptake inhibitor (SSRI) so dual-action agents (often with noradrenergic properties—such as venlafaxine) are often trialled next. These agents (and broader-spectrum medications such as the tricyclics) may theoretically be superior to SSRIs for patients with melancholic depression, as it has been elegantly postulated that noradrenergic (rather than serotonergic) neural pathways are implicated in this syndrome [14]. Whilst there is some therapeutic evidence for this amongst elderly patients [15, 16], the larger meta-analyses of antidepressant efficacy in older patients do not specifically address the melancholic subtype of depression.

It is essential that each trial of therapy is long enough to be effective. This is usually at least 4 weeks in duration, though some authors suggest longer [17], at the maximum dose tolerated within the manufacturer's guidelines. A file review of 'treatment-resistant' patients often finds that multiple agents were previously used at either subtherapeutic doses or for a short time only.

Tricyclic antidepressants are no longer commonly prescribed for depressive indications given potential lethality in overdose, propensity to cause confusion and other anticholinergic side effects. However, they do have a role, preferably with specialist supervision.

Regular review after commencing an antidepressant is required, looking for evidence of response or any adverse effects. These can include (varying with the agent)

sedation, nausea, diarrhoea, akathisia, hyponatraemia, agitation and emergent suicidal ideation (in a small proportion of those who did not have this symptom as a part of the depressive presentation). Prescribers should monitor all patients for the first few weeks of treatment, including for new-onset suicidal ideation. The risk of suicide related to commencing an antidepressant in this age group is thought to be low and needs to be weighed against the benefits of treatment. The main concerns relating to antidepressant-induced suicide risk are in those aged under 25, with a World Psychiatry Association consensus statement indicating that even risk in this group was likely to be small [18].

ECT is indicated if trials of pharmacotherapy are ineffective and if there are urgent issues such as active suicidal ideation or sustained poor oral intake and also should be considered if the patient requests it.

Referral to specialist psychiatric services should be considered if there are issues with urgency or suicide risk or if trial of a second antidepressant has failed.

Longer-term antidepressant therapy benefits recovery [19], but the indication for ongoing use should be reviewed after 12 months, particularly for those individuals with their first depressive episode.

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Falls: Prevention and Management

8

Sunita Paul

Key Points

- Falls are common in older people—30% of people over 65 years of age and 50% of people over 80 years of age are likely to fall within the next year, the fifth leading cause of death in elderly.
- Five percent of older fallers will have a major injury such as fractured neck of the femur, subdural hematoma, etc.
- Following a fall 30–40% of fallers develop fear of falling and curtail their activities.
- Falls are expensive, and there needs to be a 66% reduction in incidence of falls to maintain current healthcare costs.
- Falls are preventable, and a systematic approach to identifying risks and addressing them in a concerted manner is key to prevention.

Case Study

Mrs. SJ, an 88-year-old woman, is admitted via the emergency department after a fall in her kitchen while turning to reach for a cup on the kitchen counter. She has sustained a fractured left neck of the femur.

She is a widow and lives alone at home with community support. She needs help to shower and dress. She also receives help with household cleaning, laundry, cooking and shopping. She uses a four-wheel walker to mobilize as she suffers from osteoarthritis but reports she has been unsteady for about 6 months.

Her other comorbidities include short-term memory loss, hypertension and depression. She was last admitted to hospital 8 months ago with a fall and dislocated left shoulder. That admission was complicated by a period of delirium and pneumonia.

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Her medication list includes paroxetine 20 mg daily, temazepam 10 mg nocte, aspirin 150 mg daily, atenolol 50 mg daily, bendrofluazide 2.5 mg daily and diclofenac 75 mg SR daily.

Examination shows an alert somewhat disorientated elderly woman. She weighs 49 kg (obtained from general practitioner records). Her heart rate is 60 beats per minute and BP lying 140/80 and sitting 120/75. The cardiovascular examination is normal. She has evidence of osteoarthritis in both knees. Limited neurological examination was normal. Visual acuity was 6/24 in the right eye and 6/18 in the left.

The following three questions would act as a good guideline to the treating physician in managing the issue of "falls" with this patient, even as the fractured hip is attended to:

1. How likely is she to fall again?
2. What are her risk factors for falling?
3. What can you do to reduce her risk of falling again?

These questions can form the basis of further discussion on this topic.

The evolution of humans as a species has seen us assume an erect posture. This evolutionary advantage has also resulted in a condition unique to human kind—risk of falls. As we age, with various factors threatening our ability to keep our posture erect, this risk increases, impacting on quality and length of life with risk of various injuries and death. In fact "falls" in the elderly have the dubious honour of being a geriatric syndrome. As our society succeeds in achieving an ageing population, falls in the elderly have become an increasing concern. Preventing and managing the outcome of falls remains a challenge for health professionals and society.

Research in this field has been challenging. Assessing the success of a falls intervention programme is difficult due to fundamental methodological issues (e.g. the absence of blinding). However, fortunately a large amount of information is now available to health professionals.

WHO defines a fall as "an event which results in a person coming to rest inadvertently on the ground or floor or other lower level".

- Falls are common in older people—30% of people over 65 years of age and 50% of people over 80 years of age are likely to fall within the next year [1–3].
- Falls are the fifth leading cause of death in the elderly.
- Five percent of older fallers will have a major injury following a fall, such as a fractured neck of femur or subdural hematoma [4].
- 30–40% of fallers develop fear of falling and curtail their activities [5, 6].

8.1 Cost of Falls

An estimate by the Australian Commission on Safety and Quality in Healthcare completed in 2008 predicts a rise in cost from AUD 498.2 million in 2001 to AUD 1375 million in 2051 and 886,000 additional bed days per year by 2051. It is

projected that 3320 additional residential care facilities will be required to deal with falls-related incidences over this period.

There needs to be a 66% reduction in the incidence of falls to maintain current healthcare costs. In New Zealand, the Accident Claim and Compensation Organization (ACC) data in 2008 showed that, out of 128,000 claims totalling NZD 1.9 billion, 38% were falls related and 44% of these happened around the home of the patient. Clearly, falls are a significant challenge both for society and the individual. Falls also lead to a substantial inpatient burden.

An elderly person who sustains a hip fracture has a 20% risk of dying within a year and another 20% of these patients require a change in their living circumstances, often needing residential care. Hence, a fall can certainly be a fearful event for an older adult.

8.2 Risk Factors for Falling

Several epidemiological studies have looked at this issue. The risks can be divided into intrinsic and extrinsic factors.

Intrinsic risk factors include:

- Muscle weakness
- Balance disorders
- Cognitive impairment
- Depression
- Visual deficits
- Age >80 years
- Postural hypotension
- Syncope or "funny turns"

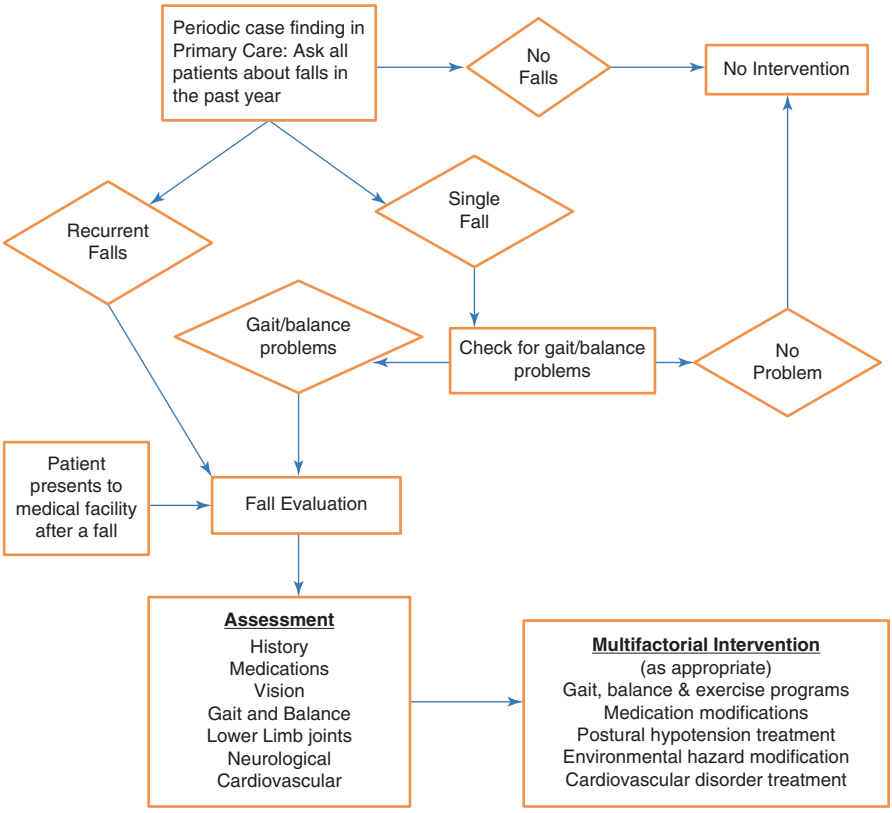
Extrinsic factors include:

- Polypharmacy with >4 drugs
  Psychotropic agents
- Environmental hazards
  Assistive devices
  Restraints
- Lifestyle factors
  Cluttered surroundings

Applying this knowledge to Mrs. SJ, she has at least five risk factors—age, polypharmacy, poor balance, poor cognition and a history of depression—which render a high likelihood of falling again.

She requires urgent review of the risk factors and modification where possible as well as minimizing the risk of injury. The next part of this chapter will address these strategies.

Algorithm for Falls Assessment and Management



8.3 Risk Management

As with many other strategies used in dealing with older patients, falls prevention needs a multidisciplinary approach [12, 13]. A Cochrane review from 2012 summarized that multifactorial interventions are required to ascertain a patient's falls risk and then implement treatment or referrals which will minimize the risks identified [14, 15]. For the most part, the most recent evidence available indicates that this type of proactive intervention reduces the number of falls in the elderly community [16].

The *multidisciplinary strategies* may include:

- Medical review
- Physiotherapist input and appropriate exercises
- Occupational therapist assessment and environmental review
- Attention to visual impairment—treating common visual issues in the elderly such as cataract and macular degeneration
- Vitamin D for the appropriate patient [17]
- Delirium prevention and management

8.4 Injury Prevention

This may include the use of hip protectors, movement sensors and other biotechnological tools.

Investigating and considering treatment for osteoporosis are beneficial. This may also involve identifying patients at high risk of falls by using fracture risk assessment tools and appropriate treatment for both preventing and managing osteoporosis.

Research results on all these interventions have at times been conflicting. The 2012 Cochrane review examined the healthcare research information to determine which falls prevention interventions are effective for older people living in the community. This involved 159 randomized controlled trials with 79,193 participants. These interventions included:

- Multifactorial risk management
- Medication review (avoiding polypharmacy)
- Avoiding psychotropic medications
- Treating cardiovascular disorders, postural hypotension and causes of syncope
- Optimizing general condition—vision, nutrition and vitamin D supplementation
- Osteoporosis treatment—appropriate use of fracture risk assessment
- Appropriate application of biotechnology such as falls alarms or self-lighting toilets

8.5 Role of Medication Review and Other Medical Inputs

Obviously certain medications may increase the falls risks for older people. Unfortunately three trials in Cochrane group were unable to reduce the number of falls by reviewing and adjusting medications; however a fourth trial involving general practitioners and their patients in the mediation review process did result in a subsequent reduction in the number of falls.

Additionally, the use of a pacemaker where appropriate can minimize falls in patients whose falls are often a result of carotid sinus hypersensitivity, a condition responsible for unexpected changes in both heart rate and blood pressure. Podiatry input for people with debilitating foot pain through the use of customized insoles, appropriate footwear, orthotic insoles as well as foot and ankle exercises reduced the number of falls for those affected.

8.6 Role of Exercise

A systematic meta-analysis by Sherrington et al. looked at 44 randomized controlled trials with 9603 participants. They concluded that there was a 17% overall risk reduction for falls in those who exercised. The analysis also looked at the variability in results, and the group felt that it was explained by various factors including dose of exercise, level of challenge to balance and presence or absence of a walking programme. The analysis also illustrated the fact that exercise-related

interventions could ironically also increase the risk of falls when applied to the inappropriate patient.

The Otago Falls Prevention Programme has been a well-established and well-used programme that examined the role of nurse-led, function-based balance and gait training for at-risk elderly patients in the community. The programme was shown to be very cost-effective; it also primarily addressed balance.

More recently, El-Khoury et al. [22] have shown that a two-year balance training programme, with both a weekly group session and individual sessions, effectively reduced falls resulting in injuries and also was helpful for women aged 75–85 years, at risk of falling, in improving measured and perceived physical function. As it is not always possible to prevent a fall, there is now more emphasize placed on reducing injurious falls and overall risk of injury [23].

8.7 Visual Impairment and Falls Prevention

Visual impairment is a common problem amongst elderly with cataract and macular degeneration, and detection and treatment have been shown to reduce falls in selected patients [24]. Trials have been limited by small numbers; however one of four trials reviewing cataract treatment as an intervention showed a clear reduction [25, 26].

Campbell et al. [27] showed that a home safety assessment and modification programme by an occupational therapist reduced falls amongst men and women aged 75 years plus, with severe visual impairment.

The following tips are useful in preventing falls in the visually impaired:

- Visually impaired older people have twice the risk of falls as those with normal sight.
- These individuals should be referred to an experienced occupational therapist who can facilitate falls risk modification through a home safety assessment.
- Determining the frequency of falls in the past year is important. Those older people with a recent history of falls will be motivated and hopefully benefit from an exercise programme specifically designed to reduce the frequency of falls.
- Diagnosis of cataracts and their removal will optimize vision and hence prevent falls.
- Extra care is necessary when older people adjust to significant changes in their lens prescriptions.
- Recommend the use of monofocals while walking.

8.8 Role of Occupational Therapist

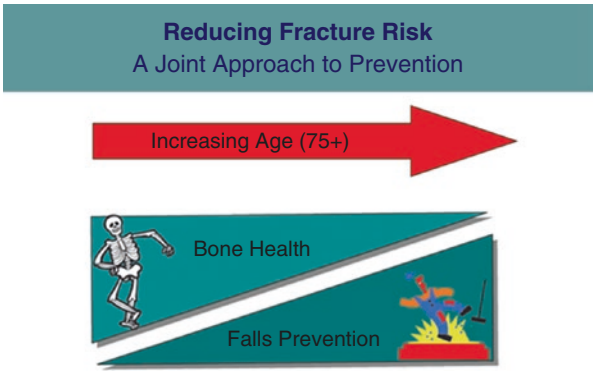
Occupational therapists are particularly helpful in instituting interventions to improve home safety, especially in people at higher risk of falling. For example, shoe device might be needed in icy conditions to prevent injurious falls.

The interventions may differ depending on the setting. Falls prevention for elderly patients admitted to hospital as inpatients may require more focused interventions as follows:

8.9 Vitamin D and Falls Prevention

Vitamin D supplementation may reduce the number of falls for older people in the community where there is a preexisting vitamin D deficiency; however vitamin D supplementation in itself does not appear to reduce falls in general.

There have been several trials assessing effectiveness of vitamin D in preventing falls. Three of these showed positive effects, and at least one had significant negative result. Trials that assessed patients in long-term facilities as expected did show positive impact of vitamin D supplementation.



8.10 Role of Biotechnology

There has been significant research into the use of biotechnology in the area of falls and injury prevention over the last decade. A variety of movement sensors, alert/alarm systems, ultralow beds for patients with delirium, appropriate lighting and non-slip flooring have been trialled in preventing falls and injuries with variable success.

Kosse et al. [28] reviewed 12 studies that looked at the use of sensors to prevent falls and related injuries in the elderly living in residential care settings. Although three trials showed a significant reduction in falls-related injuries (77%), the false alarm rate of 16% was felt to be too high to keep the carer staff focused. The group concluded that staff engagement and careful patient selection are needed when using sensors to reduce falls and falls-related injuries in residential care settings.

8.11 Use of Restraints

This has been a controversial issue, but there is now general consensus that use of chemical restraint (sedation) or physical restraint (e.g. bedrails) does not prevent falls: in fact, it can result in worse injuries. Bedrails, for example, have been shown to cause serious injuries in multiple studies—from asphyxiation to lacerations and dislocated joints. These tend to happen while a confused patient tries to climb over the bedrails.

A guideline in appropriate use of bedrails by the UK National Patient Safety Agency recommends considering certain patient properties such as presence of confusion, patient's mobility/immobility and independence/need for help or hoist. For patients who are confused and immobile, bedrails could be used with care. Bedrails are not recommended for confused patients who are mobile, however; instead these patients should be nursed in low beds. Drowsy patients who are immobile can have bedrails used with care.

8.12 Fracture Risk Assessment Tools

The development of fracture risk assessment tools in the last decade has provided a significant way forward in helping the clinician to assess the individual patient's fracture risk and use bone protection measures most appropriate for that particular patient. These clinically validated tools include FRAX and Garvan,—specific to patients with recurrent falls, and Q Fracture,—a multiple-risk self-populating software-based tool used mostly in the UK. Bone density measure is one of the risk factors used in these tools. The use of several risk factors makes these tools a much more comprehensive way of calculating an individual patient's fracture risk.

Osteoporosis treatment is a crucial part of preventing injury by reducing fracture risk in patients at high risk of falling.

To reduce hip fractures, hip protectors are also advised in these patients, especially those living in residential care settings; however, compliance remains a challenge in this group.

Case Study

We could now apply this knowledge to our patient Mrs. SJ.

Her medications need to be reviewed. As she has postural hypotension, one of her antihypertensive medications could be stopped. Diclofenac may no longer be appropriate for her, given that her renal function is likely to be at least moderately impaired when assessed by checking creatinine clearance. This could be replaced by regular paracetamol in the first instance.

If depression is no longer an issue, then paroxetine could be weaned off.

Temazepam, being a sedative, would certainly add to her risk of falling. Benzodiazepine withdrawal is especially challenging and requires constant engagement with the patient with regular follow-ups.

Good records and communication with the primary caregiver are an essential part of reviewing the medication of an elderly person.

Since Mrs. SJ has cognitive impairment, she will be at high risk of delirium, and strategies to prevent and manage delirium will need to be initiated as soon as possible with full engagement of the multidisciplinary team caring for her. The involvement of an orthogeriatric team right from the outset, with application of principles of older person's care applied, has been shown to improve outcomes for elderly patients with fractured neck of femur such as Mrs. SJ.

Secondary treatment of osteoporosis with an antiresorptive together with vitamin D supplementation, keeping her renal function in mind, would also be recommended. In many countries, a clear osteoporotic or fragility fracture such as hip fracture in an older elderly patient (>75 years) is accepted as sufficient indication of the presence of osteoporosis. In a younger patient, bone density measurement will be necessary. Clinical pharmacists on the ward are helpful in counselling patients in appropriate use of oral bisphosphonate therapy.

Once she has had surgery, timely input from a multidisciplinary team led by a geriatrician, including physiotherapist, occupational therapist, dietician, etc., should assess and facilitate transfer to rehabilitation where she should have discharge planning carried out.

She should also receive further attention and intervention into her risk of falling. An occupational therapist could assess her home setting. Her visual acuity is reduced, and she should be assessed for treatable cause such as cataract or macular degeneration; glaucoma is also a possibility.

A physiotherapist would set up an individualized balance training programme with follow-up in the falls clinic or in the community, as her cognitive impairment is only mild and she is able to follow instruction.

Considering her ongoing risk of falling, hip protectors could be trialled. Her family or community supports should be appropriately engaged and advised.

8.13 Summary

- Preventing falls as a primary end point is important.
- Reducing falls will impact on fracture risk.
- There is a welcoming evidence that several types of falls can be averted.
- A "one size fits all" approach will not work.
- More work is required to align falls and bone health services and to engender a more pragmatic and tailored approach to risk minimization.
- Addressing the prevention of falls and the subsequent injuries should be multifactorial involving point of care and critical levels.
- Consumer engagement is an integral element to successfully preventing falls and minimizing their harm.

Best practice will include identifying falls risks, implementing targeted individual strategies. These strategies will require ongoing resources to ensure they are regularly reviewed and monitored.

The best way to affect a successful falls prevention programme is to involve staff across all healthcare facilities to provide a multifactorial approach.

A time lag would naturally be expected between initial implementation of a falls prevention programme and a measurable improvement in outcomes.

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The Problem of Incontinence in the Elderly

9

Jonathan Marriott

Key Points

- Many treatment strategies either need modification or are not appropriate for patients with dementia. Treatment options will often depend on the setting of care and the availability of carers and need to be individualized.
- Much of the assessment may need to be discussed with carers, and it is important to recognize that family members may feel uncomfortable discussing and being involved in this intimate area of care with their loved ones and vice versa.
- Continence aids are often a mainstay of treatment. Options of modifying the environment to improve access and reduce the risk of falls and incontinence include decluttering, ensuring adequate lighting and highlighting the toilet.
- Ensuring bowels are regular has a greater emphasis in dementia patients to avoid incontinence both of bowel and bladder.
- Patients with Alzheimer's disease may be managed with cholinesterase inhibitors that can cause or exacerbate urinary frequency and incontinence.
- Medications used for urge incontinence should not be completely dismissed in patients with dementia despite their potential side effects.

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Case Study

A 76-year-old woman with diabetes underwent a total hip joint replacement. She was a former Professor of the Arts who lived alone and in recent years had become more withdrawn, no longer attending her previous clubs or visiting colleagues. Her operation was deemed successful and her indwelling catheter from theatre was removed on day 3. The night nursing staff found themselves responding to her requests every hour for assistance to use the toilet with her bed sometimes wet before they arrived. An IDC was inserted to avoid the nocturnal disturbance to staff, but she subsequently developed a UTI and delirium. She was later discharged to rehabilitation where she made slow progress and appeared depressed. With the IDC removed, a pad was applied for the persistent wetness.

9.1 Introduction

9.1.1 Incontinence Is a Symptom, Not a Diagnosis

Urine incontinence is considered to be one of the "geriatric giants". Unfortunately there is misperception amongst health professionals and society that it is an inevitable consequence of ageing with nothing that can be done. Without proper assessment, critical underlying conditions or treatment options that could greatly improve the lives of older people affected may be missed.

Incontinence has been associated with mood disorders, social isolation and risk of placement in residential care [1, 2]. It can result in a significant financial cost to the individual and society. Carers, who may need to provide assistance in toileting and personal hygiene, are at significant risk of fatigue [3].

A comprehensive geriatric assessment should include screening for incontinence as many older people are unlikely to volunteer this information [4, 5]. Clinicians need a sensitive approach, acknowledging any impact of culture or other beliefs may have on this embarrassing issue. Establishing rapport, understanding potential boundaries and obtaining consent for examinations are critical to the assessment process.

An older person is likely to have a multifactorial basis for their incontinence. The role of the physician is to evaluate the symptom of incontinence to determine potential underlying factors and the diagnosis. A multidisciplinary team approach of nursing, physiotherapists and other allied health will benefit the assessment and management. Depending on the underlying causes, geriatricians, urogynaecologists and urologists may have a role. The goal of assessment is to reduce the symptom burden and improve the quality of life for older individuals and their carers.

9.2 How Do We Normally Remain Continent?

9.2.1 Understanding the Underlying Physiology and Pathology

Remaining continent at any age requires a complex interaction of multiple body systems with suitable access to a toilet. Ageing changes can make an older person

more vulnerable to the many disease processes, medications or environmental factors that can potentially lead to incontinence. The incidence of incontinence tends to be equivalent in men and women later in life [6].

9.3 Urinary System

Our bladder has two major functions physiologically: to store and expel urine. Storage is reliant on a compliant smooth muscle in the bladder with adequate supports in the form of pelvic floor musculature and sphincters. To expel urine an adequate bladder contraction is required to empty the bladder to less than 50 ml, ideally with an unobstructed urethra [7]. Normal physiological changes in an ageing bladder are reduced compliance and capacity, bladder sensation and contractility [8]. These changes can lead to higher residuals in older individuals and more frequent voiding.

9.3.1 Classifying the Pathological Conditions Affecting the Urinary System

There are three major syndromes affecting the urinary system leading to incontinence: *stress*, *urge* and *overflow* incontinence. There is commonly overlap, especially as we age, which is classified as *mixed incontinence*.

Stress incontinence is involuntary leakage of urine caused by increases in abdominal pressure such as coughing or sneezing [9]. It can be caused by weakness in the pelvic floor musculature leading to urethral hypermobility [10]. Major risk factors include increasing parity or complicated childbirths, obesity and repetitive straining that can worsen the integrity of the pelvic floor musculature. Stress incontinence can also result from weakness or deficiency of urinary sphincters. Examples of this include complications of prostate surgery in men or pelvic surgeries in women.

Urge incontinence involves involuntary leakage associated with an inability to defer voiding and a strong urge [9]. Frequency of small volumes and nocturia are commonly associated with this. There are a number of important causes to rule out in patients with urge incontinence such as bladder infections, calculi, malignancy or inflammation. Clues are often in the associated symptoms and if it is of recent onset. Otherwise the most likely pathology in the older person is neurologic or idiopathic *detrusor overactivity.* Neurologic aetiologies such as strokes or Parkinson's can lead to an interruption to the normal inhibition of bladder relaxation with subsequent uninhibited bladder contractions. *Idiopathic detrusor overactivity* has an increasing prevalence with age and is a common cause [11].

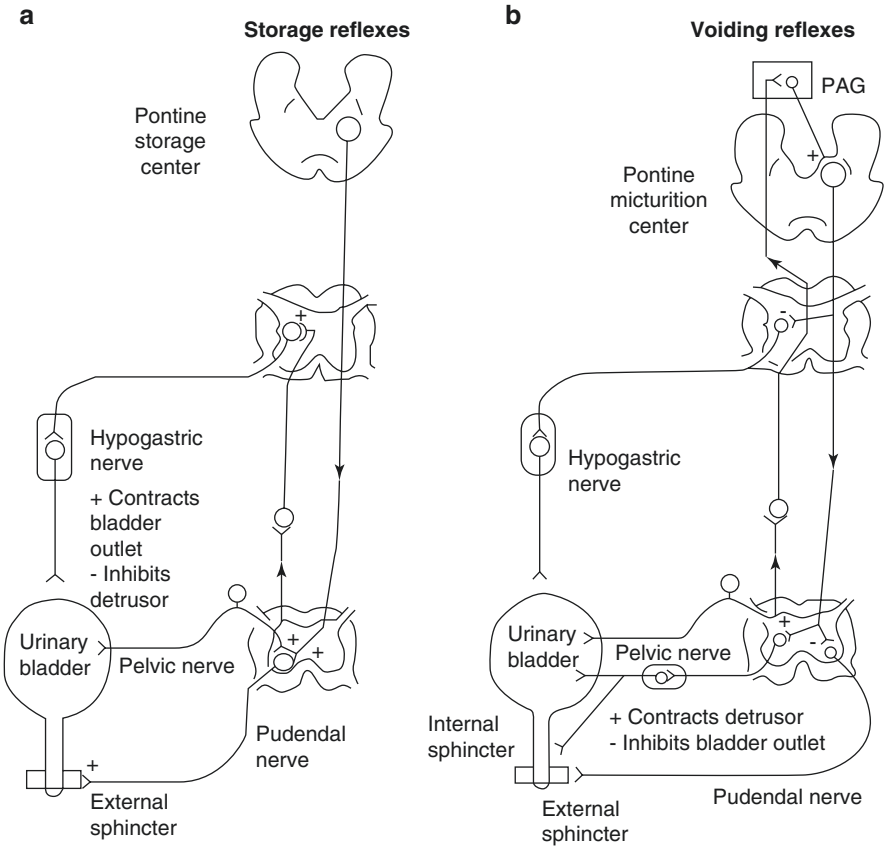
Overflow incontinence occurs once the bladder has reached and exceeded maximum storage capacity leading to leakage [12]. This can be the result of obstruction to urine flow or a weak bladder contraction or a combination of the two. Neurological causes of bladder weakness in the older person include autonomic neuropathy from

diabetes, Parkinson's syndromes or spinal cord pathologies. Obstruction is typically related to the prostate in men and rarely gynaecological tumours or massive prolapses in women.

9.4 Nervous and Musculoskeletal Systems

Our urinary system is under the control of the central and peripheral nervous system. Conscious decisions about where, and when, to void are controlled by the frontal cortex. As the bladder fills up to capacity, this sensation becomes increasingly unpleasant, leading to a desire to void. This desire to void can also be triggered by our emotions, such as anxiety, or cues such as running water. It is these types of triggers that are often targeted by bladder retraining.

Our midbrain contains the micturition centre that coordinates the contraction of the bladder and relaxation of our sphincters and vice versa. The parasympathetics travelling via the pelvic nerve lead to contraction, whilst the sympathetics via T11–L2 lead to bladder relaxation. The internal sphincter and pelvic floor muscles receive the input of the somatic nervous system S2–S4 via the pudendal nerve, which supports the bladder's storage of urine.



Once the desire to void is generated, an older person must be able to safely navigate to the toilet. Falls in particular are a major concern in the frail elderly especially at night. Conditions affecting balance and dexterity are also likely to impact on continence.

9.4.1 Pathological Conditions Affecting the Nervous System

Dementia or strokes are examples of conditions affecting cortical control of continence. They can impair the ability to recognize the fullness of the bladder, response to urge signals and understanding socially appropriate places to void.

Detrusor sphincter dyssynergia describes the condition when there is incoordination of bladder contraction and sphincter relaxation due to abnormalities with the micturition centre or its signalling [13]. Importantly this can result in high pressures within the bladder from the obstruction to flow and poor bladder emptying. Conditions such as multiple sclerosis, cerebrovascular disease or spinal cord pathology can be the culprits.

Acute changes in bladder and bowel function including new onset incontinence should always lead to consideration of spinal cord pathology.

9.5 Assessment

The goal of assessment is to determine the factors that have led to incontinence and their reversibility. In the geriatric population, there may not be any specific bladder pathology, but managing other factors identified in the assessment can still lead to excellent results. Where possible, assessing someone in their home is often the best, allowing an insight into the patient's environment and how they are coping. It is always important to rule out potentially sinister underlying causes first.

9.5.1 Key Areas to Focus on in History

9.5.1.1 Lower Urinary Tract Symptoms

Lower urinary tract symptoms can be non-specific, but an attempt should be made to determine to what degree the patient is suffering from urge (*Do you leak or have difficulty holding on when the urge to pass urine comes on? Do you leak on the way to the toilet?*) or stress incontinence (*Do you leak when you cough, sneeze or perform physical tasks such as lifting or exercise?*). The duration of these symptoms and their change over time should be explored. Other general questions include the frequency of toileting, the presence of hesitancy, the quality of the stream and whether they feel completely empty after voiding. Serious pathology may be present if there has been haematuria, pelvic pain, dysuria or systemic symptoms such as loss of weight or fever. A history of recurrent urinary tract infections should also be asked as this may be an indicator of poor bladder emptying, renal tract calculi or anatomical abnormalities of the urinary tract. Finally the impact of anxiety and mood disorders on bladder function needs to be explored.

9.5.1.2 Nighttime Symptoms and Nocturia

Many elderly who seek assistance with bladder control do so because of interruption to sleep with potential consequences of daytime fatigue, carer stress or falls [14, 15]. Sleep can be disturbed by nocturia or waking after an episode of nocturnal enuresis. Due to decreasing bladder capacity as we age, getting up twice at night or less may be considered normal.

A good sleep history is required to determine whether waking is due to the need to void or there is some other factor such as mental health, restless legs or poor sleep hygiene causing waking with subsequent voiding, "just in case".

Nocturia may be due to nocturnal polyuria which is defined generally as a greater than 33% of a 24-h output occurring overnight [16]. This can be diagnosed with the aid of a bladder diary. When present, questions will need to be directed at potentially underlying causes including edematous states (e.g. congestive cardiac failure) polyuric conditions (diabetes insipidus and mellitus) or obstructive sleep apnea (affecting ADH production). Older people whose blood pressure does not fall overnight may also lead to greater urine production, but the overall relationship between blood pressure and nocturia is not entirely clear [17].

9.5.1.3 Neurological History

Questions regarding falls, balance problems or cognitive difficulties are useful to screen for possible underlying neurological conditions contributing to incontinence.

9.5.1.4 Bowels

The bowels need to be considered both specifically for their own management and also their impact on bladder continence. Physiological changes in the bowels during ageing include reduced rectal sensation and reduced external sphincter squeeze pressure [18]. Baseline questions should include the frequency and softness of the stool, whether there is any straining, and if faecal incontinence is present. Questions gauging the degree of leakage, urgency and the presence or absence of anal sensation should follow.

Recent changes in bowel habit may indicate serious underlying bowel pathology (malignancy, inflammatory conditions, etc.). Once serious pathology is excluded, often diet, fibre and fluid intake need exploring to establish their potential role in either constipation or loose stools. Constipation in particular can exacerbate urgency symptoms and reduce bladder emptying. Medications, including previous and current laxative, should be reviewed.

9.5.1.5 Obstetric and Gynaecological History

Even with older patients enquiring about the number of babies they had, birth weights, types of deliveries and whether there were any complications will help determine the potential risk for pelvic floor muscle weakness. Asking about prolapses is also important, as they are often associated with pelvic muscle weakness.

The timing of menopause and previous use of hormone replacement therapy will help screen for vaginal atrophy. Previous operations for stress incontinence, IDCs or other pelvic procedures should be asked about.

9.5.1.6 Oral Intake and Weight

Many older people drink less than the recommended 1.5–3 L of fluid a day to avoid incontinence, placing them at risk of dehydration and constipation. Drinking more than this may suggest a polyuric condition. Caffeinated drinks such as coffee, tea and soft drinks can exacerbate urge and frequency. Obese patients should have their diet and motivation reviewed to determine the potential for weight loss.

9.5.1.7 Medication Review

Polypharmacy is common in the elderly, and there are many drugs that can impact on bladder or bowel function directly or indirectly. Drugs that can exacerbate urge symptoms include diuretics or cholinesterase inhibitors. Drugs that impair bladder emptying include those with anticholinergic properties such as TCADs or antipsychotics or indirectly by the multitude of drugs that lead to constipation. Any drug that can cause sedation or delirium will potentially impact on cognitive control of continence. In all cases a thorough review of these medications as to their ongoing indication or whether alternatives could be used should be explored.

9.5.1.8 Home Environment

Questions should be asked regarding the location of toilets and lighting and whether walking aids or home modifications are required to reduce the risk of falls and incontinence.

9.5.1.9 Degree of Bother

Ascertaining the degree of bother of a client's bladder symptoms is imperative in determining the amount of investigation and management desired. How many pads or other aids an older person is using will give an idea about the degree of wetness. Questions also need to be asked about whether there is avoidance of social interaction, jobs or intimate relationships. Carers should be asked about whether they are fatigued by the burden of attending to personal hygiene or sleep deprived.

9.5.1.10 Bladder and Bowel Diaries

Diaries are an objective assessment tool that can assist with diagnosis as well as providing useful feedback to the patient about their current habits. A standard bladder diary will reveal the type and amount fluid intake, urine output with the volumes voided and frequency, as well as comments on leakage and potential triggers. Bladder diaries can help diagnose nocturnal polyuria. Ideally they should be completed over three days, and this may need assistance from carers. Bowel charts can similarly objectively determine the frequency and consistency of stool.

The arts professor's bladder diary one month post-rehab admission

Date	Time	Fluid intake (ml)	Urine output (ml)	Comments
8/11	06:00		100	Wet bed
	07:30	Coffee 250		
	08:00		75	
	09:45		75	
	10:00	Coffee 250		
	10:10		150	Wet pad ++ on way to toilet
	11:00		100	
	13:00	Coffee 250		
	13:15		50	Wet pad +++ on way to toilet
	15:00	Water 50	50	
	15:30	Coffee 200		
	16:00		75	
	18:00	Water 200	150	Wet pad + on way to toilet
	20:00	Wine 200		
	22:00		50	Went to bed 2300
9/11	01:00		75	
	02:00	Water 50	10	
	04:00		50	Wet bed on waking
	05:00		25	
	07:00		50	Got up at 0700
Totals		1450	1085 + wet pads	
			Overnight output 210/1085 = 19%	

9.6 Examination

The important components of examination.

9.6.1 Neurological

A complete neurological examination is required with a focus on excluding:

- Extrapyramidal syndromes
- Spinal cord or cauda equina syndromes
- Cerebrovascular disease
- Autonomic neuropathies

9.6.2 Cardiovascular

- Fluid assessment
- Postural BP

9.6.3 Gynaecological/Groin Examination

- PV examination:
  Prolapses
- Demonstrations of stress incontinence:
  Vaginal atrophy
  Rashes
  Pelvic floor muscle strength
- Penis examination:
  Anatomical abnormalities

9.6.4 Abdominal

- PR examination—masses, anal tone, faecal matter, prostate size

9.7 Investigations

Routine testing for urinary incontinence should include:

1. *Dipstick/MSU* to exclude active sediments, infection or inflammation.
2. *Post-void residual/ultrasound*—Repeat measurements can improve accuracy. Formal renal ultrasounds should be ordered with markedly raised residuals or worsening renal function.
3. *Blood tests* to screen for any clinically suspected underlying conditions.

Further investigations of the bladder will be determined by clinical suspicion. Investigations for faecal incontinence may include screening for underlying conditions or more specifically investigations to ensure adequate anal sphincter integrity such as anal manometry or ultrasound.

9.8 Urodynamics

Urodynamics is the investigation of choice to confirm the presence of stress incontinence, detrusor overactivity and whether there is obstruction or hypocontractility causing poor bladder emptying. The results include measurements of bladder capacity, compliance and bladder and urethral pressures during filling and voiding. When

combined with video, further information is obtained such as the underlying mechanism of stress incontinence, the presence of bladder diverticulum indicating high pressures and the ability to diagnose detrusor sphincter dysnergia.

It is used less as people age as it can be technically difficult and embarrassing and is rarely used in patients with cognitive impairment. Indications may include diagnostic dilemmas after failed conservative management, if surgery is being considered or if there is a suspicion of a high pressure bladder [19].

9.9 Treatment Options

9.9.1 General Principles

The first important step in managing incontinence in the older person is to provide an explanation to patients and carers about the causes for their incontinence. In addition to understanding the basis for their incontinence and therefore its management, such explanation also provides reassurance for those patients who may have been worried that a sinister underlying pathology was causing their symptoms. Appropriate continence aids should be advised with the aim of achieving social continence. Products including pads and pull-up underwear, toilets or bottles, IDCs and condom drainage and mattress protectors may be enough to address concerns about personal hygiene and smell. All of the factors otherwise identified in assessment such as fluid intake, diet, bowel management, medications and mental health should be addressed. These conservative measures alone may be sufficient to improve and manage incontinence to a satisfactory level and usually should be implemented prior to further management.

Topical oestrogen therapy may have a role in treating incontinence in postmenopausal women with possibilities of improvement with urge and stress symptoms, with its main role in alleviating the symptoms of vaginal atrophy [20].

9.10 Stress Incontinence Management Options

9.10.1 General Measures

The initial steps are to reduce weight and avoid or manage precipitating factors such as heavy lifting or cough.

9.10.2 Pelvic Floor Exercises

For those older persons with adequate cognition and motivation, a course of pelvic floor exercises usually over many months can produce benefits with incontinence and small prolapses [21]. Correct identification of pelvic floor muscles and technique may require a continence physiotherapist.

9.10.3 Surgical Options

For those with persistent troublesome symptoms despite conservative measures, corrective procedures including slings for women or artificial sphincters for men can be explored. Age alone should not be a barrier for an assessment with a surgeon, with many operations able to be done as day procedures.

9.11 Urge Incontinence Management Options

9.11.1 Bladder Retraining

For motivated cognitively intact older individuals, bladder retraining involves employing deferment techniques when the urge to pass urine is first felt, to delay voiding. The goal of this process is to "train the bladder" to hold more urine, which over time can increase the functional bladder capacity, reducing urge and frequency [22]. Examples of simple deferment techniques include curling toes or counting slowly to ten. Pelvic floor exercises or medication can enhance this process to achieve good results [21]. Using bladder diaries before and after bladder training can objectively assess improvements.

9.11.2 Medications

Medications are effective in reducing incontinence, urge and frequency [23]. The choice of medication is often determined by cost and their differing side effect profile. Whilst they can lead to improvement after days, usually a few weeks is required to assess their initial effectiveness. Some individuals will use them only as needed before going out or before the most bother sometimes such as at night. There is no absolute on treatment duration, but some may choose to cease after feeling they have successfully retrained their bladder, whilst others will continue as long as symptoms are being alleviated. It is not advised to use these medications where poor bladder emptying co-exists unless catheter drainage is also being used.

9.11.3 Antimuscarinics

Bladder targetting anticholinergic agents (e.g. oxybutynin, darifenacin, solifenacin) are thought to act by reducing bladder contractions during filling [23]. They can be limited in the elderly by their side effect profile, with typical anticholinergic effects such as dry mouth, dry eyes and to a lesser extent constipation sometimes leading to cessation of therapy. Their potential for cognitive side effects in the geriatric population means that monitoring is recommended and caution is needed in those with baseline impairment.

9.11.4 Beta 3-Adrenoceptor Agonists

Mirabegron is a newer agent that directly activates relaxation of the smooth muscle of the bladder [24]. Side effects of note include potential severe rises in blood pressure. Otherwise tachycardia and potential prolongation of the QT interval are recognized. It may have benefit in the elderly due to the likely lack of cognitive side effects, but currently cost can be prohibitive.

9.11.5 Botulinum Toxin Therapy

For those with persistent urge incontinence due to detrusor overactivity, direct injections of botulinum toxin into the bladder can be of benefit [25]. It requires that a patient has the capacity to self-catheterize in the event of a temporary atonic bladder which can be an issue in the elderly. Beneficial effects can last 6–12 months or longer with repeated dosing possible [23].

9.11.6 Other Therapies

There is limited availability and practice of treatments such as sacral nerve stimulation or neuromodulation for incontinence, but clinicians should be aware that some specialists may be able to offer these or other surgical options in severe cases.

9.12 Poor Bladder Emptying

9.12.1 General Measures

Poor bladder emptying may be improved by addressing constipation or ceasing medications with anticholinergic actions. *Double voiding* is a practice of returning to the toilet soon after the initial attempt to empty the bladder, to see if further emptying is possible. Where appropriate, surgery should be considered for outflow obstruction such as that caused by an enlarged prostate.

9.12.2 Catheter Drainage

There is no absolute value of a post-void residual at which catheters should be introduced. Clear indications include retention, pain, worsening renal function or hydronephrosis. Urodynamic features such as the presence of a high pressure bladder (e.g. in detrusor sphincter dyssynergia) can lead to potential recommendations of the use of catheters to avoid potential renal dysfunction [13]. Another indication in the geriatric population may include the use of short-term catheters to allow wound healing should urine incontinence be compromising this. Where possible

intermittent self-catheterization is preferred to permanent indwelling catheters, as a good technique is associated with reduced UTIs and can allow for greater freedom including sexual expression [26].

9.13 Nocturia

If nocturia is thought to be attributable to the conditions that have already been discussed, then the treatment won't differ. If nocturnal polyuria is detected, treating any underlying cause should be the first goal of therapy. Minimizing oral fluids after dinner and afternoon diuretics can be trialled, but results are variable. If nocturnal polyuria is persistent, then DDAVP is a potential treatment option. However in the elderly, it would need to be used with great caution because of the potential for severe hyponatraemia and its consequences.

9.14 Continence Strategies in Patients with Dementia

Many of the treatment strategies already discussed either need modification or are not appropriate for patients with dementia. Treatment options will often depend on the setting of care and the availability of carers and need to be individualized. Much of the assessment may need to be discussed with carers, and it is important to recognize that family members may feel uncomfortable discussing and being involved in this intimate area of care with their loved ones and vice versa.

9.14.1 General Measures

Continence aids are often a mainstay of treatment, but they can be refused by some some patients who are resistive to care. Options of modifying the environment to improve access and reduce the risk of falls and incontinence include decluttering, ensuring adequate lighting and highlighting the toilet, for example, using a coloured toilet seat if everything else is white. A floor mat alarm can provide an early warning system for carers if the risk of falls is high, so that assistance can be provided for toileting overnight. For daytime symptoms *timed or prompted toileting* may be trialled for patients who have poor mobility or apathy [27]. Taking them to the toilet at regular intervals or after meals may prevent episodes of incontinence. Ensuring bowels are regular has a greater emphasis in dementia patients to avoid incontinence both of the bowel and bladder.

9.14.2 Medication Considerations

Patients with Alzheimer's disease may be managed with cholinesterase inhibitors that can cause or exacerbate urinary frequency and incontinence [28]. There will be

occasions when ceasing cholinesterase inhibitors may be warranted when the urinary symptoms are more bothersome than the perceived cognitive benefits. Medications used for urge incontinence should not be completely dismissed in patients with dementia despite their potential side effects. As long as the patient has a carer who can observe for cognitive side effects and take appropriate action, they might be able to reduce some of the burden of caring when a reduction in nocturia or incontinence is achieved.

The Case Revisited

In this case a simple brief bedside assessment would have identified potentially reversible factors leading to the Professor's incontinence. She had suffered for many years with frequency and urgency and minimal stress incontinence symptoms. She became very worried that she would smell of urine so she avoided going out. This led to depression, and she had actually deferred her THJR previously as she was worried about the management of her incontinence in hospital. She had no neurology or other worrying features on history and examination. Her MSU was normal, and a post-void residual revealed only 23 ml. A presumptive diagnosis of idiopathic detrusor overactivity with urge incontinence was made.

She was linked into a continence clinic after leaving rehab, and a geriatrician advised her to cut back on her four coffees a day, and she commenced bladder retraining with a continence physiotherapist. She gained some improvement with this and elected to also try an anticholinergic given the severity of her symptoms. Four months later she was almost dry; she wore pads for minor leakage and had started attending her previous social engagements. She typically only got up once a night!

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Acute Care and Geriatric Assessment

10

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Key Points

- Acutely unwell older persons frequently present with falls, delirium, and social withdrawal, rather than with symptoms pertaining to the newly diseased organ system.
- Comprehensive geriatric assessment has been shown to result in sustained improvements in physical and cognitive function and to reduce inpatient mortality.
- Geriatric syndromes are usually due to multiple coexisting etiologies, and attempting to find *the* cause is often misdirected and expensive.
- Substantial overall improvement may result from concurrent interventions directed at multiple abnormalities in older persons, even if some may be only partially reversible.
- A significant proportion of older persons who are initially labeled by hospitalists as having "acopia" or "social problems" have an alternative medical diagnosis at the time of discharge.

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Case Study

Mrs. Joan Smith is an 84-year-old lady who lives with her frail 86-year-old husband. She is brought to the emergency department (ED) after an unwitnessed fall and low back pain. She has history of hypertension, atrial fibrillation, postherpetic neuralgia, knee osteoarthritis, and hyperlipidemia. Her medications include ramipril, indapamide, digoxin, warfarin, amitriptyline, meloxicam, atorvastatin, and occasionally paracetamol up to four times daily. She is confused, temperature 37.8 °C, heart rate 84/min irregularly irregular, blood pressure 180/95, heart sounds are dual with no murmur, respiratory rate 20/min, chest clear to auscultation, abdomen soft and non-tender, and no focal neurological signs are present. She has spinal tenderness over the fourth lumbar vertebrae.

10.1 Introduction

Older persons account for a significant proportion of acute hospitalizations and emergency department visits. In 2010, adults aged 65 years and over accounted for 34% of hospitalizations in the United States, and those aged 65–84 years had the highest average cost per stay (around USD 12,300) [1]. In 2009–2010, patients aged 65 years and older accounted for 15% of the emergency department visits, and the annual average visit rate increased with age [2]. Mean length of stay for older persons is 1.7 days longer, and in-hospital mortality is five times higher, than for younger patients [3]. Percentage of patients discharged to a long-term care facility from hospital also increases with age. In 2008, patients aged 85 years and older admitted to US hospitals were about 2.5 times more likely to be discharged to a long-term care facility than 65–74-year-olds [4].

Aging is associated with homeostenosis, a progressive constriction of physiological reserves available to meet challenges of homeostasis [5]. This leads to impaired capacity of the older person to successfully compensate for physiological stressors, resulting in increased vulnerability to seemingly minor perturbations [6]. Preexisting and often multiple comorbid conditions further impair the older person's compensatory reserve. Frail older persons can be therefore viewed as complex systems on the verge of failure [6]. When the system fails, the most vulnerable organ system fails first [7]. As the most vulnerable organ system may be different from one that is newly diseased, presentation can be atypical [7]. For example, the older person with urosepsis may present with acute confusion and fall, instead of symptoms related to the urinary tract. On the other hand, some findings that are abnormal in a younger patient, bacteriuria, for example, are common in the older person [8] and may not be responsible for the presenting illness and can lead to delayed diagnosis and misdirected treatment. Due to concurrent impairments across multiple organ systems, multiple comorbid diseases, and polypharmacy, geriatric syndromes such as falls, cognitive dysfunction, and urinary continence often have multifactorial etiologies [9]. Substantial improvement may result from

concurrent interventions directed at causes identified, even if some may not be amenable to treatment or partially reversible [7].

A significant proportion of problems experienced by older persons can be traced back to Bernard Isaacs' geriatric giants: immobility, instability, intellectual impairment, and incontinence [10]. For example, about 30% of community-dwelling older persons over 65 years old report a fall every year [11]. In a recent Australian study, 10% of the older adults aged over 70 years had delirium at the time of admission to hospital and a further 8% developed delirium during their hospital stay [12]. Urinary incontinence affects 24% of community-dwelling older people and 30–60% in institutional care [13]. Geriatric giants are often multifactorial in etiology, are chronic, and are associated with loss or impairment of functional independence [9]. They can be the result of potentially reversible medical conditions, but unfortunately, these syndromes are under-recognized, and older patients are sometimes inappropriately labeled as having "social problems" and "acopia" [14].

10.2 The Sick Older Person in the Emergency Department

Older persons aged 65 years and above account for about 20% emergency department (ED) presentations [15]. Compared to younger patients, they have multiple comorbidities, present with a higher level of medical urgency, have longer length of stay in the ED, are more likely to be admitted, and experience higher rates of adverse health outcomes following discharge [16]. Delirium and immobility is common among older persons presenting to the ED, which increase the risk of falls and pressure injury [17]. Several scales have been developed to screen high-risk older persons in the ED; however, the need for reliable risk stratification tools to accurately identify vulnerable older persons who are at risk of adverse outcomes has been recently highlighted [18]. Risk minimization protocols should be in place in EDs to prevent early complications such as pressure injuries due to delays on trolleys in the emergency department. Adjustments to the layout of the department, including the type of furniture, lighting, noise reduction, and access to utilities, may be necessary to address the needs of frail older adults, who are usually managed in the same environment as the younger patients. Increased boarding time in the emergency department is associated with increased hospital length of stay and mortality [19]. On the other hand, reduction of emergency department overcrowding by expediting discharge or admission process is associated with reduced overall mortality [20]. Comprehensive geriatric assessment in the emergency department by physicians with expertise in geriatric medicine can lead to expedited discharge and lower readmission rates [21]. Hospital avoidance programs such as "hospital at home" have been shown to lower mortality and reduce functional decline in older persons and should be considered as alternatives to hospitalization [22, 23].

10.3 Comprehensive Geriatric Assessment

Providing quality acute geriatric care is complex [24]. Older persons presenting with acute illness have complex needs and require multidimensional assessment and coordinated multidisciplinary approach to care. There is good evidence that comprehensive geriatric assessment (CGA) reduces mortality and admission to residential aged care facilities following emergency hospital admission [25]. CGA can result in improvements in physical and cognitive function, sustained at 12 months of follow-up [26]. CGA is defined as a multidimensional interdisciplinary diagnostic process focused on determining the older person's medical, psychological, and functional capability that leads to the development of coordinated and integrated care plan for treatment, including appropriate rehabilitation and long-term follow-up [27]. Therefore, CGA can be viewed as both a diagnostic and a therapeutic process. The principal components of a CGA are outlined in Table 10.1 [28], and the assessment should be adapted to the context. The CGA should be carried out using standardized tools with good intra- and inter-observer agreement so that they are reproducible and can be used to reliably measure change over time [28]. For example, cognitive function may be assessed using a validated tool such as the mini-mental state examination (MMSE) [29] and mobility with a 6-min walk test [30]. The CGA should target patients who benefit most. This is usually those who are frail and have functional impairments and complex multiple comorbid conditions, rather than relatively healthy and functionally older persons or those are too sick with terminal illness or advanced dementia [26]. Broadly, two different models of inpatient CGA have been described [25]. In the first model, patients are admitted to a discrete ward [e.g., Geriatric Evaluation and Management Unit (GEMU), Acute Care for the Elderly (ACE) Unit, Acute Medical Unit (AMU)] where they are assessed by a multidisciplinary team with expertise in geriatric medicine. In the second model, patients are admitted to general medical wards, and eligible patients

Table 10.1 Components of in-hospital Comprehensive Geriatric Assessment

Medical domain	Principal diagnoses Significant comorbidities Medication review Nutritional status
Psychological domain	Cognition Affect
Functional assessment	Basic and instrumental activities of daily living Gait and balance Physical activity/Exercise
Social domain	Informal supports e.g. family and friends Financial assessment and eligibility for care resources
Environment	Home set up and safety Transportation and accessibility to local resources Telehealth

are assessed by an interdisciplinary geriatric medicine consultation service. The consultation service makes recommendations to the physician who is responsible for the overall care of the patients.

10.4 Functional Assessment: A Cornerstone of Geriatric Evaluation

A key component of the CGA is a functional assessment. Functional assessment allows patient-centered goal setting and provides information for measuring progress and predicting prognosis. It also helps to understand the impact of disease and disability on the older person and the caregiver. The basic ADLs include self-care activities such as eating, toileting, bathing, dressing, transferring, and ambulation [31]. Instrumental ADLs are composed of those activities that foster independence in the community and encompass housekeeping, cooking, shopping, managing finances, using telephone, managing medications, and transportation [31]. In many cases, functional assessment relies on patients and/or family caregivers who are asked to report on ADLs. Where self-less reliable (e.g., in dementia patients), informant-based questionnaires, and direct observation by nurses and occupational therapists may be necessary. A number of validated tools are available for functional assessment of older persons, such as the Barthel Index [32], Functional Independence Measure (FIM) [33], Physical Self-Maintenance Scale [34], and Lawton Brody Instrumental Activities of Daily Living Scale [35]. As mobility is of central importance to accomplishing most functional activities, assessment of physical activity status, gait, and balance is also an important aspect of the functional assessment. The functional assessment is of diagnostic and therapeutic relevance in the management of hospitalized older person in several ways:

1. Functional decline is a sensitive but nonspecific sign of physical illness [7] and may prompt investigation for underlying specific disease processes.
2. Incapacity to perform ADLs may be due to cognitive impairment and/or depression, and further assessments may be indicated.
3. It establishes the nature and the amount of assistance, environmental adaptations, and equipment (e.g., mobility aids) needed to complete tasks.
4. It helps with setting goals for geriatric rehabilitation.
5. It provides information on the overall prognosis.

10.5 Falls and Fracture Risk

About 30% of the community-dwelling older persons fall each year [11]. Older persons are more likely to suffer serious injury than younger persons as a result of same-level falls [36]. More than 90% of hip fractures are associated with falls, and

most occur in persons above the age of 70 years [37]. Falls contribute to functional decline, social isolation, depression, and need for permanent residential care [38]. In the acute setting, 3–20% of inpatients fall at least once during their hospital stay [39]. Falls in older people are multifactorial. Intrinsic risk factors for falls include age, previous history of falls, gait and balance disorders, cognitive impairment, visual impairment, ADL disabilities, and medication use [40, 41]. Extrinsic risk factors include cluttered environment, poor lighting, uneven floors, and use of restraints such as indwelling catheters and chest drains [41]. Acute illness and medication side effects are common precipitants of falls. Older persons who present to the hospital with a fall, give a history of recurrent falls in the past year, or have abnormalities of gait and/or balance should be offered a multifactorial fall-risk assessment [42]. A number of fall-risk assessment tools have been developed; however, only a few tools have been tested in more than one setting [43], and most tools discriminate poorly between fallers and non-fallers [44]. The STRATIFY tool [45] and fall-risk assessment tool [46] have been reported to have good positive- and negative-predictive value in the acute care setting [43]. Patients identified as at risk of falling should be considered for multifactorial intervention by multidisciplinary teams targeting risk factors [42]. Risk factors for falls in older persons are multivariate, and there is limited evidence to support any single intervention. On the other hand, multicomponent interventions targeting risk factors have been shown to reduce falls in various settings [47, 48]. Exercise is often a key component in successful multifactorial falls intervention programs. Group or individual exercise, balance training, and tai chi have been shown to reduce both risk and rate of falls [47] in the community setting. Additional interventions supported by evidence in this setting include home safety assessment and hazard reduction, gradual withdrawal of psychotropic medications, correction of vitamin D insufficiency, cardiac pacing for cardioinhibitory carotid sinus hypersensitivity in patients with unexplained falls, first cataract surgery for the appropriate eye, and restricted bifocal spectacle use [47]. Supervised exercise and vinyl flooring (as opposed to carpeting) have been shown to reduce falls in the acute hospital setting [48].

Osteoporosis treatment is an important component of the management of future fracture risk. Assessment should include a focused history to identify risk factors for low bone mineral density (BMD), falls, and resultant fracture [49]. Diagnosis of osteoporosis is by hip and lumbar vertebral BMD measurement using dual-energy X-ray absorptiometry. Non-pharmacologic management of osteoporosis includes lifestyle counseling with regard to smoking cessation, limiting alcohol intake, regular weight-bearing and muscle-strengthening exercise, and taking adequate calcium and vitamin D intake [50]. Vitamin D deficiency and hypocalcemia should be corrected before commencing antiresorptive treatment [51]. Oral or intravenous bisphosphonates and the human monoclonal antibody denosumab are approved for primary and secondary prevention of vertebral, non-vertebral, and hip fractures in men and postmenopausal women. Raloxifene is approved for secondary prevention of vertebral fracture in postmenopausal women. We reserve teriparatide for patients who do not respond or tolerate first-line treatments. BMD measurement should be repeated

in 1-3 years after initiating treatment and thereafter at longer intervals if BMD is stable. The optimal duration of treatment is debatable, but in patients with moderate 10-year fracture risk, bisphosphonate treatment may be continued after 5 years [51]. Patients at high risk of fracture may be treated with bisphosphonates for up to 10 years before giving a drug holiday; alternatively they can be switched to bone formation therapy after 5–10 years [51].

10.6 Cognition and Affect

Delirium is common in hospitalized patients, with reported prevalence of 10–31% among medical inpatients [52]. Incident delirium is particularly common in the postoperative period [53]. Delirium is associated with increased hospital-acquired complications, length of stay, mortality, and discharge to long-term residential care [52]. Recent evidence also suggests delirium may lead to permanent cognitive decline and dementia in some patients [54]. Vulnerability to delirium can be viewed as a marker of diminished cognitive reserve. Factors predisposing to delirium include dementia, previous episode of delirium, cerebrovascular disease, multiple comorbidities, functional impairment, sensory impairments, polypharmacy, depression, and alcohol abuse [55]. There are a number of tools available to screen hospitalized older persons for delirium. The Confusion Assessment Method (CAM) [56] diagnostic algorithm acute onset and fluctuating cognitive dysfunction, inattention, disorganized thinking, and altered sensorium. It can be completed at the bedside within minutes and can be used to both rule in and rule out delirium (positive likelihood ratio 9.6 and negative likelihood ratio −0.16) [57]. Multicomponent interventions that target risk factors implemented by skilled interdisciplinary teams are known to prevent delirium [58]. Such interventions include orientation, ensuring adequate hydration and nutrition, sleep hygiene, pain management, optimizing hearing and vision, reduced use of psychoactive medications, reducing restraints such as intravenous lines and indwelling urinary catheters, and early mobilization [59]. There is insufficient evidence at present for the use of pharmacological interventions such as antipsychotics or choline esterase inhibitors in primary prevention of delirium [59]. Management of delirium involves removal of precipitating factors, symptom management, preventing complications such as pressure injuries and falls, and providing education and support to the carers. Antipsychotics and sedatives do not improve prognosis and can paradoxically prolong delirium and worsen cognitive dysfunction. Therefore, these agents should be reserved for patients with severe agitation or having distressing psychotic symptoms.

Around 40% of the hospitalized older persons above the age of 65 years have dementia, although only about half of them have been previously diagnosed [60]. Hospitalized patients with dementia have higher mortality than others [60]. Identifying those with dementia is important to formulate an appropriate inpatient and discharge care plan, including follow-up. However, the diagnosis of dementia in hospital setting is complicated by the potential concurrence of delirium, and cognitive assessments undertaken in hospital may not accurately reflect premorbid

cognitive functioning. There may be reasons other than dementia and delirium for hospitalized patients to perform poorly on cognitive screening, such as acute illness, poorly controlled pain, psychoactive medication, anxiety and depression, and poor engagement [61]. Therefore, results of single cognitive tests should be interpreted with caution, and progress should be assessed with further tests as indicated. A number of validated tools are available for cognitive assessment such as MMSE and MOCA; however, a recent systematic review showed lack of evidence to help clinicians to select a validated tool in the hospital setting; the mostly researched instrument was the AMTS, with a score of <7 predictive of dementia with a sensitivity of 81% and specificity of 84% [62].

Although depression is common among hospitalized older persons, with weighted prevalence estimated around 17%, it is often unrecognized [63]. Symptoms of depression in acutely unwell older adults can be difficult to separate from those of the physical illness. Concurrent depression adversely affects the outcome of a number of medical conditions, compliance with treatment, engagement with rehabilitation process, and in-hospital mortality [64]. Depression is a risk factor for Alzheimer's disease and is a common psychological symptom of all disease stages of dementia [65]. Guidelines recommend that hospitalized older persons be screened for depression. The Geriatric Depression Scale (GDS) has been widely evaluated in the general hospital setting, and a cutoff of 5 or 6 out of 15 has a sensitivity of 79% and specificity of 77% for diagnosing depression [66]. The Cornell Scale for Depression in Dementia (CSDD) [67], which combines the patient interview, direct observation, and caregiver report, is more appropriate for screening dementia patients for depression.

10.7 Orthostatic Hypotension

Orthostatic hypotension (OH) is defined as a drop in systolic blood pressure by 20 mmHg or diastolic blood pressure by 10 mmHg, compared to supine blood pressure, within 3 min of standing [68]. The prevalence of OH is reported to be between 5% and 30% [69]. OH is a risk factor for syncope [70], falls [71], cognitive impairment [72], and hospitalization. OH is also an independent predictor of mortality in older persons [73]. OH is an important consideration in the treatment of hypertension in older persons, as cardiovascular drugs are a common cause of OH [74]. OH in older persons is often multifactorial; contributing causes may include volume depletion, anemia, prolonged bed rest, autonomic neuropathy (e.g., diabetes, amyloidosis), primary autonomic failure, Parkinson's disease, stroke, cardiac disease, and endocrinopathies such as hypoadrenalism and pheochromocytoma [75]. Evaluation should begin by identifying reversible causes and underlying associated medical conditions. Blood pressure should be measured supine and 3 min after standing. Head-up tilt table testing should be considered where there is a high pretest probability of OH despite negative bedside evaluation and in patients who are unable to stand for blood pressure measurement [76]. Non-pharmacologic management includes discontinuing potential medications contributing to OH, ensuring adequate hydration and sodium intake, avoiding alcohol, exercise program to improve conditioning, teaching physical

maneuvers (e.g., squatting, bending at waist), and abdominal and lower limb binders [75]. Patients with postprandial symptoms should be advised to avoid large carbohydrate meals [75]. In patients with persistent symptoms despite these measures, a trial of pharmacologic therapy is indicated. Fludrocortisone is often used as the first line. Other treatment options include midodrine and other alpha-adrenergic agents, desmopressin, octreotide, and erythropoietin [77].

10.8 Medication Rationalization

Polypharmacy, or the concurrent use of multiple medications, is a common problem in older persons that can lead to reduced medication compliance, lack of efficacy, adverse drug reactions, drug interactions, and iatrogenic illness [78]. The appropriate management of medications is one of the most important areas in geriatric medicine. Medication review should therefore be a key component in geriatric assessment. This should start by taking an accurate medication history. Discrepancies between what the patient has been prescribed and what they are actually taking are common. Asking the patient or the caregiver to bring all prescribed and checking patient's understanding about the indications, benefits, and potential adverse effects allow a more accurate picture of current medication use. Medication review should be viewed as an opportunity to identify any inappropriate medications (errors of commission) and potentially beneficial medications that may have been overlooked (errors of omission). Inappropriate prescribing can lead to increased healthcare utilization and adverse clinical outcomes [79]. On the other hand, in some patients, multiple medications are indicated for optimal management of comorbidities, and therefore undertreatment should be avoided [80]. There are published lists of potentially inappropriate medications for the older persons to guide treating physicians; examples include the Beers Criteria [81], Screening Tool of Older Persons' potentially inappropriate Prescriptions (STOPP), and Screening Tool to Alert doctors to the Right Treatment (START) [82]. In the hospital setting, clinical pharmacists can provide assistance with medication review, reconciliation, and discharge counseling, which has been shown to improved clinical outcomes [83]. Older persons with multiple comorbid conditions are often excluded or underrepresented in clinical trials [84], and care should be taken when extrapolating evidence to frail older persons, as unintended adverse effects may overweigh potentially modest benefits. Prescribing considerations should include patient's goals of care, remaining life expectancy, and age-associated physiological changes.

10.9 Preventing Pressure Ulcers

Pressure ulcers are the result of pressure and/or shear forces, usually over a bony prominence. These are associated with extended length of stay, increased incidence of hospital-acquired infections and other complications, and increased healthcare costs [85]. Risk factors include advanced age, low body mass index, hypoalbuminemia,

malnutrition, immobility, cognitive impairment, urinary or fecal incontinence, and diabetes [86]. Pressure ulcers are a potentially preventable adverse event. About one third of emergently admitted hospital patients may acquire pressure ulcers soon after their admission [87]. Therefore, risk assessment and preventive interventions should start early during the hospital stay. Studies have not shown significant differences between nurses' clinical judgment vs. various risk assessment tools such as the Waterlow, Braden, Cubbin and Jackson, and Norton scales in reducing pressure ulcer incidence [86]. Advanced static mattresses and overlays, and alternating-air mattresses or overlays have been shown to reduce the pressure ulcer incidence compared with standard hospital mattresses [86, 88]. It is not clear if powered surfaces are better than non-powered surfaces, and cost should be taken into consideration when deciding between them [88]. There is no clear evidence that nutritional supplementation, repositioning, heel supports and boots, wheel chair cushions, or various dressings prevent pressure ulcers [86]. Dry skin is a risk factor for pressure injury, and there is weak evidence that a skin cleanser other than soap, and a fatty acid containing cream, reduces risk of pressure ulcers [86].

10.10 Continence Management

Urinary incontinence is rarely the reason for hospitalization but can be a sign that the older person is experiencing other health problems. Around 35% of older adults are incontinent at some stage during acute hospital stay [89]. Incontinence in acute care setting is associated with urinary tract infection, immobility, and cognitive impairment [89]. A number of medications such as diuretics, hypnotics, narcotics, antipsychotics, and anticholinergics agents can affect the older person's ability to toilet successfully by direct or indirect mechanisms [90]. Several types of incontinence may coexist due to the presence of multifactorial etiologies. Assessment should comprise, at least, a focused history, physical examination including the genitourinary and nervous systems, a stress test, urinalysis, and measurement of post void residual volumes. Management depends on the type of urinary incontinence and underlying causes identified. General measures include treating any urinary tract infection, avoiding constipation, stopping offending medications, attention to orientation, providing regular toilet assistance, and use of appropriate continence aids [91].

10.11 Post-acute Care

Older persons take longer to functionally recover than to medically recover. Once patient is medically stable, every effort must be made to prevent further decline and to help return to functional independence. Discharge planning should begin early during the hospitalization, and carers should be engaged in the discharge planning process as key members of the older person's care team. Patients who are slow to progress and therefore need a coordinated multidisciplinary strategy of restorative

care should be identified early. Some of these patients may benefit from referral to an inpatient geriatric rehabilitation unit or a day hospital. Short- and long-term goals toward achieving maximal functional independence should be set, and future medical, physical, psychological, and accommodation needs of the older person should be identified. Referral to appropriate home and community support services may be needed to provide additional support at least in the early post-discharge stage. It is crucial that the hospitalist liaise with patient's family physician with regard to medication changes, services arranged, and post-discharge care plan prior to discharge.

10.12 Closing Remarks

Mrs. Smith was worked up for infection and turned out to have a lower urinary tract infection. The rest of the septic screen was negative. She had recurrent falls from the history given by her daughter. Her bone scan showed recent L4 fracture. She was found to have orthostatic hypotension. Medications were reviewed and indapamide was ceased; potential benefits vs. risks of warfarin and statins were discussed with her and the family. Her delirium resolved, and she was discharged home with social support to be followed up in geriatric outpatient clinic.

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Ambulatory Care of the Elderly

11

Nadine Dubowitz, Sonika Pandey, and Elizabeth L. Cobbs

Key Points

- Comprehensive geriatric assessment forms the basis of the medical approach to optimizing health and wellness for older adults.
- Goals of medical care should be customized and balance risks and benefits in a person-centered frame.
- Communication and health literacy are important components of effective ambulatory care.
- Advance care planning discussion and documentation are an important element of comprehensive care of older persons.
- Transition management and referrals to community resources are important components of ambulatory care.

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Case Study

Mr. AJ, an 87-year-old retired accountant, is referred to a geriatric clinic due to recurrent hospitalizations for heart failure. He denies any specific complaints. He cannot name his medications but insists that he takes them regularly. His wife provides his medical history of hypertension, diabetes, ischemic cardiomyopathy, hyperlipidemia, osteoarthritis, benign prostatic hyperplasia, and glaucoma. She also reports his memory has been failing. He has had three falls. She now manages their finances and transportation in addition to shopping, meal preparation, and housekeeping. They have a modest retirement income, have been married for 54 years, and have two grown children and three grandchildren. Mr. AJ used to enjoy visiting family and friends, travelling, and reading but now mostly watches television and naps. Mrs. J adds, "I am tired. I hope my health holds up!"

Medications include losartan, metformin, glipizide, furosemide, carvedilol, aspirin, isosorbide mononitrate, atorvastatin, Naproxen, terazosin, eye drops, and acetaminophen/diphenhydramine for sleep.

Physical examination reveals a cheerful, socially interactive gentleman, ambulating slowly with a cane. He has difficulty in hearing. His blood pressure and finger-stick glucose are elevated. He is not dyspneic with ambulation, but his jugular venous pressure is elevated. He has bibasilar rales and bilateral lower extremity pitting edema.

11.1 The Importance of Ambulatory Care for Older Adults

As the world's population ages at an unprecedented rate with increasing life expectancy, growing numbers of the oldest old, and changing family structures, many nations have endorsed an increase in home- and community-based care to support older persons to remain in the community [1]. Ambulatory clinics provide services for screening and prevention, diagnosis and management, and continuity of care and support for older persons to maintain health and function.

11.2 Health Status of Older Adults

Older adults comprise a heterogeneous population whose health-care needs vary widely and evolve over time. The majority are well but more likely to have chronic medical conditions. Those with chronic medical conditions are more likely to experience functional impairment. Common diseases may present atypically with geriatric syndromes such as falls, cognitive impairment, urinary incontinence, and frailty [2]. The detection of geriatric syndromes and risk for functional decline is key to successful ambulatory geriatrics. The health needs of well older persons are well served by general primary care clinics, but for those with a mix of acute and chronic conditions and declining functional capacity, specialized geriatric clinics are helpful.

11.3 Person-Centered Care

Person-centered health care is relationship-based and addresses the whole person in the context of their family [3]. The person-centered model recognizes and respects each patient's unique culture, values, preferences, and needs. Patients and their families deserve to feel welcomed and respected by their health-care providers and to know that their preferences for management are honored. This trusting relationship improves the ability of the providers to assist patients and families through challenging episodes in life, often through to the end of life. The US medical home model provides team-based health-care delivery and comprehensive care that is patient-centered, with emphasis on accessibility, quality, and safety. Programs such as the US *Annual Wellness Visit for Medicare Beneficiaries* provide a *Personalized Prevention Plan* for recommended services [4].

11.4 Environment of Care

Clinics serving older adults should incorporate design and furnishings that support accessibility, safety, function, and comfort. Staff assigned to greet patients should be skilled in customer service. The reception desk should be accessible to patients using wheelchairs. The waiting room should provide adequate space for patients and families. Chairs should have firm but comfortable upholstery and supportive arm rests to allow patients to push up with their arms when arising. A wheelchair-accessible bathroom should be nearby. A wheelchair scale is helpful. Doorways should accommodate wheelchairs. Contrasting colors help persons with visual impairment navigate the halls. A hallway long enough to observe gait stability and speed is desirable. Examination rooms should be large enough to accommodate the patient and the family. Electronically adjustable examination tables that transform to chair configuration to allow mobility-challenged patients to transfer and then have the position changed to an examination table with the necessary height and position are very helpful.

11.5 History and Physical Examination

The history and physical examination are vital to an accurate assessment. The interview and examination process also provide opportunities to build the relationship between the provider and patient. Techniques that communicate respect and allow the patient and family to tell their story are essential. Many clinics use questionnaires to facilitate information transfer. Use of open-ended questions and active listening help the provider build rapport and at the same time gain insight into the older person's functional level and understanding of their health status [5]. With permission from the patient, providers should obtain collateral history from the caregiver or family member who knows the patient. Many older adults do not self-report events such as falls, incontinence, or mood changes, sometimes assuming such signs and symptoms are a normal part of aging and cannot be ameliorated.

Table 11.1 Activities of daily living

Basic activities of daily living Independence = 1 Dependence = 0 (with supervision, direction, personal assistance, or total care)	Instrumental activities of daily living Independence = 1 Varying degrees of dependence or need of significant assistance = 0	Advanced activities of daily living
Bathing		
Dressing	Using telephone	Occupational
Toileting	Shopping	Recreational
Transferring	Preparing food	Travel
Continence	Housekeeping	
Feeding	Doing laundry	
	Managing transportation	
	Managing medications	
6 points: patient independent 0 points: patient very dependent	Managing finances	

Adapted from [6, 7]

11.6 Functional Assessment

Older persons with chronic medical conditions are at risk for functional decline, and the functional decline is the first sign of a medical condition. A functional assessment typically evaluates basic activities of daily living (BADLs), instrumental activities of daily living (IADLs), and advanced activities of daily living (ADDLs) [6, 7] (see Table 11.1). Approximately 17% of community-dwelling older persons have at least one IADL dependency [8].

> Mr. J's functional decline was reflected by recurrent hospitalizations and inability to manage IADLs and falls. Upon examination, his external auditory canals are occluded by cerumen. A cognitive assessment reveals moderate decline in memory and executive function. His gait is unsteady. His wife has taken on the role of caregiver and the burden of additional IADLs.

11.7 Comprehensive Geriatric Assessment

Recognition of the complex interaction of age-related physiologic changes, multiple comorbid illnesses, and functional stressors helps determine the health-care needs of older adults. Many older persons with multiple chronic conditions have daily symptoms, use multiple medications, visit several health-care providers, and require assistance with their activities of daily living (ADLs). Such individuals are

likely to utilize various health-care settings such as the emergency department (ED), acute care hospital, rehabilitation, and nursing home. They are at risk of poor health outcomes and functional decline.

The ambulatory clinic is an ideal setting for comprehensive assessment that addresses domains beyond the usual medical conditions [9]. This comprehensive assessment fosters understanding of the complex interplay between medical, social, psychological, and value factors and elucidates opportunities for interventions to bolster independent function and support patient and family goals for care [10] (see also Chap. 10).

The comprehensive assessment is often performed with participation of multidisciplinary health professionals, depending on the size of the clinic team. In some health systems, geriatric clinic is a referral clinic for episodic consultation, while in others geriatric clinic providers become the primary care providers for older patients with complex medical and psychosocial issues. In many geriatric clinics, a nurse practitioner, social worker, and nurse case manager are part of the core team. Nonclinical office staff may assist in information gathering and screening. Other health professionals (pharmacist, physical therapist, psychiatrist, or psychologist) may be a part of the team. An interdisciplinary approach facilitates comprehensive care management, coordination of services, optimal medication management, and individualized care plans for patients and their caregivers. Information about the patient's goals, values, and preferences for care is a major component of person-centered care and guides providers to tailor plans of care.

11.8 Assessment Tools

Rapid screening tools are available to screen various domains of geriatric assessment [11] (see Chap. 10). These tools identify concerns and help target assessments. Strategies to optimize efficiency include using pre-visit questionnaires, initial screening by ancillary staff, and spreading out screening of various domains over multiple visits.

> Mr. J's performance on the Mini-Cog showed 0/3 recall and an abnormal clock draw, confirming impaired memory and executive function. The repeated hospitalizations likely result from his inability to manage his medications destabilizing his chronic conditions [12].

11.9 Medication Management

Medication reconciliation is a critical task. Patients or caregivers should bring to each visit either the medications themselves or a comprehensive list of all (e.g., prescription and over-the-counter) medications, including supplements, with doses.

The most common classes of medications implicated in ED visits for older persons are oral antiplatelet medications, oral hypoglycemics, insulin, and warfarin [13]. One commonly used guideline for medications to avoid is the Beers Criteria [14].

11.10 Screening and Prevention

Increasing evidence is available to guide screening prevention in older persons. In the USA, older persons receive only about 50% of recommended care [15]. Screening for hypertension, diabetes mellitus, breast cancer, glaucoma, osteoporosis, and colorectal cancer is generally recommended. Prostate cancer screening is more controversial but is generally recommended for men over 50 whose life expectancy exceeds 10 years. Limitations in life expectancy, health status, and preferences for care all influence decisions about screening and preventive care. A coordinated effort to prevent falls in older adults has been recommended by the World Health Organization and many other agencies recognizing the personal and societal cost of fall-related injuries [16]. This report describes the importance of building awareness of falls prevention and treatment, improving the assessment of each individual, and facilitating culturally appropriate intervention to reduce falls among older adults [17–19].

While the US Preventive Services Task Force (USPSTF) does not recommend screening older adults for cognitive impairment, it is important to recognize signs of cognitive decline and to conduct further assessments [20].

The immunization status should be checked and acted upon as needed (Table 11.2).

11.11 Communication and Health Literacy

Health literacy reflects capacity to manage health affairs including listening, following directions, filling out forms, interacting with health professionals, and doing basic math calculations. Impairments in hearing, vision, and cognition impact on health literacy. Older adults are likely to have at least one chronic health condition and need to navigate the health-care system and access health information materials and resources [21]. Health literacy is related to health outcomes [22]. Providers may improve the patient's comprehension in multiple ways. Providing a pocket talker to a hearing-impaired patient during a clinic visit may transform an encounter. A pocket talker is a small, battery-operated, movable unit the size of a pack of cards that has an attached microphone and headset (available on amazon.com for about $120). Patient information should be in easy-to-read format with large print (usually 16 point or greater), simple design, and sharp contrast between background and text. Tips and materials are available at Quick Guide to Health Literacy and Older Adults at www.hhs.gov (Accessed 11 Jan 2016).

Table 11.2 Prevention and screening for older adults[a]

Healthy lifestyle			
	Physical activity	Aerobic Strength Flexibility Balance	Exercise benefits persons of all ages and should be tailored. US Department of Health and Human Services. Healthy People 2020 at www.healthypeople.gov (Accessed 18 Jan 2016)
	Tobacco cessation	Screen for smoking	Counsel on how to quit if they currently smoke
	Alcohol	Specific question about frequency and quantity	Physician recommendations effective
Aspirin		Benefits may differ for men and women	Discuss with those at risk for cardiovascular disease
Immunizations			
	Tetanus	Booster doses recommended every 10 years by USPSTF	Tdap (tetanus, diphtheria, pertussis) recommended once for those over 65
	Influenza	Recommended annually	
	Pneumococcal	Revised recommendations available	23-valent polysaccharide vaccine and 13-valent pneumococcal conjugate vaccine available
	Herpes zoster	Recommended for immunocompetent older adults	Recommendations vary
Cancer screening		Decisions should be based on the benefits, risks, and preferences of each individual	
	Prostate	Based on individual specific factors	
	Colorectal	Screening recommended	
	Breast	AGS recommends avoid screening if life expectancy is less than 10 years	
	Cervical	Cervical cancer is rare in older women who have been previously screened	
	Lung	Consider for smokers with >30 pack years of smoking who are between 55 and 80	
Cardiovascular screening			

(continued)

Table 11.2 (continued)

	Blood pressure	Screen annually or biannually	
	Lipids	Can stop screening at 65 if prior screening negative	
	Abdominal aortic aneurysm	One-time ultrasound examination in men 65–75 who have ever smoked	
Functional	Functional assessment	BADLs IADLs Gait speed	Guides clinician to focus on conditions that impact function and quality of life
	Visual	Evidence lacking	
	Hearing	Evidence lacking	
Psychosocial			
	Cognitive	Mini-Mental Status Exam Mini-Cog Clock Drawing Test Memory Impairment Screen Saint Louis University Mental Status (SLUMS) Examination [37] Montreal Cognitive Assessment (MOCA) [38]	Not recommended for those without memory complaints or evidence of functional decline
	Depression	Over the past 2 weeks, have you felt down, depressed, or hopeless? Over the past 2 weeks, have you felt little interest or pleasure in doing things?	Recommended by USPTSF and ACOVE
Osteoporosis		Recommended with varying specifics	
Nutrition	Nutritional assessment	Evidence lacking	
	Vitamin D	Recommend 800–1000 IU daily intake Evidence lacking to guide screening	
	Multivitamins	Evidence lacking	
Falls/mobility		Screen for falls	
Continence		ACOVE recommends screening question	

Table 11.2 (continued)

Medication use		ACOVE recommends the following: 1. Maintain complete list of Rx and OTC 2. Review at each visit 3. Assess for interactions, duplication adherence, and affordability 4. Assess for classes associated with adverse effects 5. Minimize anticholinergics	

USPSTF US Preventive Services Task Force, *AGS* eAmerican Geriatrics Society, *BADLs* basic activities of daily living, *IADLs* instrumental activities of daily living, *ACOVE* Assessing Care of Vulnerable Elders, *Rx* prescription medication, *OTC* over-the-counter medication

[a]Details may be found at: (1) Center for Disease Control, Advisory Committee on Immunization Practices (ACIP). http://cdc.gov. Accessed 18 Jan 2016. (2) US Preventive Services Task Force at www.uspreventiveservicestaskforce.org. Accessed 18 Jan 2016. (3) Center for Disease Control and Prevention, Aging and Health in America at http://www.cdc.gov/features/agingandhealth. Accessed 18 Jan 2016

11.12 Community Resources

In the USA, the Administration on Aging is the principle program in the Department of Health and Human Services promoting the provision of services and programs to help older persons remain independent at home. Home-delivered meals, home health aides, adult day health programs, and transportation are available to varying degrees in different communities. Case manager nurses or social workers may be accessible through local senior centers or offices on aging. US *senior villages* [23] are membership-driven, grass roots organizations offering coordinated access to affordable services such as transportation, health and wellness programs, home repairs, and social and educational activities. Providers should be knowledgeable about community resources and criteria for access. Care management programs may improve patient outcomes and reduce hospital and ED use [24].

The Program of All-Inclusive Care for the Elderly (PACE) is a US program that provides medical and social management and an adult day health center to help frail older persons to remain safely in the community. A specialized interdisciplinary team includes a physician (often a geriatrician), a nurse practitioner, nurses, social workers, a physical therapist, a pharmacist, a dietician, and transportation personnel. Cost savings from decreased hospital use fund increased community services.

Table 11.3 Advance care planning discussion

Element	Special features	Accompanying documents	Special notes
Capacity	Assessment of capacity is decisional specific (e.g., health proxy, financial management, where to live, health-care options)	Cognitive testing may be needed Patient must be able to receive information, understand options, risk and benefits, and consistently communicate preferences	Patient may lack decisional capacity in one domain but have decisional capacity in another
Health-care proxy	Patient should be encouraged to designate health-care proxy in case of future incapacity	Legal paperwork should be completed, e.g., durable power of attorney for health care	Encourage patient to discuss preferences with designated health-care proxy
Preferences, values, goals	Provider provides education about likely outcome of various treatments. Patient provides information about goals, preferences, and values	Patient quotes are helpful. Subject to change over time as health states evolve	When patient requests limits to care, these should be placed in authorized-written orders such as MOLST (medical orders regarding life-sustaining treatment) or POLST (physician orders regarding life-sustaining treatment)

11.13 Advance Care Planning

The long-term relationships between patients and providers create an ideal setting for advance care planning (ACP) discussions. Elements of ACP include capacity to make health-care decisions, health-care proxies, and preferences for care (see Table 11.3). Quotes from the patient may be helpful. ACP documentation should be kept in an accessible location that can be easily located by other health-care providers in the event of a change in health status. ACP discussions naturally evolve over time; updates are frequently needed to reflect changes in goals and plans.

11.14 Caregiver Support

Caregivers are at risk for neglecting their own health and may not recognize symptoms of stress. Providers can monitor caregiver stress and offer education, resources, and support. Caregiver support organizations focused on specific conditions (such as dementia or cancer) are sponsored by local health departments, faith-based communities, and other organizations. National organizations may offer tools for assessment and education (e.g., caregiving information materials from National Institute on Aging at nia.nih.gov; American Medical Association's Caregiver Self-Assessment Questionnaire, ama-assn.org).

11.15 Transition Management

Suboptimal transitions upon hospital discharge contribute to rehospitalizations and poor health outcomes. Collaboration between clinic providers helps ensure medication reconciliation and timely follow-up. Electronic medical records facilitate communication of discharge summary information and effective handover from hospital to community providers [25]. Post hospital phone calls or nurse home visits are often helpful to reduce errors with medications, equipment, treatments, or follow-up care.

11.16 Home Visits

For patients with advanced functional impairment, home visits may be the best option to provide person-centered primary care. Financial payment systems play an important role in determining incentives to providers to deliver home care. In the Veterans Affairs health system in the USA, home-based primary care is a well-established program that provides interdisciplinary care to homebound patients. Patients report high satisfaction rates, and total costs are reduced [26].

11.17 Palliative Care

Palliative care aims to improve the quality of life for patients (and their families) facing life-threatening illness. Early identification of symptoms and expert assessment and treatment of pain and other causes of suffering are key elements (see Programmes, Cancer, and Palliative care at who.int). Clinic providers are positioned to integrate palliative care into the care of older patients by identifying goals and preferences for care, assessing and treating symptoms, and supporting patients and families around decisions around medical interventions. Home hospice brings an added layer of support for patients for whom death is expected.

11.18 Population Management of Older Persons

Clinic patient panels present a major opportunity to manage population health for older persons. The electronic medical record allows tracking process measures (such as vaccinations and advance care planning discussions) and health outcomes (such as blood pressure and hemoglobin A1C). Feedback drives improvements in care.

Quality indicators have been developed to broadly measure the care provided to vulnerable older persons at multiple levels of the health system (including ambulatory clinic), using such tools as Measuring Medical Care Provided to Vulnerable Elders: The Assessing Care of Vulnerable Elders-3 (ACOVE-3) Quality Indicators [27].

System issues (e.g., continuity and coordination of care, end-of-life care, screening, and prevention) should be addressed as well as diseases and syndromes (e.g., depression, dementia, diabetes, urinary incontinence, osteoarthritis, and many

others) [27]. Care management models using clinical guidelines, educational materials, and transition management have been associated with a reduction in hospital use [28, 29].

Hypertension is one example of a chronic medical condition with age-specific recommendations, as noted in the most recent Eighth Joint National Committee (JNC 8) guidelines. For patients 60 years of age and older, initiation of blood pressure medication should be considered if systolic blood pressure is greater than 150 mmHg or diastolic blood pressure is greater than 90 mmHg [30]. The targets for initiation of therapy are set at a higher range than patients under 60 years of age.

Diabetes management is another example of a chronic medical condition in which there are age-related guidelines. The American Diabetes Association has created a framework for target measurements (A1c, lipids, blood pressure) for diabetic patients based on age and life expectancy in its most recent annual report [31]. The report emphasizes the importance of avoiding hypoglycemia as well as screening for depression, cognitive impairment, and other geriatric syndromes. The older adult population is categorized into three broad areas: healthy (with few existing chronic illnesses and intact cognitive and functional status), complications and reduced functionality (multiple chronic illnesses and ADL impairments or cognitive impairment), or vulnerable at the end of life. The framework helps providers create patient-centered treatment plans.

11.19 Elder Abuse and Neglect

A 2011 WHO report cited growing concern about elder abuse in Europe and called for policy development, improved reporting and research, and other interventions to deter mistreatment [32]. Although USPSTF concluded insufficient evidence exists to recommend screening for elder mistreatment, physicians have professional and legal obligations to diagnose, report, and refer victims of abuse [33]. In the USA, the most common report to Adult Protective Services is self-neglect, where older adults are not able to meet their basic needs. Older adults who self-neglect are less likely to live with others, have weekly contact with children or siblings, visit with friends, or participate in religious activities [34–36]. A home visit by a nurse may provide additional information to guide referrals and interventions. A comprehensive assessment guides the determination of whether the older adult can safely live at home once supportive services are arranged. Community organizations may provide assistance with trash removal, cleaning, yard work, grocery shopping, meals, and other domains.

Case Closure

Mr. J underwent removal of the cerumen from his ears and was referred for audiologic testing. Naproxen and diphenhydramine/acetaminophen were discontinued, and a simplified schedule of medication administration was developed, using a pill organizer and cueing from his wife. A bathroom scale was provided, and a plan was developed for measuring daily weights with parameters for

calling the clinic in the event of an increase. Physical therapy evaluated his gait and made a home visit for safety assessment. He continued therapy for balance and gait training. Arrangements were made for an adult day health program 3 days a week with transportation provided. Mr. J was capable of articulating his general goals for his health care and designating Mrs. J as his health-care proxy. "I have lived a wonderful life. I have faith in my doctors. The hospital has taken good care of me. I would definitely want to go back to the hospital if I needed treatment but I don't want to be a burden to my wife or children. I would not want to be on a life support machine." The provider documented this in the Advance Care Planning Discussion section of the medical record. A family meeting resulted with affirmation of the couple's desire to continue living in their home but acknowledgment of their need for assistance. Both adult children offered to provide assistance in housekeeping, financial management, and transportation.

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Residential Care

12

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Key Points

- Assisted living facilities (also known as residential or personal care homes) are increasingly available for older persons with disabilities and provide more homelike options for long-term living. Cost may be a barrier.
- Person-centered care is reflected by care plans that support residents to achieve the desired quality of life and level of physical, mental, and psychosocial health.
- Interdisciplinary teams create comprehensive assessments that support individualized care in residential settings.
- Safety is a major concern in residential care settings. Falls and related injuries represent a common concern.
- Palliative care and hospice are increasingly integrated into residential care settings in recognition that functional decline is often a harbinger of end of life.

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Case Study

Ms. AD, an 83-year-old divorced postal worker with peripheral vascular disease and several recent hospitalizations, is admitted to a nursing home following unilateral above-the-knee amputation. Previously she lived at home with assistance from neighbors and hired aides. She lacks family and financial resources. Although she achieves some improvement in mobility, she continues to require assistance with transferring and other activities of daily living. She reluctantly agrees to stay in the nursing home for long-term care. She complains about nursing home life. She refuses to get out of bed in time for breakfast each morning. She screams at the nurses during personal care. "You aren't doing it right!"

12.1 Introduction

Dramatic increases in life expectancy have resulted from widespread advances in health and living conditions. The roles of women continue to expand, and families are increasingly geographically mobile. As a consequence, a growing population of older persons faces a dearth of affordable personal care. Options for residential care are expanding.

Countries are in varying stages of implementing systems of care for older adults. China, for example, has a rapidly expanding residential care sector but a weak regulatory environment and enforcement capacity [1]. India's population of 1.22 billion includes 90 million older adults who have been heavily dependent on their children for care and support. The need for health care is large in the poor population, while actual health-care utilization is concentrated in the wealthier sections of the population [2]. National, state, and nongovernmental organizations are working to develop health-care services, day-care programs, and housing particularly in underdeveloped and rural regions to serve older adults [3]. Residential options include private homes, group homes, assisted living facilities, and nursing homes.

12.2 Assisted Living Facilities

Assisted living facilities (ALFs) emerged in the 1990s in the USA as an alternative to nursing home care, offering enhanced independence and dignity. Other terms include *residential care homes*, *assisted care living facilities*, and *personal care homes*. *Continuing care retirement communities* refer to a continuum of services available in one building (independent, assisted living, and nursing home). ALFs are licensed and regulated at the state level. ALFs provide a spectrum of care that falls in between nursing home care and independent living, aiming to support wellness, safety, and health, and also provide oversight and assistance with activities of daily living (ADLs). The strength of ALF residence is the access to activities and

opportunities for socialization (e.g., dining room for communal meals, arts activities) in a setting that provides support with ADLs. Medication management may also be provided.

Many ALFs are well designed for older persons with disabilities with wide doorways, gentle elevators, and handrails in the halls. Some facilities offer expansive and even luxurious private apartments, while others provide shared bathrooms and small dormitory-like rooms. Some ALFs provide secure *memory care units* that specialize in care for residents with dementia.

Cost is a major barrier to the US ALF residence. Costs vary widely depending on geographic region, amount of services needed, and degree of incorporated luxury. International affordable retirement options are likely to grow as countries such as Costa Rica capitalize on the economic potential of serving older ex-patriots.

12.3 Skilled Nursing Facilities

US skilled nursing facilities (SNFs) provide skilled nursing care and related services for those who require medical, nursing, or rehabilitation services due to injury, disability, or illness. US SNFs are rooted in the medical model and heavily regulated by the federal government. Of the over 15,000 SNFs in the USA, almost 70% are for-profit, 25% are not-for-profit, and 5% are government. Few nursing homes have more than 200 beds, and most operate approximately 100 beds. Ancillary services vary widely; about half of SNFs provide infusion services.

12.4 Residents

Eligibility for SNF care is based on the need for assistance with two or more ADLs. Twenty percent of SNF residents stay for <3 months, while the remaining 80% are long-stay residents. While nearly half of adults 65 and older in the USA spend some time in a nursing home, most stays are transient. Approximately 25% SNF residents stay >3 years. Most short-term residents are admitted for rehabilitation and have goals of returning to community living. Long-term SNF residents tend to be older and female, with multiple chronic health conditions affecting cognitive and physical well-being and subsequently quality of life. Functional problems such as fecal incontinence are often multifactorial, not easily remedied, and associated with an increased risk of institutionalization [4].

12.5 Person-Centered Care

Person-centered care means that resident is at the center of the care and decision-making process. Residents are supported to achieve their desired level of physical, mental, and psychosocial health that is individually practicable, an approach

endorsed by the American Geriatrics Society [5]. *Care plans* are living documents which support person-centered care by reflecting the resident's changing needs, driving active listening, and supporting staff to meet those changing needs.

A number of person-centered care models have been described. The Eden Alternative emphasizes meaning, empowerment, and growth along with a sense of purpose, community, and belonging [6]. Other models include the Green House model [7] and the Wellspring model. The Japanese government introduced the "unit-care model" into nursing homes in 2003. The "unit-care model" relies on structure and staffing to allow a large-scale facility to consist of small-scale groups for desirable care provision. Unit-care model facilities have less fixed times and all-at-once assistance for waking up, dressing, and toileting, and residents have more choice in menu and spare time programs [8].

12.6 Interdisciplinary Team and Data Management

A physician supervises the care of each resident, writes medical orders (similar to those in a hospital), and visits periodically and is available for acute medical problems. Physicians who are effective leaders in the SNF have the potential to promote high-quality, cost-effective care [9]. A comprehensive assessment is completed by the interdisciplinary team (IDT) upon admission. The IDT is central to SNF care and includes physician, nurse, social worker, therapists, dietician, pharmacist, recreation therapist, and other health professionals.

The person-centered *care plan* identifies the goals of care and the anticipated treatments. In the USA, information is entered into the Minimum Data Set (MDS), a government-mandated, computerized database that reflects the medical, psychological, and social factors for each resident. Residents and families are invited to participate in *care meetings* to share information, establish goals of care, and elect treatment options. Care plans are completed within 7 days after the assessment and include measurable objectives and timetables to meet a resident's medical, nursing, mental, and psychosocial needs. Care plans are revised by the IDT quarterly or earlier with any change in condition. The MDS functions as an interdisciplinary communication tool that is revised to reflect changes in the resident and care. The assessment and care-planning processes are the foundations on which individualized care is delivered and continuity of care is ensured (see Table 12.1).

12.7 Regulations

US SNFs are extensively regulated in an effort to achieve high-quality care. The Omnibus Budget Reconciliation Act of 1987 requires periodic comprehensive assessment, sets minimum staffing metrics, and supports resident rights. The use of restraints and psychotropic medications is discouraged. The Society for Post-Acute and Long-Term Care Medicine (formerly known as the American Association of Medical Directors) is a medical professional organization focused on long-term care.

Table 12.1 Sample goals of care

Goal	Examples
Recover functional independence and return to community living	Rehabilitative stay following joint replacement, fracture, stroke, fall, infection, and cancer treatment
Strive for functional improvement and move to assisted living residence	Rehabilitative stay but with expectation of continued need for help with activities of daily living
Strive for functional improvement but expectation of limited success. If no improvement, elect to go home or residential setting with hospice	Ongoing medical issues such as cancer Uncertain prognosis
Improve overall well-being with meaningful activities in continued SNF residence	Engage in SNF activities, visit with family and friends, optimize function to the extent possible. Hospitalization is okay if needed
Further decline expected. Goals of care are focused on comfort. Death is not unexpected	Advanced dementia or other progressive illness. Prefer no hospitalization
Nearing the end of life. Goals of care are focused on comfort. Death is expected in weeks to months	End-of-life care being provided. Resident, family, and staff preparing for death

The organization has been a leader in improving care in nursing homes and offers a certificate program for physician training. SNFs are inspected on a regular basis by state regulatory authorities.

12.8 Payment

US SNF expenditures exceed $120 billion per year, primarily financed by public health programs. Medicare payments predominantly cover post-acute short-term stays (up to 100 days) and account for approximately 14%. Medicaid programs cover most of the long-term stays, accounting for approximately 64%. The remaining stays are financed by private pay and long-term care insurance.

12.9 Resident Experience

The quality of life in SNFs remains a major issue. The medical model is a barrier to a homelike environment that promotes choice, purpose, and meaning in daily life. Concerns voiced by SNF residents include lack of autonomy and difficulty in forming appropriate relationships with others. Residents desire acceptance and adaptation, connectedness with others, homelike environment, and caring practices [10].

The rights of SNF residents have received affirmation in the last 20 years. US SNF residents have rights guaranteed under Federal and State law, including the right to exercise his or her own rights, be informed about rights and

responsibilities, choose a physician and treatment, and participate in decisions and care planning. Privacy and confidentiality are protected. Provisions exist for residents to voice grievances and have the SNF respond in a timely manner. *Resident Councils* are convened on a monthly basis to air concerns and share information. A resident, even though determined to be incompetent, should be able to assert these rights based on the degree of capability. Each SNF has a designated *ombudsperson* responsible for resident advocacy, facility monitoring, and assistance with conflict resolution.

Safety is a major concern, and injurious *falls* are among the most common adverse events. Approximately half of SNF residents fall each year, and of those, a third need medical attention or must restrict their activities as a result. *Exercise* programs are effective to prevent falls [11]. A resident-centered multifactorial approach is recommended. Guidelines are available (American Geriatrics Society and British Geriatrics Society. Clinical Practice Guideline for the Prevention of Falls in Older Persons. New York: American Geriatrics Society; 2009 (www.americangeriatrics.org/). Resistance training exercises improve muscle strength and functional performance and should be incorporated [12].

SNFs must provide expert and timely medical care while optimizing the person-centered, homelike environment. Safety concerns arise in the treatment of conditions such as diabetes where risks of treatment are frequent (e.g., hypoglycemia from pharmacological treatment of diabetes) [13]. Conservative treatment approaches are recommended. Prompt recognition and treatment of acute medical changes are needed. Quality improvement efforts are aimed at early identification and management to improve health outcomes and care as well as reduce cost by avoiding unneeded hospitalizations. Tools and guidelines are available from professional organizations [14]. Decisions to hospitalize often depend on staffing levels and availability of diagnostic tests and laboratory support [15].

Residents may have low expectations for functional improvement and quality of life. *Urinary incontinence*, for example, is a geriatric syndrome present in 60–70% of SNF residents that is amenable to lifestyle interventions, behavioral therapy, and medications [16]. Resident perspectives however reflect low expectations for improvement, often believing that incontinence is inevitable and untreatable [17]. SNFs seek to provide a person-centered balance of care that allows the resident access to the best possible information and treatment while respecting the right of the resident to choose preferred avenues of care which may include refusing treatments.

12.10 Nursing Staff

Nurses and nursing assistants make up the majority of SNF staff and are major determinants of the resident's experience. SNFs must have nurse staffing to meet the needs of residents as defined in their care plans. Although much studied, no consistent evidence has been found to determine the ideal relationship between SNF nurse staffing and quality of care [18]. Recruitment and retention of staff may be

Table 12.2 Advance care planning discussion

Domain	
Decisional capacity	Capacity is decision-specific. Resident may have capacity around some questions, but not others. For example, resident may have capacity to designate a surrogate decision-maker but may lack capacity to make discharge decisions and plans due to impairments in memory, insight, and judgment. Capacity may be temporarily diminished, as in delirium
Health-care proxy	Name, type of proxy (e.g., next of kin, durable power of attorney for health care, guardian), and contact information should be listed Back-up health-care proxies should be identified if possible
Preferences for care	Describe the resident's goals of care, values, preferences for treatment, and unwanted interventions. Use resident's own words if possible. "I want to get better if I can, but I don't want to be kept alive on machines." "I don't want to be a burden on my family." "I have lived a good life, and I am not afraid of dying." "I hate the hospital. I don't want to go to the hospital again. Take care of me here in the nursing home as best you can. I understand I may not have long to live. I want to make the most of each day I have left"

Documentation of discussion between the resident and physician and the preferences of the resident for health-care proxy and future health-care interventions

challenging. Turnover rates have been reported in the USA as >70% for nursing assistants and >50% for licensed staff including nursing directors. Education and cultural transformation are difficult when staff turnover is high.

12.11 Advance Care Planning Documentation

Advance care planning discussion is a process where information is shared and planning is accomplished between the physician and the resident (or health-care proxy). All SNF residents should have the opportunity to participate in advance care planning. The physician is responsible for documenting the discussion and writing orders that carry out the wishes of the resident. Assessment of the resident's capacity to make decisions, designation of health-care proxy, and information about the resident's values, goals, and life-sustaining treatment decisions should be documented in a part of the medical record that is easily accessible and updated (see Table 12.2).

12.12 Advance Directives and Orders to Limit Care

Advance directives are written documents that provide direction for future medical decisions and health proxy. (See Advance Directives and Living Wills.)

When SNF residents set limits on unwanted treatments such as attempts at cardiopulmonary resuscitation or hospital transfer, orders to limit such treatments must be written by the physician. State-authorized orders to limit care are increasingly common in the USA. MOLST (medical orders regarding life-sustaining treatment) and POLST (physician orders regarding life-sustaining treatment) are frequently used and can be honored by emergency medical personnel during transport.

12.13 Dementia Care

Dementia is the most common condition in SNF with 50–70% of residents meeting the diagnostic criteria. A major challenge in the care of persons with dementia is the high prevalence of neuropsychiatric symptoms such as agitation and apathy [19]. Clear evidence-based guidance for dementia care has been lacking [20]; however therapeutic activities enhance emotional wellness, engage and support a sense of well-being, and reduce behavioral symptoms. Reminiscence therapy, art therapy, music therapy, exercise, and dance may be provided by informal caregivers or professionals. Person-centered care, communication skills, and modified dementia care mapping (detailed observations and scoring of residents are provided to staff to guide care), sensory therapy activities, and structured music therapies reduce agitation in residents with dementia [21]. Spending time outside in a garden appears to reduce agitation in dementia residents [22]. Caregiver support and education are among the most effective ways to improve quality of life among residents and caregivers as well as reduce behavioral symptoms. Increasing efforts (and regulatory incentives) are in force to reduce the use of antipsychotic medications for behavioral symptoms due to the increased mortality risk associated with all such medications [23].

SNF residents with primary progressive dementia often experience decreased ability to feed and lose weight as the disease advances. In the past, as many as a third of SNF residents had feeding tubes [24]. Data has shown that the use of feeding tubes in advanced dementia does not improve survival or decrease unwanted outcomes [25]. Potential harms from feeding tubes include the need for restraints to prevent residents from pulling them out, wound infections, and depriving residents of pleasure feeding. The best strategy is to conduct person-centered care planning and proceed in accordance with the resident and family's preferences for care.

12.14 Medication Management

Polypharmacy is associated with an increased number of potentially inappropriate medications and increased adverse drug events, drug-drug interactions, hospitalizations, and increased costs. A pharmacist member of the IDT is associated with decreased costs [26].

12.15 Sexuality

The issue of SNF residents' desire for sexual expression has garnered increased attention. Sexuality is a natural part of the human condition at any age. Some US states have laws to address conjugal rights in nursing homes, and the Australian government funded a sexual assessment tool with guidelines on how SNF staff should support the expression of sexuality. 53% of people 65–74 and 26% of those between 75 and 84 are sexually active [27]. Expressions of sexuality range from

passing compliments and maintenance of physical appearance and attractiveness to sexual intercourse. Dementia residents present a particular challenge to SNF staff to balance concerns of safety with rights to sexual expression as the assessment of capacity to consent may present a quandary.

12.16 Palliative Care

Pain and other distressing symptoms are prevalent among SNF residents. In one national survey, families reported up to a third of their loved ones with pain or dyspnea at the end of life did not receive enough help. More than half reported receiving inadequate emotional support during the terminal illness of their loved one [28].

Palliative care is interdisciplinary care that provides an extra layer of support to relieve distress and improve the quality of life for anyone living with serious illness and should be an essential component of SNF care. Residents with chronic conditions such as dementia, frailty, heart disease, lung disease, kidney failure, and cancer often have pain and other symptoms amenable to palliative treatments. Palliative care does not fall under a special insurance benefit and may be provided along with attempts at curative or disease-modifying care.

A growing body of evidence suggests that palliative care improves quality of care and patient and family satisfaction and prolongs survival, due to reduced iatrogenesis, crisis prevention through effective symptom management, and reduced depression. Palliative care lowers health-care costs by reducing hospitalizations, emergency department visits, and emergency medical calls. Palliative providers are experts at communication with residents, families, and staff. The family meeting is often pivotal to helping residents and families understand the prognosis and options for care and to articulate their goals and preferences for care. With improved understanding of treatment options (e.g., symptom burden of chemotherapy), residents and families may elect to avoid treatments that risk additional burdens (e.g., medication errors, hospital-acquired infections, poor communication of care plans).

In the UK, the Gold Standards Framework Care Homes Training Program and other educational efforts have strengthened palliative care in nursing homes, aiming to improve the quality of care for residents near the end of life; to improve coordination and collaboration with general practitioners, primary care teams, and others; and to reduce hospitalization, enabling more residents to live and die at home and thereby improve cost-effectiveness [29].

12.17 Hospice Care

Hospice care is associated with significant decreases in rates of hospital transfer, feeding tube use, and intensive care in the month prior to death [30]. Barriers to hospice include difficulty with exact prognostication in residents with noncancer conditions and lack of mechanisms for financial payment if residents are using their Medicare benefit for rehabilitation.

12.18 End-of-Life Care

Approximately 65% of long-term care residents die within 1 year of SNF admission, and more than half of them die within 6 months of admission. By 2020, an estimated 40% of Americans who die will do so in a nursing home [31].

The final days or hours of life may present challenges for the SNF IDT even when the goal of care has been palliative for some time. Specific steps should be taken to relieve suffering, comfort family and staff, and discontinue burdensome treatments or activities (see Table 12.3).

Table 12.3 Checklist for end-of-life care

Intervention	Notes
Ensure hospice involvement if possible	Include interdisciplinary team to provide full spectrum of support to patient, family, and staff
Document decisions about goals of care	Medical record should reflect discussions and planning
Confirm orders written to prevent unwanted interventions Use of state-authorized medical orders such as MOLST (medical orders regarding life-sustaining treatment)	Do not attempt cardiopulmonary resuscitation Do not intubate Do not hospitalize unless needed for comfort
Family support	Educate family about "normal" dying. Ask family about cultural rituals or preferences for care Assure physical comfort (e.g., place to sleep if spending the night) Offer bereavement support and resources
Proactive symptom relief strategies	Ensuring opioids, anxiolytics, antipyretics, anti-nausea, and other medications are available for relief of possible symptoms
Review medications and discontinue unneeded medications	Avoid iatrogenic harm (e.g., hypotension, hypoglycemia) Reduce pill burden and choking hazard
Discontinue unwanted routines	Frequent vital signs and weights no longer necessary when comfort is the dominant goal and death is expected
Consider changing diet to comfort feeding	Liberalize special diet orders Offer pureed foods and sips if safe to swallow
Support nursing staff to perform excellent oral and skin care	Consider special mattress if risk for skin breakdown
Bereavement services for self and staff	Schedule time for reflection and debriefing Participate in staff bereavement support rituals (e.g., prayer, moment of silence, final salute)
Consider sending condolence card after the death	Include staff in signing of card

Case Conclusion

The IDT completed a comprehensive geriatric assessment on Ms. AD. Her preferred daily schedule is to stay up late and watch movies on television. She likes to sleep late and take her bath before her morning routine begins. She is particular about her makeup, her wig, and her attire. She eats her first meal in the late morning accompanied by very hot tea. She prefers to take her medications after her meal. She likes to have perfectly manicured fingernails, coordinated outfits, and jewelry before she leaves her room. She enjoys going to the casino. The SNF staff devised a care plan honoring her preferences. She is fully coiffed and dressed before leaving her room each morning in her motorized wheelchair. She soon forms close relationships with various members of the staff and settles into a pleasant routine. She especially enjoys the periodic bus trips to the casino. In her advance care plan, she identifies two nieces as proxies in the event she loses capacity to make health-care decisions. She would accept intravenous treatments in the SNF, but she prefers not to go to the hospital and would not want an attempt at cardiopulmonary resuscitation or life support machines.

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Rehabilitation for the Older Patient

13

Tara Ball

Key Points

- Functional assessments and outcome measures are important in rehabilitation.
- Interdisciplinary team approach is the key to success.
- Patient-centred goals are important to aim for.
- Discharge planning should start early.
- Integration into community and continued care after the rehabilitation should be provided as necessary.

13.1 Case Study (Part 1)

Mrs. Ida Jones Mrs. Ida Jones is an 82-year-old lady who lives with her 81-year-old husband. She has been referred by her GP and brought into the rehabilitation unit from home. Her GP is concerned about her decline in mobility after a fall 2 months ago. Since the fall Mrs. Jones has become housebound. Prior to the fall, Mrs. Jones walked with a four-wheel walker frame and enjoyed regular outings with her husband. She also enjoyed the company of her sister Vera who unfortunately died about 3 months ago. Mrs. Jones showered and dressed herself prior to the fall but is now relying on her husband for assistance.

Mrs. Jones arrived at the rehabilitation ward in a wheelchair. She reports tiredness, poor sleep, left hip and knee pain and right foot pain. She also tells you that she is frequently wanting to urinate and sometimes can be incontinent. This is also new for her. Finally, she reports a persistent dry cough in the last few weeks.

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13.1.1 Past Medical and Surgical History

- Congestive cardiac failure
- Atrial fibrillation
- Permanent pacemaker
- Hypertension
- Gastro-oesophageal reflux disease
- Depression
- Osteoarthritis
- Osteoporosis
- Lower back pain
- Fractured right neck of humerus 2014. Nonoperative management
- Hay fever
- Macular degeneration

13.1.2 Medications

- Warfarin 2 mg nocte
- Bumetanide 1 mg mane
- Cyproheptadine 4 mg nocte
- Venlafaxine XR 37.5 mg mane
- Perindopril 5 mg nocte
- Acetaminophen 1 g tds
- Esomeprazole 40 mg nocte
- Bisoprolol 2.5 mg nocte

13.2 Case Study (Part 2)

13.2.1 Rehabilitation Assessment

13.2.1.1 Initial Assessment

The initial assessment is usually done by the physician. This assessment is aimed to look at the whole person, and after taking a thorough history and examination, it may also be necessary to speak to relevant family members and any health professionals previously involved in the patient's care. The physician then takes a full functional history starting with premorbid level of function and then current level of function [1].

13.2.1.2 Multidisciplinary Team Assessments

Multidisciplinary care is the cornerstone of any rehabilitation program. The efficacy of coordinated care is supported by a number of studies [3, 4]. Each discipline will assess the patient independently on arrival to the rehabilitation unit and implement the appropriate assessment tools, outcome measures and management plans. Throughout the program the multidisciplinary team works together in an interdisciplinary manner.

A formal functional tool can be used such as the Barthel [12] or the FIM (functional independence measure) [6, 13]. These assessment tools are usually used within the first 72 h of the patient's admission and used again within 72 h of discharging the patient. The FIM assessment tool is widely used across the world; it is a common method of assessing basic daily living activities and functional abilities [6]. A cognitive assessment should also be performed on all elderly patients prior to participating in a rehabilitation program [1]. Participation in therapy is dependent on the ability to follow simple one-step commands and to sufficiently recall tasks so that learning is carried over each day [2]. There are a variety of standardised assessment tools but a Mini Mental Status Exam (MMSE) is the one most commonly used. The primary determinant of one's ability to benefit from a rehabilitation program is one's pre-existing disability and level of function. However severe cognitive impairment is a risk factor for a poor response to any rehabilitation input [7].

Depression and anxiety is common in the older person. A standardised questionnaire, like the Geriatric Depression Scale (GDS) or the Depression Anxiety Stress Scale (DASS) [14], can be used if there are concerns about whether a patient has any form of mood disturbance, which may affect the ability to participate in a rehabilitation program.

Hearing and vision should also be assessed and corrected as much as possible [1]. Finding out when the patient last had a hearing test or saw an optometrist is a vital part of the assessment. Hearing aids and glasses are often left at home. It is important to remind elderly patients to regularly have their hearing and vision checked.

A fall injury prevention screening tool is commonly used on all patients in the rehabilitation unit.

Underlying medical problems can impact on a patient's ability to participate and progress in a rehabilitation program; thus it is important to identify and manage these issues promptly. It is essential that underlying medical problems are identified and managed appropriately.

13.2.1.3 Goals

Each rehabilitation patient should have specific rehabilitation goals. These goals are usually patient centred and identified early in the rehabilitation process. Setting functional goals such as to improve mobility or to become independent with self-care tasks is common. The multidisciplinary team often assists the patient in identifying realistic and achievable goals. Rehabilitation therapists often use the pneumonic SMART when setting rehabilitation goals with patients.

S—Specific
M—Measurable
A—Attainable
R—Realistic
T—Timely [11]

An example of a goal is "I want to walk 50 m with my walking stick within one minute". This goal is ideal because it is specific and it is measurable which enables

the patient and the therapist to monitor their progress. Awareness of the goal provides a challenge and enables the patient to be motivated and engaged throughout the program. The goal should also be realistic so that the patient does not become dissatisfied and give up. The goal should be timely so that an endpoint is set and the patient has a clear target to work towards.

13.2.1.4 Rehabilitation Process

The multidisciplinary team usually involves the rehabilitation physician, rehabilitation nurse, physiotherapist, occupational therapist, speech therapist, social worker, dietician, psychologist and podiatrist. The rehabilitation team meets on a weekly basis in a case conference forum. In this meeting each patient is individually discussed. This allows formal coordination of the multidisciplinary plan and documentation of the discharge care plan and follow-up arrangements. The case conference is about reviewing the rehabilitation process including patient-centred goals and progress. Any medical interruptions are discussed.

Family/relative meetings are also important in order to update the patient's family on the rehabilitation process, provide an open channel for communication and work towards an agreeable and safe discharge plan.

Review of Case: Mrs. Ida Jones It is often beneficial with a patient like Mrs. Jones who has multiple comorbidities and new medical and rehabilitation issues to write down a problem list. For example:

New Problems

- Dry cough
- Fall
- Reduced mobility
- Housebound
- Assistance with self-care
- Urinary issues
- Constipation
- Tiredness
- Constipation
- Pain (left hip, left knee, right foot)
- Grief and loss issues
- Deconditioned

Other Concerns

- Polypharmacy
- Multiple comorbidities
- Frailty
- History of depression
- Carer strain
- Premorbid function

Current Function

There are many ways to record a functional history, but one of the most widely used classifications is the World Health Organization Model for the International Classification of Functioning, Disability and Health (ICF) [5, 15].

This enables the physician to compartmentalise the problems into the following categories based on body function and structure:

1. Impairments
2. Abilities to execute the task (activity limitations and restrictions)
3. Ability to participate in life activities

The above points are based on consideration of the patient's health condition including environmental and personal factors.

For example, in the case of Mrs. Ida Jones:

1. Impairments
   - Tiredness and weakness
   - Urinary urgency
   - Constipation
   - Joint pain including left hip, left knee and right foot
   - Falls
   - Mood disorder
2. Activity limitations and restrictions
   - Reduced mobility (requires a frame for short distances and a wheelchair for longer distances)
   - Requires assistance for self-care tasks (showering, dressing, toileting)
3. Participation in life activities
   - Housebound
   - Reduced number of outings with husband
   - Loss of sister—no longer visiting each other

Rehabilitation Assessment Tools on Admission

Functional Independence Measure (FIM) [15]. Mrs. Jones' admission FIM was attended to by the multidisciplinary team.

Self-care recorded by occupational therapist:

(a) Feeding—5
(b) Grooming—5
(c) Bathing—4
(d) Dressing upper body—4
(e) Dressing lower body—3
(f) Toileting—4

Sphincter control recorded by rehab nurse:

(a) Bladder management—5
(b) Bowel management—7

Mobility implemented by physiotherapist:

(a) Bed, chair and wheel transfer—4
(b) Toilet transfer—4
(c) Tub and shower transfer—4

Locomotion recorded by physiotherapist:

(a) Walk—2
(b) Stairs—1

Communication recorded by speech therapist:

(a) Comprehension—5
(b) Expression—6

Social cognition recorded by social worker:

(a) Social interaction—5
(b) Problem-solving—5
(c) Memory—5

Total score: 78/126
Mini Mental Status Exam (MMSE) implemented by rehab nurse:

Mrs. Jones scored 23/30.

Fall screen implemented by rehab nursing staff:

Fall risk in the high category.

Geriatric Depression Scale (GDS) implemented by social worker/counsellor/psychologist:

5/12 moderate depression, evidence of grief and loss.
SF36 [18] psychosocial assessment tool: social worker.

Physiotherapist Assessment Tools:

1. Timed Up and Go (TUG) [16]. Mrs. Jones scored 59 s.
2. Five times sit to stand. Mrs. Jones scored 23 s.
3. Modified Berg Score [17]—15/28.
4. Manual muscle testing (MMT).
   - Right dorsiflexion 3/5
   - Left hip flexion 3/5
   - Left knee extension 3/5
5. Pain visual analogue scale (VAS) [19].
   - Left hip 9/10
   - Left knee7/10
   - Right foot 7/10

13.2.2 The Rehabilitation Program

13.2.2.1 A 2-Week Reconditioning Program Implemented

After the fall Mrs. Jones had become inactive and this led to chronic disuse of her musculoskeletal system. She had become quite deconditioned and frail. Deconditioning is defined as the multiple potentially reversible changes in the body systems brought about by physical inactivity and disuse. Such changes often have significant functional and clinical consequences in older people [8]. The decline in muscle strength of 2–3% per day is not uncommon in elderly patients, and this can affect their cardiovascular systems as occurred with Mrs. Jones. Frailty is a clinical state that makes the medical management and rehabilitation of the elderly complex [9]. In a reconditioning program, strength work and cardiovascular training is effective and should be supervised initially. For an unconditioned elderly patient, submaximal exercise of 40–50% of the maximal heart rate could be beneficial [10]. After the inpatient program, a patient may progress through to a community-based program and try other enjoyable group activities such as Tai Chi and hydrotherapy. Tai Chi assists in balance, strength, coordination and flexibility. Hydrotherapy helps to improve cardiovascular endurance and is another group activity which enhances socialisation for the elderly population.

13.2.2.2 Medical Management

The medical management of the patient runs parallel and is intertwined throughout the rehabilitation program. Often specialist medical consultations are requested and the GP is kept in the loop via phone call and a copy of the discharge letter:

1. Urinary tract infection—MSU positive. *E. coli* urinary tract infection antibiotic started (sensitive to trimethoprim).

2. Right foot drop—Neurosurgical consultation. MRI of the lumbosacral spine showed right foraminal stenosis. Nonoperative management advised.
3. Constipation—Noticed on Bristol stool chart [20]. Rectal examination and abdominal X-ray confirmed the diagnosis; aperients given.
4. Left hip pain—X-ray confirmed severe osteoarthritis. Left knee pain—X-ray confirmed mild osteoarthritis with no evidence of fractures. Orthopaedic consultation suggested nonoperative management and intra-articular steroid injection given to the left hip under ultrasound guidance.
5. Dry cough—Bilateral crackles noted, JVP slightly raised. Oxygen saturation 98% on room air. Chest X-ray showed evidence of mild pulmonary oedema. Dose of frusemide given for a period of two to three days while monitoring renal function and electrolytes.
6. Hearing impairment noted—Family requested to bring in hearing aids. Visual acuity assessed. Patient wears glasses for reading and long-distance vision. Advised for future, patient has yearly optometry appointments.
7. Tiredness—multifactorial cause:
   - Iron, B12, folate (normal).
   - TSH (normal).
   - Delirium secondary to UTI and CCF. Continue current treatment and monitor delirium and fall risk.
   - Poor sleep.
   - Deconditioned.
   - Depression; suggest increase venlafaxine XR 75 mg daily.
8. Fall prevention and management—multimodal cause:
   - Mild cognitive impairment/delirium, right foot drop, urinary tract infection, left hip pain, lying and standing blood pressure, polypharmacy, decreased vision

13.2.2.3 Physiotherapy Management

1. One session per day, includes 30 min of aerobic strength and flexibility work
2. One-on-one training
3. Gait assessment. Trial of orthotic for right foot. Ankle-foot orthosis (AFO) and Dictus brace trialled
4. Fall prevention and management

13.2.2.4 Occupational Therapy Management

1. Self-care assessment.
2. Equipment review—bathroom self-care aids, walker, wheelchair.
3. Home environmental assessment—access, bathroom, falls hazards within the home.
4. Meal preparation assessment.
5. Cognitive retraining including brain activities—puzzles, crosswords.
6. Sleep hygiene.
7. Lifestyle activities and recreation.

8. Energy conservation and establishment of a daily routine in conjunction with the other Allied Health members. This routine is displayed in the room.
9. Falls prevention and management.

13.2.2.5 Social Worker

1. Assessment of mood—Geriatric Depression Scale
2. SF36 [20]
3. Emotional support and counselling given
4. Assessment of community services
5. Liaise with family and relatives
6. Grief and loss counselling
7. Mindfulness therapy
8. Aged Care Assessment Team (ACAT) to delegate paperwork for permanent respite care if required in the future. This was discussed with the patient and family. ACAT assessment also allows for the patient to receive domestic assistance for cleaning tasks, transport vouchers given, shopping home delivered if needed.

13.2.2.6 Rehab Nursing Care

Functionally orientated nursing care is very important to any rehabilitation program. The following was implemented by the rehabilitation nurses caring for Mrs. Jones:

1. Teaching tasks in a simple manner and repeated in the same manner.
2. Encourage independence with all tasks.
3. Prepare patient adequately with aids.
4. Allow time and prompting for tasks.
5. Slow, clear and audible instructions.
6. Emotional support giving positive reinforcement and feedback.
7. Bowel management—Bristol stool chart, timed toilet, dietician seen for high-fibre diet.
8. Bladder management—time and volume, fluid balance recorded, timed toileting implemented.
9. Medication—consideration of Webster-pak, education re self-medication given.

13.2.2.7 Weekly Multidisciplinary Team Review

1. Case conference.
2. Family meeting—information and education. Avoid being overprotective; avoid helping too much. Carer training offered to husband and community services.
3. Independent living unit recommended prior to discharge with husband.
4. Discharge care plan to return home with supports.
5. Follow-up; outpatient rehabilitation.

13.2.2.8 Rehabilitation Outcomes in the Case of Mrs. Jones

Mrs. Jones participated in a 2-week inpatient multidisciplinary rehabilitation program with the emphasis on reconditioning. Her goals were to be able to safely and

independently walk 50 m with her four-wheel walker within a 5-min time frame. She wanted to be able to shower and dress independently and toilet herself without assistance. She wanted to go out with her husband to a restaurant and once a week enjoy a social outing with her family or friends. Mrs. Jones was also concerned for her husband's wellbeing and felt that some help to clean the house once a week would be of benefit.

13.2.2.9 Outcomes

- Discharge FIM 104/126.
- Admission FIM 78/126.
- Overall widespread functional improvement.
- Mrs. Jones was able to walk 50 m independently and safely with a low frame well within the 5-min time frame indoors and outdoors.
- She was able to manage three steps with a handrail and supervision was recommended.
- She required supervision for car transfers.
- Timed Up and Go in 33 s (60 s on admission).
- Five times sit to stands in 20 s (23 s on admission).
- Gait improved; left ankle dorsiflexion improved with a leather Dictus brace and power improved to 3/5. Mrs. Jones was able to demonstrate good foot clearance without needing the brace on discharge.
- Pain VAS score left hip 3/10, left knee 3/10.
- Cognition improved; discharge MMSE 26/30 (admission 23/30).
- Self-care; patient was able to be independent with aides once set up for self-care tasks.
- Toileting independent.
- Meals; prepared by husband. Patient independent at meal time.
- Home environment modifications and equipment:
  - Handrail installed on front two steps
  - Non-internal steps
  - Lives on lower level of home
  - Toilet in bathroom with toilet surround to assist transfers
  - Handheld shower hose
  - Grab rail installed
  - Shower chair recommended
- Referral made to the International Low Vision support group to explore assistive ADL visual aids, for the home.
- Patient was discharged home with husband Bernie.
- The social worker was able to organise community services to initially supervise self-care tasks at home and services for domestic cleaning duties once a fortnight. The age care assessment team assessed Mrs. Jones during the rehab admission and approved her for respite and permanent aged care if needed in the future.
- Mood improved with medical management of delirium and increased in venlafaxine dose.

- Grief and loss counselling commenced and will be ongoing.
- Patient aims to have regular social outings. Information provided re day respite centres and social groups in the local area.
- Information on alternative transport options including taxi transport subsidy scheme completed.
- Alternative care support to take Mrs. Jones shopping as needed also.
- Information on carer supports for Mrs. Jones husband given and Mrs. Jones participated in carer training, to increase confidence and optimise personal safety. Fall education prevention information given to Mrs. Jones.
- Mrs. Jones medically stable at time of discharge to home.

13.2.2.10 Follow-Up Plans

- Return to outpatient rehab program 2 h per day, twice weekly for 6 weeks.
- Home exercise program given for alternative days. 30 min per day can be divided into 15 min twice daily or 10 min three times per day of light aerobic, strength and flexibility work.
- Recommendations to see GP within 1 week of discharge to monitor any medical issues.
- Follow-up phone call 48 h after discharge by rehab nurse:
  - No problem
  - Patient doing well

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Stroke in Old Age

14

David Abernethy

Key Points

- Three quarters of all strokes occur over age 65, and these strokes in the older age group are much more often fatal.
- Stroke is the fourth most important cause of death and the major cause of adult disability.
- Both stroke prevention after TIA and minor stroke and the acute treatment of ischaemic stroke are highly effective at any age.
- Atrial fibrillation is an important largely preventable cause of severe stroke in the elderly, and prophylactic effective anticoagulation should be much more widely used.
- "Time is brain"—thrombolysis and clot retrieval for acute stroke must be treated urgently.
- Successful stroke prevention and treatment require continuous improvement of stroke systems and repeated public awareness campaigns.

Case Study

A 91-year-old was last seen well by his wife at 10:00 on a Saturday morning. She came home about 10:30 to find him slumped over to the right and poorly responsive with left face and arm weakness. He was brought immediately to the hospital by ambulance on a Saturday morning arriving at about 11:00, accompanied by his distraught wife. He was in atrial fibrillation treated with

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aspirin. He was on warfarin up until 9 months ago which was stopped after a fall. About a week after the fall, he developed a sacral pressure area that took over a month to heal. He had tremor-dominant Parkinson's disease and decreased mobility for about a year needing a walker and getting home help three times a week for showering and dressing.

On examination GCS 12/15 M6 V2 (/5 incomprehensible sounds) E4, he could respond to commands but did not volunteer any spontaneous information. He had head and eye deviation to the right, left hemiparesis with flaccid weakness of his left cheek, left upper lip droop, no movement in his left arm and weak left leg that could be lifted off the bed for 5 s with difficulty.

14.1 Introduction

Stroke is an often devastating illness largely confirmed to the elderly age group. The term stroke encompasses acute focal brain ischaemia, intracerebral haemorrhage (ICH) and subarachnoid haemorrhage (SAH).

The causes, prevention and acute investigation and treatment of ischaemic stroke, ICH and SAH differ in important ways. SAH is not discussed further, but a comprehensive account of all aspects of diagnosis and treatment is available free from *Brain* (http://brain.oxfordjournals.org/content/124/2/249.long).

The bedside subdivision of acute ischaemic stroke into POCI, PACI, LACI and TACI is a useful guide to the likely cause and to prognosis. From the rehabilitation perspective, the size of stroke is the most significant factor affecting outcome, with large MCA infarcts and large deep hemisphere ICH having particularly poor outcome. All other ischaemic stroke types have a relatively good prognosis. The death rate in the first 30 days is less than 20%, about 30% remain dependent, and about 50% recover to be fully independent [1]. These outcomes justify diligent patient care with appropriately timed and vigorous rehabilitation for those likely to recover.

The biggest impact on the burden of stroke will be made through primary and secondary prevention. Smoking, hypertension, atrial fibrillation, hypercholesterolaemia, diabetes and obesity are the most important risk factors. In the Western world, atrial fibrillation, obesity and diabetes are increasing.

Between a tenth and a quarter of ischaemic strokes are preceded by TIA, about half in the preceding 48 h. The risk of stroke after TIA may be as high as 12%. Prompt assessment and simple interventions in an ambulatory setting can reduce this risk by up to 80% [2]. Between 20% and 30% of strokes occur in patients with known atrial fibrillation. The proportion of these patients on anticoagulation is low, the strokes typically disabling, and the rate of anticoagulation in patients with AF over 65 or with other reasons for an increased stroke risk must be improved.

There are rapid advances in the treatment of acute stroke; however these treatments are in general only modestly effective with at best a 10% absolute improvement in recovery with no or no significant deficit. At present at best only a third of stroke victims reach the hospital early enough to be offered care likely to significantly reduce infarct size, and many who do are not treated promptly or at all because of hospital system failures. Well-organized, regularly audited, hospital and

community systems and continuing public education are needed if effective treatments are to reach the majority of afflicted persons.

14.2 The Importance of Systems for Stroke Care

Stroke care is urgent. Patients with suspected stroke or TIA should be assessed as quickly as possible.

Organized stroke units have been shown to improve outcome from acute stroke. The precise reasons are uncertain. However a team dedicated to timely implementation of all aspects of acute care that have been demonstrated to work, applied to all stroke patients; to continuous process improvement; to education of patients and relatives, and to stroke secondary prevention are the most likely reasons.

Guidelines and standard treatment and investigation plans should be followed in the care of the acute stroke patient and in the prevention of stroke after TIA or minor stroke. The most comprehensive guidelines are produced by the AHA/ASA.

Specific system components include:

- Early recognition of stroke by the patient, relatives and carers
- Organized response by emergency services
- FAST track systems for diagnosis, investigation and where possible thrombolysis or clot retrieval
- Rapid response to in-patient and periprocedural stroke with an agreed suitable location for urgent treatment administration and monitoring
- Urgent investigation and institution of secondary prevention treatment for TIA and minor stroke patients
- Surgical intervention in special circumstances to reduce disability and death in malignant middle cerebral artery syndrome or cerebellar infarcts

14.3 Stroke Epidemiology

Stroke is a problem almost confined to the over 65 age group. In the 2012 Auckland stroke study, the rate of first stroke/100,000/year for ages 15–64 was 55, for 65–74 381, for 75–84 913 and for over age 85 1518. About 80% strokes were ischaemic, 18% haemorrhagic and 2% undetermined. About three quarters of the haemorrhagic strokes are from are primary non-traumatic intracerebral haemorrhage (PICH) and a quarter due to subarachnoid haemorrhage [3].

The current World Health Organization definition of stroke (introduced in 1970 and still used particularly for epidemiological studies) is “rapidly developing clinical signs of focal (or global) disturbance of cerebral function, lasting more than 24 h or leading to death, with no apparent cause other than that of vascular origin” [4].

The updated AHA definition more closely reflects clinical practice: Central nervous system infarction is defined as brain, spinal cord or retinal cell death attributable to ischaemia, based on neuropathological, neuroimaging and/or clinical evidence of permanent injury. Central nervous system infarction occurs over a

clinical spectrum: Ischaemic stroke specifically refers to central nervous system infarction accompanied by overt symptoms, while silent infarction by definition causes no known symptoms. Stroke also broadly includes intracerebral haemorrhage and subarachnoid haemorrhage [5].

14.4 TIA and Ischemic Stroke Have the Same Mechanisms

Between 9.4% and 26% of strokes are preceded by TIA [7–9]. 14.1% of patients with TIAs and 13.1% of those with minor ischaemic stroke have atrial fibrillation [10]. Transient ischaemic attacks and stroke differ by their duration and the persistence of any defect but have the same underlying pathophysiological mechanisms. TIAs last a few minutes up to 24 h. The longer the attack, the more likely there has been underlying infarction which probably occurs in about a third of attacks lasting more than an hour. The most serious TIAs, those most likely to be followed by acute stroke, affect speech and motor power or are associated with atrial fibrillation.

14.5 Secondary Prevention of Recurrent Stroke After TIA or Minor Stroke

Particularly after TIA and minor stroke, early secondary prevention is critically important. Outpatient provision of same-day investigation and treatment has been shown to reduce the risk of subsequent stroke in the next 3 months by up to 80%, with about 50% of the risk reduction in the first 48 h [2]. Establishing the underlying mechanism of TIA and stroke guides acute intervention and prognosis for recovery and helps select prevention strategies that minimize the risk of recurrence and identify rare serious causes needing specific actions such as endocarditis and vasculitis.

14.5.1 Causes of TIA and Minor Stroke

The common causes are:

- Artery-to-artery embolism—the most common.
- Atrial fibrillation and other causes of cardiac embolism, including venous embolism via right to left shunt, and some rare; see below.
- Small-vessel disease associated with ageing, hypertension and diabetes—suspected from the resemblance of symptoms to lacunar stroke syndromes and often from stereotyped multiple recurrences—the capsular warning syndrome [11].

Unusual vascular causes

- Large-artery critical stenosis—limb-shaking TIA in carotid occlusion.
- Thrombotic causes particularly the lupus anticoagulant syndrome.
- Recurrent focal onset with spread over minutes suggesting motor or sensory migraine aura in cerebral amyloidosis often with convexity subarachnoid haemorrhage visible on CT [12].

- Endocarditis.
- Vasculitis.
- Cardiac tumour rare non-vascular causes.
- Brain tumour—about 1 in 100 TIAs proves to be a brief focal symptom associated with an unsuspected cerebral tumour. These attacks are probably focal seizures. Even more rarely the tumour, typically a rapidly progressing malignant glioma, is not visible on the initial CT scan.
- Subdural haematoma—although the presentation is often subtle and relatively uncommon, the history of some minor cognitive and memory impairment since a minor head injury, more recent fluctuating confusion and focal TIA-like attacks is distinctive.
- Other space-occupying lesions.

Unusual evolving sensory and motor TIAs in amyloid angiopathy

Amyloid angiopathy may cause repetitive stereotyped TIAs which evolve over minutes spreading, for example, over sequential fingers and then to the ipsilateral face in a manner suggesting a migraine aura. In these cases, an MRI sequence sensitive to iron may show cortical and subcortical microbleeds or convexity SAH [12]. Although uncertain since the incidence of both stroke and ICH is increased, antiplatelet therapy is probably best avoided [13].

14.5.2 Clinical Features and Mimics

A detailed discussion of positive and negative symptoms and differentiation of the likely cause of attacks (TIAs, unusual variants with loss of consciousness, limb-shaking from hemisphere or upper brainstem and mimics: syncope, seizure, migraine aura without headache and functional tumours) by analysis of the mode of onset, duration and mix of clinical features is available free from *Practical Neurology* [14] and via PubMed http://www.ncbi.nlm.nih.gov/pubmed/24453269.

14.5.3 Diagnosis of TIA

The diagnosis of TIA and stroke brings a significant psychological impact for the person affected and restriction of activity particularly driving and sometimes loss of livelihood, with at times catastrophic consequences for them and their dependents. Medications for secondary prevention have significant and sometimes hazardous side effects. There are many TIA and stroke mimics, and due care and adherence to diagnostic criteria are prudent.

Robust diagnostic criteria for TIA are well established. It is sensible to apply these criteria when assessing transient neurological symptoms. Recently transient neurological episodes in the vertebrobasilar circulation have been shown to be more common in the 2 days before VB territory stroke, and it may be necessary to offer preventative treatment against TIA for a brief period without reaching a definite (by NINDS criteria) diagnosis of TIA.

14.5.4 Diagnostic Criteria for Transient Ischaemic Attacks

Current definition: TIAs are brief episodes of neurological dysfunction resulting from focal cerebral ischaemia not associated with permanent cerebral infarction [15].

As discussed above, it is important to take a critical approach to the diagnosis of TIA to avoid inclusion of mimics. Here are the accepted NINDS clinical criteria for the diagnosis of TIA published by the AHA in 1975 [16].

The typical history for a TIA in the carotid system is a swift (no symptoms to maximal symptoms in less than 5 min, usually less than 2 min) onset of:

1. Motor defect (weakness, paralysis, poor use or clumsiness of one extremity or of both extremities on the same side)
2. Sensory defect (numbness including loss of sensation or paraesthesias involving one or both extremities on the same side)
3. Aphasia (speech and/or language disturbance which may be only a minor defect or may be global and may or may not include difficulty in reading, writing or performing calculations)
4. Loss of vision in one eye or in part of one eye when vision in both eyes was intact (amaurosis fugax)
5. Homonymous hemianopia
6. Combinations of the above

These clinical phenomena generally represent a decrease or absence of function. When there is a sensory event, it is commonly described as coming on all at once, that is, without a march. The typical history of a TIA in the vertebrobasilar arterial system is a swift (no symptoms to maximum symptoms in less than 5 min, usually less than 2 min) onset of:

1. Motor defect (weakness, clumsiness or paralysis of any combination of extremities up to quadriplegia, sometimes changing from one side to another in different attacks).
2. Sensory defect (numbness, including loss of sensation or paraesthesias in any combination of extremities including all four or involving both sides of the face or mouth. This is frequently bilateral trouble, or the distribution may change from side to side in different attacks).
3. Loss of vision, complete or partial in both homonymous fields (bilateral homonymous hemianopia).
4. Homonymous hemianopia.
5. Ataxia, imbalance, unsteadiness or disequilibrium not associated with vertigo.
6. Either vertigo (with or without nausea and vomiting), diplopia, dysphagia or dysarthria is not to be considered as a TIA when any of these symptoms occurs alone, but in combination with one another or with any of the above (numbers 1, 2, 3 and 4), the attacks should be considered a TIA.
7. Combinations of the above.

Certain symptoms may appear in a TIA in either arterial system. The most important of these are:

1. Dysarthria, if it occurs alone
2. Homonymous hemianopia, if it occurs alone

The occurrence of certain symptoms in solitary fashion constitutes an attack which is an "uncertain TIA". An attack which consists solely of each of the following symptoms should be categorized as an uncertain TIA:

1. Vertigo alone
2. Dysarthria alone
3. Dysphagia alone
4. Diplopia alone

For the sake of clarity, the following symptoms, transient or prolonged, are not to be included as TIA:

1. Unconsciousness including syncope
2. Tonic and/or clonic activity
3. March of a sensory defect
4. Vertigo alone
5. Dysphagia alone
6. Dysarthria alone
7. Incontinence of bowel or bladder
8. Dizziness or wooziness alone
9. Loss of vision associated with alteration of consciousness
10. Focal symptoms associated with migraine
11. Scintillating scotomata
12. Confusion alone
13. Amnesia alone

The differential diagnosis of TIAs includes "hemiplegic" migraine, focal convulsive events (often due to neoplasm and producing either sensory or motor phenomena), Meniere's disorder, sensory phenomena associated with hyperventilation and finally some unknown mechanism.

14.5.5 Transient Neurological Attacks Revisited May Presage Vertebrobasilar Stroke

In practice, transient neurological symptoms that were explicitly excluded from the NIH diagnostic criteria for TIA suggest the possibility of brain ischaemia. The Oxford Vascular Study group considered isolated vertigo, vertigo with nonfocal symptoms, isolated double vision, transient generalized weakness and binocular

visual disturbance as transient neurological attacks (TNAs) in the vertebrobasilar circulation territory, atypical amaurosis fugax and limb-shaking as TNAs in the carotid territory and isolated slurred speech, migraine variants, transient confusion and hemisensory tingling symptoms as TNAs in uncertain territory.

In sequential ischaemic strokes where the vascular territory could be determined, 16% of 275 vertebrobasilar strokes and 1% of 759 carotid strokes were preceded by a TNA by a median of 4 days and for vertebrobasilar strokes half within 2 days. Vertigo without (23) and with other nonfocal symptoms (10) was most common, making up 60% of TNAs preceding vertebrobasilar stroke [17].

14.5.6 Investigation of TIA and Minor Stroke

The state of the brain, brain circulation, the aorta and great vessels, the heart and heart rhythm for intermittent or constant atrial fibrillation should all be evaluated and guided by the clinical problem and results of the CT and carotid studies.

Systemic symptoms should be screened to identify clues to inflammatory or infectious causes including endocarditis, vasculitis, HIV and syphilis, all of which are seen at a rate of a few cases per year in hospitals serving populations over several hundred thousand.

In many hospitals, plain CT head and carotid duplex ultrasound, ECG and Holter monitor for occult AF are the investigations readily available. MRI with cervical and intracranial MRA or CTA is superior, since 30% have DWI positive lesions, and the presence of unsuspected lesions, their location, microbleeds and intracranial atheroma are invaluable to definitive diagnosis and optimal care.

14.5.7 Severity Assessment ABCD2 Score and Detection of Atrial Fibrillation (AF)

It is common practice to adjust the speed of investigation and the intensity of treatment by ABCD2 score. This may be justifiable at the population level, but for the individual who has had a TIA, there seems no reasonable justification for delay in sufficient investigation to institute treatment, i.e. CT head scan to exclude haemorrhage, haematoma or obvious tumour. Treatments that do not depend on the question of ICH and the outcome of CT scan and for which there is no important contraindication should be begun as soon as the diagnosis is considered. TIAs with motor weakness, dysphasia or AF should be treated as emergencies. A recent meta-analysis reached similar conclusions: “The ABCD2 score does not reliably discriminate those at low and high risk of early recurrent stroke, identify patients with carotid stenosis or AF needing urgent intervention, or streamline clinic workload. Stroke prevention services need adequate capacity for prompt specialist clinical assessment of all suspected TIA patients for correct patient management” [18].

14.5.8 Medical Management of TIA and Minor Stroke

The risk of stroke is 12% or greater after TIA or minor stroke, most of this risk is in the first 48 h, and it largely disappears after 3 months. The Express study showed stroke risk can be reduced by 80% in TIA patients referred to a same-day clinic, investigated by CT scan and when relevant duplex ultrasound. In the Express study, patients with TIA on aspirin or who were perceived as high risk had dual antiplatelet treatment with clopidogrel [19].

Dual antiplatelet treatment after TIA and minor stroke is more effective but may increases the risk of haemorrhage, and its duration should be minimised.

The Chinese stroke study Clopidogrel in High-Risk Patients with Acute Non-disabling Cerebrovascular Events (CHANCE) treated patients early (within 24 h, in the known high-risk period) after a high-risk TIA ABCD ≥ 4 or minor stroke NIHS ≥ 3. Patients received a 300 mg loading dose of clopidogrel then 75 mg/day for 3 months plus aspirin 75 mg/day for 3 weeks, reducing the risk of haemorrhagic complications. The absolute risk reduction in stroke was 3.5% at 3 months and 3.4% at 1 year with initial dual- versus single-agent therapy, with the reduction in stroke evident within days, after which the stroke rates in the two groups were parallel [20, 21]. US studies of the same issue are pending. More detailed analysis showed that the important benefit from dual antiplatelet treatment is obtained in the first two weeks [22].

14.5.9 Carotid Endarterectomy

In the NASCET study, the risk of ipsilateral stroke among patients with symptomatic internal carotid artery disease was 5.5% within the first 2 days after a first-recorded hemispheric TIA and 20.1% in the first 90 days. The median duration of a hemispheric TIA was 15 min (interquartile range 5–60 min; for 72.1% the duration was less than 1 h, and for 7.6% it was 6 h) [22]. About 10% of patients with a TIA presenting to California emergency departments returned to the emergency department with a stroke within 90 days. In half of the patients, the stroke occurred within the first 48 h after the TIA [23].

When there is 70% or greater internal carotid stenosis ipsilateral to the ischaemic attack, carotid endarterectomy significantly reduces stroke risk after carotid territory TIA or minor stroke. There is a significant risk of stroke or death from surgery whenever the procedure is performed so that its value falls with delay after TIA.

By implication, CEA should be performed as soon as possible to obtain the full benefit against the fixed surgical risks. A Swedish registry study of 2596 patients showed that very early CE, although intuitively attractive because of the high risk of major stroke in the first 48 hours after TIA or minor stroke, was unreasonably dangerous. In those with very early CE within the first 48 h, the risk of stroke or death was very significantly higher: 11.5% compared with 3.6% in those who had CE between day 3–7 with OR of 4.24 (CI, 2.07–8.70) [24]. When indicated, CE should be done as soon as possible but after the first 48 h. One unusual complication of CE is the unilateral reversible vasoconstriction syndrome.

14.5.10 Carotid Artery Stenting

A Cochrane meta-analysis of 16 trials of carotid angioplasty and stenting in patients considered too high risk for surgery showed that the rate of death or any stroke between randomization and end of follow-up was not significantly different for endovascular treatment compared with medical care. There was an increased risk of periprocedural stroke or death for endovascular treatment compared with endarterectomy for patients over 70. The rate of death or major or disabling stroke was not significantly different between treatments. The long-term efficacy of endovascular treatment is uncertain as restenosis is more frequent after endovascular treatment [25]. The surprisingly good results from vigorous medical treatment of intracranial stenosis suggest that similarly superior results might be possible from medical treatment of carotid stenosis.

No of trials/ patients	Stroke OR (95% CI)	Death OR (95% CI)	MI OR (95% CI)	Stroke/death OR (95% CI)
16/7572	Favours CEA 1.81 (1.40–2.34)	No difference 1.59 (0.94–2.70)	Favours CAS 0.44 (0.28–0.87)	Favours CEA 1.75 (1.29–1.31)

14.5.11 Aggressive Medical Management in Intracranial Stenosis

Persistent, aggressive management of medical risks of stroke combined with 90 days of dual antiplatelet therapy proved very successful in reducing the risk of stroke in severe intracranial arterial stenosis in the Stenting and Aggressive Medical Management for Preventing Recurrent Stroke in Intracranial Stenosis (SAMMPRIS) trial. Four hundred fifty-one patients with recent TIA or stroke related to 70–99% stenosis of a major intracranial artery had either aggressive medical management or aggressive medical management plus stenting with the Wingspan stent. By 30 days, 14.7% of 224 patients in the stenting group and 5.8% of 227 patients in the medical group had died or had a stroke. During a median follow-up of 32.4 months, 15% of 227 patients in the medical group and 23% of 224 patients in the stenting group had had a primary endpoint (one of stroke or death within 30 days of enrolment, ischaemic stroke in the territory of the affected artery more than 30 days after enrolment or stroke or death within 30 days after a revascularization procedure of the arterial stenosis during follow-up). Beyond 30 days, 21 (10%) of 210 patients in the medical group and 19 (10%) of 191 patients in the stenting group had a primary endpoint.

Medical management was identical in the two groups:

- Aspirin 325 mg per day, clopidogrel 75 mg per day for 90 days after enrolment
- Treatment of the primary risk factors
  - Raised systolic blood pressure target <140 mmHg, <130 mmHg for patients with diabetes
  - Low-density lipoprotein levels < 70 mg/dL (1.81 mmol/L)

- Treatment of secondary risk factors
  - Diabetes, elevated non-high-density lipoprotein [non-HDL] cholesterol levels, smoking, excess weight and insufficient exercise with the help of a lifestyle modification programme

Aspirin, clopidogrel, one drug from each major class of antihypertensive agents, rosuvastatin and the lifestyle programme were provided free to the study patients [26].

14.6 The Pathological Causes of Ischaemic Stroke

Almost all acute ischaemic stroke results from arterial occlusion, with hypoperfusion during shock or anaesthesia a rare cause, identified from the context and by watershed infarcts at the junction of the middle cerebral artery with the anterior and posterior cerebral circulations. The classification of stroke mechanism used in the TOAST trial is a useful way of categorizing stroke clinically [27].

1. Large-artery atherosclerosis (aorta, carotid, vertebral, basilar)
2. Cardiogenic embolism—atrial fibrillation by far the most common cause
3. Lacunar infarction—small-vessel disease related to age, diabetes mellitus and hypertension
4. Rare causes (e.g. dissection, vasculitis, prothrombotic states)
5. Unclassified
   - Despite adequate investigation
   - Due to inadequate investigation

The cause of ischaemic stroke remains uncertain despite a complete diagnostic evaluation in 20–40% of cases (cryptogenic stroke). A significant proportion of this group may be due to intermittent atrial fibrillation (AF) [28].

14.6.1 Large-Artery Atherosclerosis

Large artery-to-artery embolism causes about 40% of ischaemic strokes.

The most common identified cause of ischaemic stroke is large artery-to-artery embolism. Focal brain infarction results from interruption of blood flow, most commonly from emboli from thrombi on the surface of atheromatous plaques in large arteries, the aorta or its major branches and particularly the internal carotid vertebral and basilar arteries. Rarely emboli may break off from thrombi formed on dissected flaps of the arterial wall.

14.6.2 Large-Artery Thrombotic Occlusion

Large-artery (carotid or vertebral) occlusion by thrombosis developing on atheroma is considerably less common causing less than 10% of infarcts [29].

14.6.3 Cardiogenic Embolism

Cardiac embolism causes between 20% and 30% of ischaemic strokes.

The most important cardiac cause is non-valvular atrial fibrillation. Known paroxysmal AF is thought to as likely as permanent atrial fibrillation to cause stroke. Occult paroxysmal AF is believed to be a significant cause of large cortical strokes when there is no other apparent cause and particularly when there have been typical wedge-shaped cortical lesions in two different vascular territories. The frequency and duration of attacks of AF necessarily being a significant risk factor for stroke are under active investigation with implantable and wearable prolonged recording devices and indirectly by assessing the value of anticoagulation compared with antiplatelet therapy after likely embolic stroke of unknown cause. Since AF is a marker for more severe cardiovascular and arterial disease, some patients in AF, estimated to be about 25%, will have another cause for stroke [30]. The rate of recurrent stroke in non-valvular AF patients is about 4% in a month. After stroke or TIA when the patient is in sinus rhythm, particularly when the stroke syndrome is a PACI with normal carotids, or large POCI, and particularly if there are multiple lesions in two vascular territories, the possibility of cardiac embolism and intermittent AF needs to be considered. Different strategies have been proposed to detect intermittent AF after stroke from repeated ECGs to Holter monitor to 48 h of continuous cardiac monitoring with different detection rates [28]. It is likely that in the future detection may require several months monitoring with an implantable device. The CRYSTAL AF study in 441 patients found that long-term monitoring with an insertable cardiac monitor (ICM) detected atrial fibrillation (lasting >30 s) by 6 months after stroke in 8.9% of patients in the ICM group versus 1.4% of patients in the control group (hazard ratio, 6.4; 95% CI, 1.9–21.7) [28].

Other causes of cardiac embolism:

Venous emboli may pass through a patent foramen ovale to the cerebral arteries—particularly if there is associated atrial septal aneurysm.
Cardiac emboli may arise from mural thrombi after acute myocardial infarction or from scars and akinetic segments of longer standing.
Prosthetic cardiac valves or valvular heart disease
Post-cardiac surgery
Cardiomyopathy
Infective endocarditis
(Rare) Marantic endocarditis (often in cancer patients)
(Very rarely) Atrial myxoma or fibroelastoma

14.6.4 Small-Vessel Disease: Lacunar Infarction

Small deep infarcts result from occlusion of single small perforating arteries. The most common sites are in the internal capsule from occlusion of perforating striate branches of the M1 segment of the middle cerebral artery deep in the Sylvian fissure, posterior cerebral perforators to the thalamus and paramedian basilar perforators to the pons. The occlusion is usually local thrombosis of arterial wall

damaged and narrowed by lipohyalinosis associated with age, hypertension and diabetes. Less commonly occlusion may be embolic from a proximal source (heart, aorta, carotid).

14.6.5 Collateral Circulation and Its Effect on Infarct Size and Location After Vessel Occlusion

The state of the brain arterial collateral circulation often determines the size and location of infarction after arterial occlusion.

The anterior, middle and posterior cerebral arteries are not end arteries. Collaterals exist between the arteries across the distal boundaries of their territories. After occlusion of one intracerebral artery, significant perfusion from the surrounding arteries often limits infarct size. For example, after occlusion of the proximal middle cerebral artery by embolism, the size of the resulting infarct is determined by collateral flow from the anterior and posterior cerebrals. Infarct after MCA proximal occlusion may be restricted to the deep grey and white matter supplied by the occluded striate vessels, sparing the overlying subcortical white matter and cortex, or larger infarcts up to the entire MCA territory.

In internal carotid occlusion, collateral flow through the anterior communicating artery and posterior cerebral branches may prevent any infarction (see below).

When the internal carotid is occluded, ischaemia may be confined to small patchy infarcts in watershed areas in a parasagittal arc at the boundaries between territories of the anterior, middle and posterior cerebral arteries or lead to large infarcts in part of or the entire middle and anterior cerebral arterial territories. The resulting stroke syndrome may stutter over hours or days and fluctuate, possibly worsening with erect posture. The clinical defects may be subtle because the functional areas affected are relatively silent affecting shoulder and trunk rather than limb motor function, higher cortical visual function and the anterior frontal lobe.

In the vertebrobasilar circulation, basilar artery occlusion may cause paramedian pontine perforator occlusion or more extensive often catastrophic midbrain and pontine infarction, producing coma if the midbrain is involved and locked-in syndrome if confined to the pons.

In about 10% of people the posterior cerebral artery originates from the internal carotid via the posterior communicating artery so that occipital lobe infarction may result from carotid territory disease. For this reason isolated PCA territory occipital infarcts should have cervical carotid and Circle of Willis arterial imaging. Conversely a large posterior communicating artery may preserve the occipital and inferior temporal lobes after basilar occlusion.

14.6.6 Venous Infarction

Venous infarction after venous sinus thrombosis is uncommon and occurs in prothrombotic states from oestrogen-containing oral contraceptives and in inflammatory bowel disease. It usually presents as a parasagittal haemorrhagic infarction, often with headache, occasionally thunderclap, and seizures.

14.7 Acute Assessment

14.7.1 What Is Wrong with This Patient: When to Suspect Stroke

The essence of the diagnosis of ischaemic stroke is deciding whether or not there has been sudden or very rapid onset of a focal brain defect, while excluding mimics, particularly persistent deficits after focal seizures, or migraines particularly with aphasia or hemiparesis, and from functional illness—see mimics section. Primary confusion or depressed consciousness without focal signs is unlikely to be due to stroke and more likely due to encephalopathy, sepsis, meningitis, encephalitis or sometimes persistent seizure.

14.7.2 The Clinical Approach to Suspected Acute Stroke Where Thrombolysis or Clot Retrieval Is Possible

The evaluation of suspected acute stroke is urgent, since if thrombolysis is possible within 4.5 h of stroke, a worthwhile improvement in outcome is likely. If there is ICA or proximal MCA occlusion, recanalization with IV thrombolysis is unlikely, but provided that intraarterial clot extraction commences before 6 h from the onset of symptoms, the chance of recovery disability-free will be improved. The earlier these measures are undertaken, the better the outcome so that no time can be wasted.

14.7.3 History

Summary Points

When and how did this illness start?

This account should come directly from the patient if at all possible, from the relatives if they can't communicate effectively and/or when the patient has finished.

What are all the symptoms?

How long has each one been present?

This is implicit in an account of the presenting illness, but it pays to check if everything noticed has been reported and first awareness clarified.

What has happened since (progression of any defects, any new problems)?

Any suggestion of recent systemic complaints that might suggest less common causes: cancer, endocarditis, vasculitis, etc.

History, medications particularly anticoagulants or antiplatelets, matters relevant to safety of thrombolysis and previous functional status must all be covered quickly.

The diagnostic process begins with the recognition usually from the patient's, sometimes a witness's, account of their illness, of the abrupt or rapid onset of

symptoms most likely to arise from a focal CNS defect (and not from a cranial nerve, such as Bell's palsy, or from a peripheral nerve or spinal root causing wrist and finger or foot drop). The sudden or rapid evolution suggests ischaemic stroke, particularly combined with the focal impairment of CNS function. The clinical defects in most ischaemic strokes develop over seconds to a few minutes, but defects may fluctuate and in rare cases continue to worsen over several days.

14.7.4 Examination Approach: Use the NIH Stroke Score

Use the NIH stroke score as the skeleton of your examination approach supplemented with attention to pupils, eye movements and, if practical, ability to walk. The NIHSS is a very useful guide to important aspects of the examination, especially for language, and can be performed very quickly. Most of the necessary NIHSS observations are covered in the quick screening examination also designed to identify and localize any relevant brain lesion outlined below (http://www.ninds.nih.gov/doctors/NIH_Stroke_ Scale.pdf). There is more than one app available—I use 10-Second NIHSS for iPhone.

14.7.4.1 How to Examine the Suspected Stroke Patient

Use the NIH stroke scale as a guide, by checking for Horner's and checking pupils, expanded where brainstem or cerebellar stroke is suspected looking for nystagmus, squint and pursuit horizontal eye movements.

The point is to establish presence or absence of stupor, coma, delirium or major language defect at the outset usually evident either on entering the room or after attempting to obtain a brief account of the symptoms and their onset. Very quickly, in 2 or 3 minutes, determine whether there is obvious evidence of a significant focal brain lesion by examining first the hemisphere, then the brain stem functions. Examination should screen rapidly for occipital (hemianopia), parietal (sensation and neglect), frontal (motor, language) and prefrontal (eye deviation and responsiveness) function. Then if still relevant look for brainstem dysfunction (pupil inequality, ocular misalignment, gaze palsy, nystagmus, new unilateral deafness, Horner's syndrome, isolated crossed hemi face and body loss of pain and temperature sensation), and lastly check cerebellar function including, if practical, walking. At this point, you should be able to decide if there is a focal brain lesion compatible with stroke and whether the lesion is a:

TACI—a combination of unilateral field defect or inattention, sensory loss or inattention, hemiparesis and head and eye deviation.

PACI—one or a less disabling combination of focal cortical dysfunctions.

LACI or POCI—see later discussion of typical syndromes in an emergency setting after resuscitation if any.

Establish responsiveness to question, to voice or if necessary to physical stimuli or to pain,

Language function—if relevant—test comprehension: "Show me your right hand|left hand|both hands". This may also identify perseveration, a sign of anterior frontal lobe involvement.

Exclude severe metabolic encephalopathy, if relevant, by testing orientation and the ability to register and recall, after interruption by a working memory task, three objects. Useful working memory tasks include naming the months of the year, or spelling WORLD, backwards.

Look for head and eye deviation (if present, the person will almost always be poorly responsive) and lower facial weakness.

Screen quickly for a field defect or inattention by hand and then finger counting in right and left hemifields.

Test upper and lower quadrants.

Test on the right, then on the left and then on both fields together for inattention.

If the patient can't respond but eyes are open, make small finger movements in each quadrant and observe the response.

Horner's syndrome.

Nystagmus, gaze paralysis, ocular misalignment, pupil size and reactions.

Hemiparesis using the NIHSS method of sustained ability to elevate each limb, supplemented by a test of finger and foot dexterity (moving each finger to the thumb in turn, rapid foot tapping).

Ataxia by finger nose, heel shin tests and if reasonable standing and walking a few steps.

Sensory loss to single light finger touches on the face, dorsum of the hands and feet, testing right, left, and both at once in random order (for sensory neglect). Pain should be tested by pin prick on then same areas: cheek and the dorsum of the hands and of the feet.

14.7.5 Stroke Mimics

Stroke mimics need to be excluded. Migraine, seizure and functional syndromes are the most common, and the inability to speak is one of the more common stroke mimic presentations (and challenging to distinguish from global aphasia).

Recognition of post-ictal states after unobvious seizures can be challenging. Past known epilepsy is helpful, as is initial obtundation clearing during the acute assessment. Prolonged post-ictal aphasia, hemianopia and hemiplegia all may occur without there having been a preceding recognized partial or generalized seizure.

Sudden global aphasia without weakness can be due to TIA, stroke, seizure or migraine and is quite commonly functional. If available, urgent MRI DWI scan is ideal.

Functional weakness is common, especially in the setting of acute severe headache. Particularly useful guides to definite functional weakness in the setting of emergency assessment are the dropped shoulder sign on testing shoulder abduction and a give-way pattern of jerky weakness. Normal motor power can be demonstrated in suspected functional leg weakness by having the patient stand, using the examiner for balance, and while holding one leg off the ground 1. Rise to tip toe, lifting their body weight off the ground showing ankle plantar flexion is normal; and 2. perform a partial knee bend followed by straightening the leg - showing hip and knee extension are normal. It can be helpful to the patient's recovery to point out that power can be normal with some activities but not others - see www.neurosymptoms.org for an in depth discussion of functional symptoms by Dr. Jon Stone intended to help patients get better.

Global cognitive impairment from metabolic encephalopathy (ME) is sometimes mistaken for stroke—attention to onset and progression of symptoms and awareness of this entity should avoid this problem. Depressed consciousness alone is a highly unusual presentation for stroke, since upper brainstem infarction affecting the reticular activating system is required and is invariably accompanied by either or both of pupil inequality and ocular misalignment. In ME/delirium, there is usually impaired arousal either sleepiness or, particularly in postoperative delirium, hypervigilance with agitation. Language if affected at all shows mild nominal aphasia not sufficiently severe to impair communication. The striking and definitive abnormalities are with attention and concentration tested rapidly and effectively by orientation in place and time and the ability to register three objects and then recall them after a working memory task such as subtraction of serial sevens or days of the week backwards. In the usual case, even registration of the three objects is unsuccessful. There may be lack of cooperation with formal neurological examination in the presence of observable bilateral limb use. Other typical features (when present) include multifocal myoclonic jerks and asterixis.

Occasionally, the apparently acute onset of Bell's palsy, peroneal nerve palsy and particularly radial nerve palsy, the latter usually acquired from compression while intoxicated or sedated, is mistaken for stroke.

Bell's palsy symptoms often begin in mild form on the preceding day and are much worse on the day of presentation. The constellation of face LMN weakness, "numbness", unilateral loss of taste, pain behind the ear and hyperacusis in the same ear are common in Bell's palsy and do not occur in stroke. There is no other cranial nerve (horizontal diplopia from the sixth nerve as it curves around the seventh nerve nucleus in the brainstem) or long tract signs such as arm or leg weakness. Speech, language and swallowing are not affected.

Radial nerve palsy from compression against the humerus while intoxicated produces weakness of wrist, finger and thumb extensors, and the flexed wrist and finger posture causes finger abduction to be weak, unless tested with the forearm, hand and fingers on a flat surface. Peroneal nerve palsy causes characteristic weakness of ankle dorsiflexion and eversion with normal inversion (performed by tibial nerve innervated tibialis posterior) never seen in acute stroke. Knee and ankle jerks and ankle plantar flexion are normal. The lower motor neuron weakness causes a typical flaccid flopping down of the foot when walking. Symptoms of nerve compression may be first noticed on waking and are often the result of peripheral nerve compression during deeper than usual sleep from intoxication. Partial anaesthesia with alcohol, sedatives and/or analgesia for chronic pain is the common cause and often either not mentioned or flatly denied.

Vertigo may be due to stroke but is most often due to idiopathic episodic vertigo, commonly due to migraine.

14.7.6 How to Think About Stroke: Where Is the Lesion (and What Is Its Prognosis)

The Oxford stroke study categorization of stroke cases is both a guide to the examination findings most useful to determine lesion location and severity and a guide to likely outcome. Lesions were divided on clinical grounds into:

Total anterior circulation infarct—TACI

Patients with large acute lesions of the MCA territory are easily recognized. In the dominant hemisphere, aphasia is a distinctive feature. In the non-dominant hemisphere, speech is often dysarthric, and there will be sensory and visual neglect or hemianopia. If there is a large premotor lesion, the head and eyes will be deviated away from the lesion, with apathy and reduced responsiveness.

Area affected (dominant hemisphere)	Signs
Dorsal anterior frontal lobe	The head and eyes will be deviated acutely towards the side of the lesion
Lateral anterior frontal lobe	Expressive dysphasia
Superior temporal lobe	Receptive aphasia
Dorsal posterior frontal	Motor control of face (especially upper lip, often the cheek), arm and leg
Dorsal anterior parietal	Sensory loss
Posterior parietal lobe	Hemianopia Nondominant hemisphere
Dorsal anterior frontal lobe	The head and eyes will be deviated acutely towards the side of the lesion
Lateral anterior frontal lobe	None
Superior temporal lobe	None
Dorsal posterior frontal	Motor control of face (especially upper lip, often the cheek), arm and leg
Dorsal anterior parietal	Sensory loss
Posterior parietal lobe	Hemianopia, visual inattention, sensory inattention

1. Partial anterior circulation infarct—PACI

Small cortical infarcts in the posterior cerebral, MCA or anterior cerebral territory will cause one or more components of the TACI syndrome, hemianopia with or without sensory loss, sensory and/or visual neglect in the nondominant hemisphere, receptive or expressive aphasia in the dominant hemisphere and paralysis largely confined to the mid-face and upper limb in the MCA territory or the leg only in the anterior CA territory.

Determining that there is a unilateral hemisphere cortical lesion and its extent means systematically checking for these easily recognized signs of focal brain dysfunction.

2. Lacunar infarct—LACI

Lacunar syndromes tend to affect face, arm and leg with equal severity, usually with no defect of language or of sensory neglect (with occasional exceptions) or visual field defect, headache, drowsiness or vomiting. Pure motor stroke and sensorimotor stroke tend to occur in the genu or front part of the posterior limb of the internal capsule or ventral pons dysarthric clumsy hand; ataxic hemiparesis tend to

occur in the more posterior part of the internal capsule, most likely in the territory of perforators from the posterior cerebral artery or in the pons. Pure sensory stroke occurs in the thalamic classical lacunar syndromes:

Pure motor hemiparesis
Pure sensory stroke
Sensorimotor stroke
Ataxic hemiparesis
Dysarthria/clumsy hand syndrome
Vertebrobasilar territory
Posterior circulation infarcts—POCI
The top of the basilar syndrome and basilar occlusion
Pontine paramedian lesions
Lateral medullary syndrome
Cerebellar infarcts
Cerebellar hemisphere
∗ F-N-F and H-S ataxia
Cerebellar vermis (midline)
∗ Broad-based unsteady gait only
Acute vertigo

Vertigo may be the sole obvious clinical feature of stroke, particularly if the HINTS criteria are met. HINTS (horizontal VOR, multidirectional nystagmus and test of skew, a cover test to demonstrate vertical ocular misalignment when fixing on a Snellen chart letter or similar improvised fixation target) [31]. The brainstem or inferior cerebellar lesions are small, and early MRI DWI is only about 80% sensitive. A delayed scan after 48 hours is more likely to identify the lesion. Vertigo is more commonly due to peripheral vestibular lesions; most of these are episodic idiopathic acute vertigo—the classic cause, inflammatory vestibular neuritis, is fairly rare with an incidence of ~3/100,000/year. A few are typical Meniere's with unilateral deafness, roaring tinnitus and acute vertigo lasting 30–75 min with reversing horizontal nystagmus. Some are clearly migrainous in migraine sufferers with typical headaches at the time of the dizziness; many others are a similar idiopathic syndrome usually suspected to be a migraine aura with or without headache. Vertigo can last weeks in the absence of abnormal signs. Occasionally with migrainous vertigo, there may be positioning nystagmus with head down to right, to left and in the midline.

In this patient group, the examination features of particular importance are:

The pupil size and eyelid position (Horner's syndrome suggesting lateral medullary location)
Together with pinprick perception on the face, hands and feet
Nystagmus (horizontal-rotatory beating in only one direction suggests a vestibular lesion and multidirectional a central cause)
Horizontal voluntary and pursuit eye movements

The horizontal vestibulo-ocular reflex (HVOR) tested by brisk head rotation while fixing the eyes on the examiner's nose, normal in brainstem stroke and abnormal in acute unilateral peripheral vestibular lesions
Dysarthria
Palate deviation
Limb ataxia
Inability to walk
The patient with a peripheral vestibular nystagmus tends to have a narrow-based gait and to wander to one side but not fall; the patient with a large cerebellar lesion typically cannot walk unsupported.

Patients whose only obvious clinical problems are vomiting and inability to walk should be suspected of large-volume cerebellar infarction or haemorrhage—the fatal gastroenteritis described by CM Fisher. Sudden deterioration from brainstem compression by the swollen cerebellum can cause death in a matter of minutes [32].

14.7.6.1 Vertebral, Basilar and Posterior Cerebral Artery Stroke

Posterior cerebral artery infarcts and posterior cerebral arteries. The proximal PCA branches supply the paramedian midbrain, medial and posterolateral thalamus. The superficial PCA branches supply the occipital lobes, inferior and medial temporal lobes and medial parietal lobes. Visual field defects are the most common defect, but dominant PCA infarction of the splenium of the corpus callosum may cause alexia without agraphia from disconnection of the right medial occipital lobe. Medial thalamic or dominant medial temporal lobe can cause memory loss non-dominantly, and usually PCA infarction may cause inability to recognize faces or prosopagnosia (infarction is usually bilateral). See Caplan for full details of the effects of unilateral and bilateral posterior cerebral infarcts [33].

Basilar artery occlusion

Top of the basilar syndrome [33]

Infarction of the thalamus and midbrain region vertical eye movement abnormalities—usually no voluntary or reflex movement up or down, convergence retraction nystagmus, convergence of one or both eyes causing pseudo-sixth nerve palsies, sometimes vertical skew, small pupils poorly reactive to light with infarction lower in the midbrain, fixed mid-position pupils or bilateral third nerve palsies, drowsiness or stupor from reticular activating system involvement, hallucinations and usually vivid and well-formed attacks of clonic movements of the limbs often mistaken for seizures

Occlusion of pontine paramedian perforator or short circumferential branch arteries

Unilateral infarction affects:

Corticospinal tracts—contralateral limb weakness
Corticobulbar tracts—contralateral dysarthria, dysphonia and dysphagia
Medial lemniscus—contralateral

When this occurs as a TIA, the bulbar symptoms are often described in a manner implying dysphasia.

Locked-in syndrome bilateral occlusion of paramedian perforators or short circumferential branch arteries, most likely from thrombosis on local atheroma, is likely to cause extensive bilateral pontine infarction, resulting in the locked-in syndrome. The degree of awareness depends on the state of the rostral part of the pontine reticular formation.

Superior cerebellar artery

Ipsilateral limb ataxia sometimes with headache, vertigo and nystagmus
Dysarthria
Rarely with ipsilateral Horner's, contralateral loss of pain and temperature and contralateral fourth nerve palsy

Anterior inferior cerebellar artery

Vertigo, nystagmus, dysarthria, ipsilateral tinnitus, deafness, Horner's, contralateral loss of pain and temperature, facial weakness, numbness, gaze palsy and dysmetria
Isolated vertigo (rarely)
Lateral medullary syndrome
Vertebral or posterior inferior cerebellar artery occlusion

Cerebellar infarction causing isolated vertigo may cause isolated vertigo, and at times the responsible lesion in the inferior cerebellum (PICA territory) can be large. 10.4% of 240 cases with isolated cerebellar infarction had clinical features suggesting vestibular neuritis. In 96% there was isolated spontaneous prolonged vertigo with imbalance as the sole manifestation. In one case, the presentation was the same but was followed 2 days later by further neurological deficits. The most common infarct location, in 96%, is in the medial branch of the posterior inferior cerebellar artery territory and in a single case by the anterior inferior cerebellar artery territory [34].

Lesion	Symptoms and signs
Vestibular nuclei	Vertigo, oscillopsia, nystagmus, vertical diplopia Vertical skew—ipsilateral eye (on the side of the lesions) downwards
Inferior cerebellar peduncle	Truncal ataxia, ipsilateral limb ataxia
Spinothalamic tract	Loss of pain and temperature contralateral limbs
Spinal trigeminal nucleus and descending tract	Loss of pain and temperature on the ipsilateral face
Nucleus ambiguus	Weakness of the ipsilateral palate, pharynx and larynx
Descending sympathetic	Ipsilateral Horner's syndrome

An interesting sign is horizontal deviation of the eyes behind closed lids towards the lesion from loss of tonic vestibular input from the side of the lesion.

14.7.7 Case Fatality Rates and Functional Status: Data from the Oxford Community Stroke Project

	Lacunar LACI	Whole territory TACI	Cortical only PACI	Vertebrobasilar POCI	ALL
30 days					
Dead	2	39	4	7	10
Dependent	36	56	39	31	39
Independent	62	4	56	62	50
6 months					
Dead	7	56	10	14	18
Dependent	26	39	34	18	29
Independent	66	4	55	68	52
1 year					
Dead	11	60	16	19	23
Dependent	28	36	29	19	28
Independent	60	4	55	62	49

The key point is that the outcome from large MCA strokes is very poor. 4/10 will be dead inside a month and more than half within 6 months. All other strokes do fairly well, with low immediate death rate and two-thirds independent at 3 months.

14.7.8 Malignant MCA Infarcts

Life-threatening brain swelling occurs in up to 10% of patients with middle cerebral artery (MCA) infarct. Prognosis is poor, death rate nearly 80%. No medical treatment is effective. Deterioration from raised intracranial pressure causes increasing drowsiness with Cheyne–Stokes respiration within 24 h in up to a third, but more commonly begins between the second and fifth day after stroke.

If an MCA infarct has occurred larger than 50% of the MCA territory on CT scan, irrespective of thrombolysis and clot retrieval, and the patient is otherwise healthy and under age 60, the outlook for reduced disability and improved survival is significantly better after decompressive hemicraniectomy. The outcome is better still if this is done early before significant deterioration and in all cases must be done within 48 h of the stroke.

Pooled analysis of 93 patients from three trials with decompressive surgery undertaken within 48 h of stroke onset showed that substantially more patients in the decompressive-surgery group had an mRS $\leq$4 with 51% absolute risk difference, an mRS $\leq$3 with 23% absolute risk difference and survived with 50% absolute risk difference for numbers needed to treat two for survival with mRS $\leq$4, four for survival with mRS $\leq$3 and two for survival regardless of functional outcome.

The infarct volume criteria used in the three pooled RCTs were as follows: more than 145 cm^3 on diffusion-weighted MRI in DECIMAL, brain CT ischaemic changes affecting more than two-thirds of the MCA territory including the basal

ganglia in DESTINY and brain CT ischaemic changes affecting at least two-thirds of the MCA territory with space-occupying oedema in HAMLET [35].

14.7.9 How to Think About Stroke: What Caused the Stroke

14.7.9.1 Investigation of the Cause of Ischaemic Stroke

The vast majority of strokes are due to complications of atheroma, atrial fibrillation, other obvious cardiac embolic sources or small-vessel disease. Twenty per cent are due to a clinically obvious cardiac embolic source, atrial fibrillation, myocardial infarction or valvular heart disease. A further 10% considered due to an occult source such as intermittent AF, patent foramen ovale with Atrial Septal Aneurysm, or to bacterial endocarditis. About 20% are due to small-vessel disease, where age, predisposition, hypertension and diabetes are the important causes. Hyperhomocysteinemia is a rare treatable cause, 40% to atheroembolism, typically from carotid or vertebral blood vessels, occasionally in showers from the proximal aorta. A small percentage are due to occlusion by local thrombosis over atheromatous plaque in the extra- or intracranial circulation and to other less common causes including arterial wall diseases dissection, FMD, moyamoya, HIV and thrombotic tendency especially cancer.

Rational secondary prevention begins with accurate diagnosis. Has there been an infarct or infarcts? Where? Is there an identifiable cause? Should other causes be sought?

In parallel ECG, for anterior circulation infarcts, carotid duplex ultrasound and 48 h of monitoring to exclude AF should be undertaken. Echocardiography is often useful but may not be readily available. Studies for thrombotic tendency are not often useful and are often restricted.

14.7.9.2 Has There Been an Acute Infarct?

When intervention is a realistic option, the first step is to determine whether there has or has not been acute infarction. Often acute infarct will be obvious from the admission or a subsequent CT scan. If this completely explains the stroke syndrome, no further investigation is needed. MRI with DWI sequence is the only satisfactory way to identify all acute infarcts, and discovery of multiple lesions in different territories is invaluable information.

14.7.9.3 Stroke Mechanism and Radiological Investigation

Besides, determination of the underlying mechanism of stroke is difficult in up to 40% of cases [8]. MRI with DWI and either MRA or CTA as early as practical are very helpful in identifying the location, size and therefore likely cause of single infarcts or in alerting the clinician to multiple infarcts in more than one arterial territories necessarily of cardiac or aortic origin. DWI is thought to be about 80% sensitive to posterior circulation infarction and to be more likely positive after a brief delay of 48 h [36].

14.8 Acute Intervention

14.8.1 Thrombolysis

14.8.1.1 Scientific Background

The NINDS trial of alteplase in acute stroke was the first study to demonstrate worthwhile benefit with a thrombolytic agent given within 180 min of stroke onset. The global odds ratio for a favourable outcome (a composite of Barthel index, modified Rankin scale, Glasgow Outcome Scale and NIH Stroke Score at 3 months) was 1.7 (95% CI 1.2–2.6). Patients treated with tPA were at least 30% more likely to have minimal or no disability at 3 months on the assessment scales. Symptomatic intracerebral haemorrhage within 36 h was ten times higher, 6.4% of patients given tPA compared with 0.6% of those given placebo ($P < 0.001$), but overall mortality at 3 months was no different between the treatment groups 17% in the tPA group and 21% in the placebo group ($P = 0.30$).

A 2014 Stroke Thrombolysis Trialists' Collaborative Group meta-analysis of individual patient data from 6756 patients in the nine randomized trials comparing alteplase with placebo or open control for which data was available confirmed and extended these findings. They demonstrated best results with the earliest treatment and that treatment benefit continued to at least 4.5 h at which point the confidence interval included no benefit and that older patients and patient with large strokes also benefited from treatment.

There was a good outcome, either no symptoms or no significant disability, a modified Rankin score of 0 or 1, at 3–6 months for 32.9% of 787 treated with alteplase within 3 hours versus 23.1% of 762 who received control (OR 1.75, 95% CI 1.35–2.27) and for 35.3% of 1375 versus 30.1% of 1437 (OR 1.26, 95% CI 1.05–1.51) treated between 3.0 and 4.5 h. This finding of roughly 10% absolute improvement in disability-free survival in a large study (a 42% relative improvement if treated under 3 h) confirmed the results of the NINDS trial, at a cost of 2% risk of early death from haemorrhage though all-cause mortality at 3 months was slightly and not significantly higher by 1.4% in the treated group.

Alteplase increased the rate of symptomatic intracranial haemorrhage to 6.8% versus 1.3%.

The absolute risk of clinically significant haemorrhage (using the SITS-MOST definition of the ICH causing a 4 or more point NIHSS deterioration) was increased by 3.1%, 73% fatal within 7 days.

The relative increase in fatal intracranial haemorrhage was not affected by treatment delay, age or stroke severity, but the absolute excess risk from alteplase was higher for patients with more severe strokes. Mortality at 90 days with alteplase was 17.9% and 16.5% in the control group (hazard ratio 1.11, 95% CI 0·99–1·25), not significantly different.

14.8.1.2 Posttrial Clinical and Safety Experience

The EU safety monitoring programme of alteplase in widespread use recruited 6483 patients from 285 centres in 14 countries (50% with little previous experience in stroke thrombolysis) between 2002 and 2006.

The ICH rate was 468/6438 (7.3%; CI 6·7–7·9) using the NINDS definition, symptomatic ICH with a 1 or more point NIHSS deterioration. The mortality rate at 3 months in SITS-MOST was 11.3%.

The AHA/ASA scientific committee, after careful literature review, reached the same conclusions that age and stroke severity should not affect eligibility for treatment.

The issue of safety of treatment with advancing age is particularly relevant in acute stroke care. The risk of ischaemic stroke doubles for each decade after age 55 years [37], and short- and long-term outcomes are unsurprisingly worse for those over 80.

The clear message is that thrombolysis should be offered to all eligible stroke victims as quickly as possible and that delays in care are unacceptable. Systems in both the community and in hospitals should be set up to ensure the fastest possible treatment times.

14.8.1.3 Proximal Large-Vessel Occlusion: Outcome After IV Thrombolysis

Outcome after IV tPA is known to be poor for distal ICA and proximal MCA occlusion, particularly if the thrombus length is over 8 mm [38].

Outcomes of LVO with IV thrombolysis [39]

Site of occlusion	Revascularization	Mortality
Distal MCA	44.2%	17%
Proximal MCA	30%	24%
Terminal ICA	5.9%	45%
Tandem ICA/ MCA	27%	14%
Basilar	30%	75%

14.8.1.4 Intraarterial Thrombectomy for Large-Vessel Occlusion

Five recent trials have shown that thrombectomy with second-generation, mainly stentriever devices after IV thrombolysis is considerably more effective than thrombolysis alone in distal ICA and proximal MCA occlusion provided that treatment can commence within 6 h of stroke onset and should not continue beyond 8 h. Meta-analysis of the individual patient data of the 1287 patients enrolled in these five studies (634 assigned to endovascular thrombectomy, 653 to control) showed that intraarterial thrombectomy significantly reduced disability at 90 days (adjusted cOR 2.49, 95% CI 1.76–3.53). The number needed to treat to reduce disability by at least one mRS level was 2.6. Worthwhile benefits were found for the 15% aged 80 years or over, the 15% with contraindications to intravenous thrombolysis and those presenting after 5 h. ICH and 90-day mortality were similar [40]. Perfusion or collateral imaging used in three of the five trials improves patient selection, likely improved outcome, and therefore a larger estimate of the treatment effect, compared with standard CT head. Few had extensive early ischaemic features on routine CT brain imaging (only 121 patients had an ASPECT score 0–5; lower score indicates more extensive brain abnormality). Benefit was not found for distal anterior circulation vessels (middle cerebral artery segment M2 and beyond). There are unresolved

technical questions about whether general anaesthesia or sedation alters outcome and the impact of aspiration, balloon-guiding catheter, stenting of coexisting carotid stenosis and intraarterial thrombolytic drugs [40].

In units where I-A thrombectomy is available, patients with MCA syndromes who could benefit from thrombectomy should have CT angiograms at the time of their initial scan. These patients can be difficult to identify from initial defect extent and severity and may deteriorate after IV thrombolysis. Effectiveness in symptomatic basilar occlusion has not been formally assessed in controlled trial, but there is evidence from observational studies that treatment is likely effective and the time window believed to extend up to 12 h, with outcome dependent on the degree of infarction on MRI [41].

14.8.1.5 Practical and System Issues

Quick treatment requires efficient processes and a team approach.

Audits show that disappointingly few eligible stroke patients actually receive thrombolysis. The hospital needs a formally organized stroke service with a team able to respond immediately. Agreement that CT scan must be performed urgently to allow treatment decisions must be reached and adhered to.

Stroke treatment must begin as soon as possible. A lack of urgency can result from the attitude that because treatment is effective if given within 3 h, there is plenty of time to assess, investigate and treat. Time is brain—every 15-min reduction in treatment produces:

4% reduction death
4% reduction in symptomatic ICH
4% increase in ambulation
3% increase in D/C to home irrespective of initial NIHSS or age [42]

Barriers to rapid treatment include delay in presentation. Only 22–31% of patients with ischaemic stroke present within 3 h of symptom onset [43]. Vigorous and continuing efforts should be made to increase public awareness of the symptoms of stroke and the need for urgent care.

Integration with ambulance services education of paramedics helps to identify acute stroke patients in the community and to bring them urgently to hospitals with teams ready to respond immediately. Arrangements should be made with the ambulance services to notify the stroke team of impending arrival with patient-identifying data so that existing medical records can be reviewed, radiology can be notified, test ordering can commence and contact information for informants may allow useful history about onset, symptoms and signs to be obtained in advance of arrival. This approach with delivery of the patient to the CT area improved door-to-needle times to 20 min.

Small hospitals with inadequate stroke systems and without stroke teams should team up with large stroke centres, and telemedicine should be used for patient assessment where stroke specialists are not available. There is also confusion over the type of tPA to be used. Doctors are trained to use generic drug names; however, tPA exists in several forms. Tenecteplase, used for treatment of myocardial

infarction, is more potent and has been administered in error which resulted in intracerebral haemorrhage. It is important that standard orders for the stroke FAST track make explicit reference to alteplase rather than tPA.

All members of the team should be notified early and simultaneously by pager. The team should include at least two doctors, a stroke specialist and a stroke-trained RMO and two nurses, typically a stroke and an ED nurse.

In hospitals, emergency department assessment must be streamlined. A dedicated resuscitation and treatment area is needed for 90–120 min, for assessment and initial treatment, as is a medical team member to monitor blood pressure control, and for deterioration during the infusion. Obstacles to these efficiencies can range from concerns over privacy of emergency service communications to the need to warm up CT scanners switched off after hours. A reliable dedicated area with committed staff for delivery of thrombolysis after acute stroke in persons who are a hospital in-patient for other reasons can also prove difficult to negotiate.

The most urgent actions must take priority and be done in parallel by team members (interview of patient, witnesses, consent, exclusion checking, test ordering, observations, BP treatment, ECG, tPA dose calculation) according to an agreed institutional protocol which must be immediately available in hard copy. CT scan is the rate-limiting step for decision making and should not be delayed beyond emergency actions needed to stabilise the patient.

Excessively cautious interpretation of the original NINDS tPA exclusionary criteria may prevent prompt effective treatment.

Because of the haemorrhage risk from alteplase, clinical, radiological and laboratory-related exclusion criteria are listed in the current (mid-2016 AHA/ASA) acute stroke management guidelines; however the basis for some is uncertain, and a balance of risks is permissible in their application, and some are potentially modifiable or reversible before alteplase administration.

Current AHA-approved exclusion criteria [44] Copyright AHA

Significant head trauma or prior stroke in the previous 3 months

Symptoms suggesting SAH.

Arterial puncture at noncompressible site in the previous 7 days.

History of previous intracranial haemorrhage.

Intracranial neoplasm, AVM or aneurysm.

Recent intracranial or intraspinal surgery.

Elevated blood pressure (systolic >185 mmHg or diastolic >110 mmHg).

Active internal bleeding.

Acute bleeding diathesis, including but not limited to:

Platelet count <100,000/$mm^{3.}$

Heparin received within 48 h resulting in abnormally elevated aPTT above the upper limit of normal.

Current use of anticoagulant with INR >1.7 or PT >15 s.

Current use of direct thrombin inhibitors or direct factor Xa inhibitors with elevated sensitive laboratory tests (e.g. aPTT, INR, platelet count, ECT, TT or appropriate factor Xa activity assays).

Blood glucose concentration <50 mg/dL (2.7 mmol/L).

CT demonstrates multilobar infarction (hypodensity >1/3 cerebral hemisphere).

Relative exclusion criteria: Recent experience suggests that under some circumstances, with careful consideration and weighting of risk to benefit, patients may receive fibrinolytic therapy despite one relative contraindication. Consider risk to benefit of intravenous rtPA administration carefully if any of these relative contraindications is present:

Only minor or rapidly improving stroke symptoms (clearing spontaneously)
Pregnancy
Seizure at onset with post-ictal residual neurological impairments
Major surgery or serious trauma within previous 14 days
Recent gastrointestinal or urinary tract haemorrhage (within previous 21 days)
Recent acute myocardial infarction (within previous 3 months).

Notes for the exclusion criteria:

A physician with expertise in acute stroke care may modify this list.

In patients without recent use of OACs or heparin, treatment with intravenous rtPA can be initiated before availability of coagulation test results but should be discontinued if INR is >1.7 or PT is abnormally elevated by local laboratory standards.

In patients without a history of thrombocytopenia, treatment with intravenous rtPA can be initiated before availability of platelet count but should be discontinued if platelet count is

<100,000/mm^3.

Frequency of contraindications in 1838 patients presenting within 3 h of onset of acute stroke [45]

Contraindication	%
Minor symptoms (NIHSS score <5)	11.5
SBP >185 mmHg or DBP >110 mmHg	3.2
Stroke/head trauma in the previous 3 months	2.6
INR >1.7	2.1
aPTT >40 s	1.1
Seizure in acute setting	0.7
Major surgery in preceding 14 days	0.6
Previous intracranial haemorrhage	0.5
Aneurysm	0.4
Platelet count <100,000	0.3
MI in previous 3 months	0.1
Gastrointestinal/urinary tract haemorrhage in the previous 21 days	0.1
Serum glucose <50 mg/dL (<2.77 mmol/L)	0.1
Brain tumour	0.1

14.8.1.6 Rationale for the Exclusions and Circumstances Under Which They May Be Relaxed

A more detailed discussion of the basis for the exclusions and discussion of when and how they may be modified can be found in the 2015 AHA/ASA statement Scientific Rationale for the Inclusion and Exclusion Criteria for Intravenous Alteplase in Acute Ischaemic Stroke [43].

14.8.1.7 Minor Symptoms or Rapid Partial Recovery

Previous AHA criteria excluded patients with mild symptoms or NIHSS <5. Patients in the NINDS trial had no minimum NIHSS score but had to have measurable impairment of language, motor function, cognition and/or gaze, vision or neglect. Poor outcomes after milder strokes are quite common and may result from neurological deterioration, from disability from cognitive deficits not revealed during the NIHSS examination or from recurrent stroke. Patients with higher initial stroke severity and visible arterial occlusion on brain imaging who may improve temporarily are at higher risk for early neurological deterioration [46, 47]. This group should be treated rather than observed.

14.8.1.8 Raised Blood Pressure on Presentation

Recognition of the need to control blood pressure before, during and after thrombolysis came from the Australian Streptokinase study. Elevated blood pressure was not an exclusion in the ASK, and there was a direct relationship of the level of blood pressure with the risk of severe intracranial haemorrhage. The SITS and GWTG phase 4 registries have also demonstrated the relationship between high BP at presentation and increased risk of ICH. Provided the blood pressure can be stabilised below 185 systolic and 110 diastolic, it is considered safe to proceed with tPA. Blood pressure should be carefully controlled for the next 24 h and tends to fall in ensuing days irrespective of treatment.

14.8.1.9 Serious Head Trauma in the Last 3 Months

Recent serious head trauma is considered an absolute contraindication.

14.8.1.10 Stroke in the Previous 3 Months

The safety of administration of tPA after previous stroke is unknown. From the perspective of administration of warfarin after large cardioembolic stroke, the risk of haemorrhagic transformation is considered to be sufficiently low to permit safe anticoagulation after about 2 weeks. Consideration of the balance of risks posed by the size of the previous infarct and elapsed time since that stroke occurred if greater than 2–3 weeks may allow repeat administration of tPA when potential benefit is high.

14.8.1.11 Fear of Unsuspected Coagulopathy

Waiting for the platelet count and INR result often delays commencement of tPA. 6.4% of a series of 470 patients treated with tPA had coagulopathy, but it was unsuspected in only 0.4%. It is also uncertain that the coagulopathy increased the risk of bleeding significantly [48]. Abnormal platelet counts or abnormal INR values are also rare. Only 0.34% of 1752 stroke patients had platelet counts <100,000 that were not suspected on the basis of the initial history [49]. It is reasonable to begin tPA while waiting for the INR and stop the infusion if the result is unexpectedly abnormal, as recommended in the AHA exclusion criteria.

14.8.1.12 Other Situations In Which Bleeding Risk May Be Increased

tPA is safe in patients with renal failure on dialysis although stroke outcome is often poor. tPA is safe during menstruation although transfusion has been reported and required in two women with menorrhagia. tPA has been safely administered during pregnancy, but both uterine bleeding and maternal sICH have been reported; gynaecological advice and preparation for possible uterine bleeding are recommended. Bleeding from diabetic and other ocular haemorrhagic retinopathies is considered sufficiently rare that if tPA treatment is of sufficient benefit to justify the minimal risk of visual loss, it should be considered. Infective endocarditis causes septic emboli, leading to local arteritis at the site of impaction which may weaken the arterial wall. Infarcts often undergo haemorrhagic transformation. Treatment with intravenous alteplase is not therefore recommended, though not listed as an exclusion. Liver-disease intravenous alteplase may be reasonable in patients with normal thrombin time, aPTT and PT; direct factor Xa inhibitors may prolong the PT and aPTT, but these responses are not reliable enough to estimate the effects of these agents.

14.8.1.13 Seizure at the Time of Presentation with Acute Stroke

It can be difficult to distinguish Todd's paresis from ischaemic infarct complicated by seizure. The limited literature available suggests that slightly more than half such cases turn out to be infarcts. Because the rate of haemorrhage in stroke mimics is low, estimated ~0.6% or less [50], if there is sustained doubt about the cause of hemiparesis and the benefit of treatment, high thrombolysis may be justified.

14.8.1.14 Intracranial Aneurysm

Unruptured intracranial aneurysms occur in 2–3% of the general population, and there is no evidence from large registries of any increased risk from thrombolysis. Caution is advised with giant aneurysms.

14.8.1.15 Cerebral Microbleeds

A meta-analysis of 790 patients in five studies found that the overall prevalence of CMBs was 17.1%. 7.4% of patients with CMBs suffered a symptomatic ICH after thrombolysis, compared to 4.4% without CMBs. The pooled relative risk of ICH was 1.90 (95% CI 0.92–3.93), a non-significant increase in risk not warranting withholding tPA [49].

14.8.1.16 Either Very Low or Very High Blood Glucose

Both hypoglycaemia and hyperglycaemia can worsen brain ischaemia. Hyperglycaemia with acute hypertension may also be part of an autonomic reaction to severe stroke. Low blood glucose <2.77 mmol/L is rarely associated with hypoglycaemic hemiparesis. Hyperglycaemia is associated with worse outcome [51], reduces the chance of recanalization [52], is associated with accelerated infarct growth during arterial occlusion [53], and increases the risk of ICH. It is unknown if correction lowers the risk, but it is sensible to lower blood glucose to 10–11 mmol/L avoiding hypoglycaemia.

14.8.1.17 Acute Myocardial Infarction

The major concerns about giving intravenous alteplase to patients with recently completed MIs are that they may be harbouring ventricular thrombi that can be caused to embolize by lytics, post-MI pericarditis that may be transformed to pericardial haemorrhage by lytics and cardiac rupture caused by lysis of fibrin clot within necrotic myocardial wall. tPA is thought to be safe in non-STEMI and when the right heart and inferior ventricle is involved. The risk with anterior wall infarction is uncertain.

14.8.2 Complications of Thrombolysis

14.8.2.1 Risk of tPA in Stroke Mimics

Stroke mimics were identified in 3% of patients in two series of 781 patients treated with fibrinolytics [54, 55]. The ICH rate with IV thrombolysis in MI where the dose of tPA is higher and combined with heparin was 0.65% in the GUSTO study [50]. In a multicentre observational cohort study containing 5581 patients, 100 stroke mimics were thrombolysed with a sICH rate of 1% [56]. The most important ones are seizure, prolonged and atypical migraine, hysteria or functional weakness and isolated global aphasia or inability to understand or speak [55]. Recrudescence of previous neurological defects was common in one series. In this situation, urgent CTA and MRI DWI sequence is the most definitive way to exclude large-vessel occlusion and acute infarction; however when there is serious risk that stroke may have occurred, it is reassuring to know that the risk of ICH after IV thrombolysis for stroke mimic is probably less than 1%. There is a low risk of ICH if thrombolysis is administered in a non-vascular stroke syndrome.

14.8.2.2 Angioedema

Orolingual angioedema is reported in 1.3–5% of stroke patients treated with IV rtPA [57]. It is usually transient, mild and contralateral to the ischaemic lesion typically in the insular and frontal cortex on either side. Risk of angioedema is associated with angiotensin-converting enzyme inhibitors (relative risk [RR] 13.6; 95% CI 3.0–62.7) [58]. Rarely its severity or rapid progression continuing for over 30 min may necessitate emergency intubation or cricothyrotomy [59]. In 228 patients with ACE-inhibitor-induced angioedema, none of 145 patients with oedema involving only the anterior tongue and lips required intubation. 34% of patients with laryngeal or hypopharyngeal involvement and 18% of patients with involvement of the palate, floor of the mouth or oropharynx required intubation. Mean duration until resolution of oedema was 29 h [60].

14.8.2.3 Recommended Management

Close monitoring of the patient should continue during administration especially towards the end of the rtPA infusion, when orolingual angioedema is more likely. If there are any signs of unilateral or bilateral tongue or lip swelling, immediately discontinue the remaining rtPA infusion. Administer diphenhydramine (Benadryl)

50 mg IV, followed by either ranitidine 50 mg or famotidine 20 mg IV. If reassessment of the patient reveals that the tongue is continuing to enlarge even after the administration of diphenhydramine and ranitidine or famotidine IV, then give methylprednisolone 80–100 mg IV. If the orolingual angioedema has not halted administer of epinephrine 0.1% 0.3 mL subcutaneously or 0.5 mL by nebulizer, while arranging urgent ENT or anaesthetist assessment for possible oral intubation followed if unsuccessful by emergency cricotomy/tracheostomy or fiberoptic nasotracheal intubation [61].

14.8.2.4 ICH After tPA

Severe ICH occurs in about 3% of cases and should be suspected when there is new headache, nausea, vomiting, reduced responsiveness or very elevated blood pressure during or in the 24–36 h after the infusion.

tPA is short acting with rapid clearance; however prolonged PT, APTT and reduced fibrinogen levels may last 24 h or more post-infusion suggesting lytic reversal may be useful for sICH beginning up to 24 and possibly up to 36 h after tPA administration [62]. A fibrinogen level <150 mg/dL was the only significant factor associated with haematoma expansion in a retrospective study of 128 patients with symptomatic intracranial haemorrhage after alteplase for ischaemic stroke [63]. Cryoprecipitate can be used to replace depleted fibrinogen. It is typically given as a four- to six-unit pool, with each 10–15 mL unit containing 150–250 mg fibrinogen.

The tPA infusion should be stopped if iCH is suspected and an urgent CT scan obtained. If confirmed an initial dose of 6–8u of cryoprecipitate can be given. If contraindicated or not available, an antifibrinolytic agent (tranexamic acid 10–15 mg/kg IV over 20 min or e-aminocaproic acid 4–5 g IV over an hour) can be used; however there is little evidence to support any of these actions. If the fibrinogen level remains low, less than 150 mg/dL, the Neurocritical Care Society suggests the administration of additional cryoprecipitate [64].

Platelet transfusion is not known to be useful. It is sensible to discuss management with a haematologist and the on-call neurosurgeon, though surgery is clearly indicated only for life-threatening cerebellar haemorrhage. It is sometimes considered for patients with lobar haemorrhage within 1 cm of the surface and measuring >30 mL [65].

14.8.3 Acute Phase Stroke Care

Care in an acute stroke unit has been shown to improve outcome. The main advantages are probably:

Consistent, organized, guideline-based care by trained committed staff.
Minimized preventable complications.
Education of the patient and relatives.

Both the care process and staff education are subjected to continuous quality improvement.
Accurate diagnosis and reliable institution of secondary prevention tailored to the most likely stroke mechanism.
Organized rehabilitation as soon as the patient can benefit.
Where feasible planned early discharge with necessary community-based treatment and support.

14.8.3.1 Monitoring for Deterioration

Deterioration was seen in about a third of stroke patients after admission to the hospital. Early deterioration may be from progression of the primary vascular occlusive process, in large-vessel disease from distal movement of an embolism lodged at a bifurcation, fragmentation of an embolism producing multiple distal infarcts, progression of thrombotic occlusion, recurrent emboli from a proximal source or haemorrhagic transformation of the infarct. When there is near occlusion of a major vessel, the problem may be haemodynamic, and symptoms may be relieved or improved by nursing the patient flat. In severe stroke, the problem may be raised to intracranial pressure from swelling of the infarcted tissue. Onset can be within the first 24 h but is often between 48–72 h. Effective interventions include nursing head up, justifiable hyperventilation and surgical decompression for either malignant MCA or cerebellar infarction.

Progressive brain swelling produces a rostro-caudal pattern of deterioration, with decline in responsiveness together with Cheyne–Stokes pattern of periodic breathing. If deterioration continues, there will be transtentorial herniation with third nerve palsy on the side of the expanding lesion and central neurogenic hyperventilation from midbrain compression.

14.8.3.2 Blood Pressure Reduction AHA Guideline Summary

Before and During tPA Infusion

Patients eligible for IV rtPA should have their blood pressure carefully lowered and stabilised to systolic <185 mmHg and diastolic <110 mmHg before tPA is started and maintained below 180/105 mmHg for at least the first 24 h after intravenous rtPA (AHA class I; level of evidence B).

Blood Pressure Lowering in Acute Stroke Not Requiring tPA

The benefit of treating arterial hypertension in the setting of acute ischaemic stroke is not well established, and many patients' blood pressures decline spontaneously during the first 24–48 h after onset of stroke. Malignant hypertension or other conditions needing aggressive treatment of blood pressure should be treated as required. It is reasonable to lower very high blood pressure (systolic >220 mmHg or diastolic >120 mmHg) by 15% during the first 24 h after stroke. It is reasonable to start or restart antihypertensive medications after the first 24 h for patients who have pre-existing hypertension and are neurologically stable.

14.8.3.3 Swallowing and Feeding

Dysphagia is a clinical problem in up to half of patients admitted to the hospital with stroke and might be responsible for subsequent poor nutrition, chest infections and increased early mortality [66].

Swallowing was assessed clinically within a median of 3 days and by videofluoroscopy (VF) 10 days prospectively in 128 hospital-referred patients with acute first stroke, and patients were followed up for 6 months. There was a clinical swallowing abnormality in 51% patients and on VF in 64%. Twenty per cent suffered a chest infection over 6 months. By 6 months, 87% of the 112 survivors had returned to their normal diet, with persistent clinically evident swallowing problem in 50%; videofluoroscopy remained abnormal in (/(+34 17) 67.0) 76%, showing penetration of the false cords in 34 patients and aspiration in a further 17. The single independent baseline predictor on VF of chest infection was a delayed or absent swallowing reflex and of failure to return to normal diet delayed oral transit [66].

Assessment of swallowing before the patient begins eating, drinking or receiving oral medications is recommended (AHA/ASA class I; level of evidence B) and should be standard practice.

Although nutrition is important for resistance to pneumonia and avoidance of pressure ulcers, the large international FOOD trial of extra protein and calorie supplements over normal hospital diet in 4023 of a planned 6000 patients failed to find evidence of either benefit or harm [67].

The role of early parenteral feeding in patients with dysphagia within the first 7 days is uncertain. There was a 5.8% survival advantage balanced by an increase in poor outcome of 4.7% for patients given early enteral feeding (NG or PEG) compared with IV fluids alone for the first 7 days with late enteral feeding if required (tube feeding was avoided in half, a good reason to avoid early PEG placement). The FOOD trial investigators concluded that to reduce case fatality, dysphagic patients should be offered enteral feeding by nasogastric tube within the first few days of admission. Early PEG feeding (within 7 days) was slightly more hazardous than nasogastric feeding [68]. Longer-term PEG feeding was more effective with less GI haemorrhages [69]. In neither trial were there significant differences between groups in the frequency of recurrent strokes, neurological worsening, pneumonia, urinary infection or venous thromboembolism. However, the rate of gastrointestinal haemorrhage was higher with early rather than avoid tube feeding (22/429 vs. 11/430, $P = 0.04$) and with nasogastric rather than PEG tubes (18/162 vs. 5/159, $P = 0{\cdot}005$). Nasogastric enteral feeding is preferred to PEG within the first 2 or 3 weeks unless the patient cannot tolerate a nasogastric tube [68].

A Cochrane systematic review of effectiveness of interventions for the treatment of dysphagia (swallowing therapy) and nutritional and fluid supplementation in patients with acute and subacute (within 6 months from onset) stroke

found that behavioural interventions reduced dysphagia and that, compared with NGT feeding, PEG reduced treatment failures and gastrointestinal bleeding and had higher feed delivery and albumin concentration. Nutritional supplementation was associated with reduced pressure sores and increased energy and protein intake [69].

The AHA/ASA recommends that patients who cannot take solid food and liquids orally should receive nasogastric, nasoduodenal or percutaneous endoscopic gastrostomy tube feedings to maintain hydration and nutrition while undergoing efforts to restore swallowing (class I; level of evidence B).

14.8.3.4 Prevention of Pulmonary Embolism

Immobility after acute stroke predisposes to deep vein thrombosis (DVT) and to pulmonary embolism (PE). Low-dose anticoagulation can reduce the risk, but the IST demonstrated any benefit of heparin or heparin plus aspirin is outweighed by bleeding complications. Patients at higher risk for DVT and PE are also at higher risk of bleeding [70, 71]. Graduated compression stockings work for surgical patients but were shown to be not effective in acute stroke by the first two Clots in Legs Or sTockings after Stroke (CLOTS) trials. The CLOTS 3 trial showed that intermittent pneumatic compression, IPC, via thigh-length sleeves on both legs for 30 days, in immobile patients with acute stroke, reduced proximal deep vein thrombosis within 30 days of randomization by a third, and the chance of dying within 6 months of randomization was significantly lower in the IPC group [72].

Where available, IPC should be used for 30 days in immobile patients after acute stroke. The balance of risks and benefits of subcutaneous LMW heparin in combination with low-dose aspirin is unknown after this point, but the main hazard of haemorrhagic transformation of infarction is past.

14.8.4 Estimation of Infarct Size on CT Scan (The ASPECT Score)

The Alberta Stroke Program Early CT score (ASPECTS) is a 10-point quantitative topographic CT scan score. ASPECTS was developed to offer the reliability and utility of a standard CT examination with a reproducible grading system to assess early ischaemic changes on pretreatment CT studies in patients with acute ischaemic stroke of the anterior circulation. The ASPECTS system has become the standard system for assessing the presence and size of any infarct on non-contrast CT scan.

14.8.4.1 How to Compute the ASPECT Score

The following information was taken from the ASPECTS training website http://www.aspectsinstroke.com which contains explanations, examples and training materials.

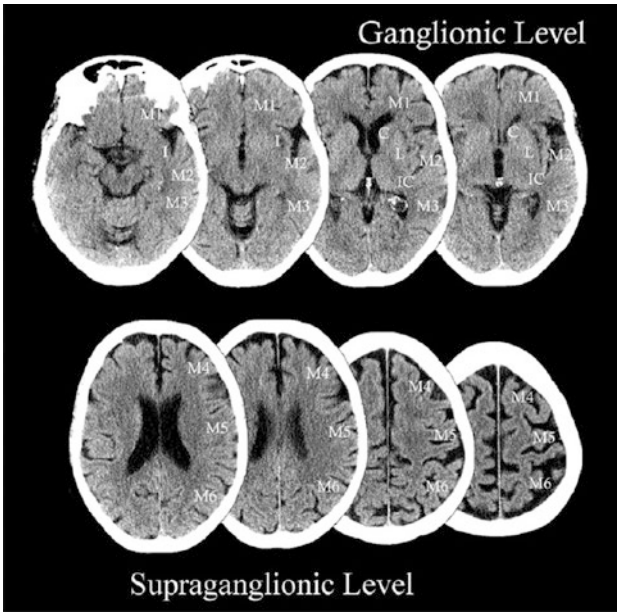

Fig. 14.1 Aspects score calculation from CT slices (*Source*: www.aspectsinstroke.com)

The ASPECTS is determined from the evaluation of two standardized regions of the MCA territory: the basal ganglia level, where the thalamus, basal ganglia and caudate are visible, and the supraganglionic level, which includes the corona radiata and centrum semiovale.

All cuts with basal ganglionic or supraganglionic structures visible are required to determine if an area is involved. The abnormality should be visible on at least two consecutive cuts to ensure that it is truly abnormal rather than a volume-averaging effect.

To compute the ASPECTS, 1 point is subtracted from 10 for any evidence of early ischaemic change for each of the defined regions.

A normal CT scan receives ASPECTS of 10 points.

A score of 0 indicates diffuse involvement throughout the MCA territory

14.8.4.2 Use of the ASPECT Score in Acute Ischaemic Stroke

The ASPECT score is reliable and reproducible with low inter- and intra-observer variability.

Within the first 3 h of MCA stroke onset, baseline ASPECTS values correlate inversely with the severity of NIHSS and with functional outcome.

Scores of 7 or less, indicating more extensive cerebral hypoattenuation in the MCA territory, are correlated with both poor functional outcome and symptomatic intracerebral haemorrhage.

ASPECTS applied to non-contrast CT scans from various clinical trials suggest that higher ASPECTS value (ASPECT 8–10) were associated with a greater extent of benefit from IV thrombolysis.

14.9 Secondary Prevention

14.9.1 Secondary Stroke Prevention After Significant Ischaemic Stroke

Hypertension, smoking, hyperlipidaemia, obesity and inactivity increase the risk of further stroke and heart disease and should be treated. Exercise programmes reduce these risks and improve mood. Atrial fibrillation should be identified and the risk of stroke minimized with anticoagulation. Statins and antiplatelet treatment should be employed in most other cases of ischaemic stroke unless a specific mechanism is known.

Case Study: Outcome and Discussion

CT scan showed only mild cerebral atrophy. Blood pressure, which had been 145/90 on arrival, had risen to 188/94, and he required two injections of labetolol to bring it down to 180/90. Thrombolysis was begun at 12:10. He needed intermittent GTN during the infusion. By 14:00 he was more alert; he had left facial weakness, but the left arm and leg had recovered. He passed a swallow test and was able to take his Madopar. There was no infarct visible on CT head scan at 24 h. Serum creatinine was 84–89 and eGFR 64–70. At day 5 he was started on dabigatran 110 mg/day. He was transferred to rehabilitation and discharged after 17 days in the hospital to his own home.

He had had tremor-predominant PD since 2005 affecting the left more than the right hand. His Parkinson disease was treated with dispersible Madopar 187.5 mg at 07:00, 11:00 and 125 mg at 16:00. He was not aware of the wearing-off of effect between doses and had no symptoms of postural hypotension. He had had gradual decline in mobility and difficulty rolling over the bed. He falls asleep easily and gets up 3–4 times to pass urine which he does on a bedside commode. In June 2014, he was still driving. He told the neurology registrar he feels a real pull between wanting to remain independent and feeling stressed by people wanting to help him.

The MDT report on his rehabilitation stay after stroke noted: He had been previously receiving three times a week supports from a home care agency for showering. Following this hospital admission, Mr. O'Brien has agreed to an increase in supports that includes one shower a week, sponge bath on the other days and assistance with dressing and undressing. The nursing staff reported him able to make needs known to nursing staff, communicates well, enjoys reading and listening to the radio and that there was "no concern" about his cognition. However I received an unexpected rambling phone call from him which had no clear purpose a few weeks after his discharge. The call related vaguely to a book I had recommended to him on a ward round. He usually sleeps well overnight waking to use a urinal independently. The physiotherapists found that he could walk independently on the ward using a walking frame, limited to about 40 m by breathlessness. He was able to go up and down four steps holding two rails with supervision, using a step to pattern; however he has been unable to complete a

single step holding on to one rail only, and therefore could not manage the steps up to his house and therefore required ambulance transfer to home. They arranged for the community physiotherapy team to continue to work on mobilizing in the home, including stair practice. He was provided with long-term use of a bed lever, chair platform, walking frame and swivel bather and an increase in support that includes one shower a week, sponge bath on the other days and assistance with dressing and undressing.

A discharge home visit by an occupational therapist and liaison nurse to review his ability to manage mobility and transfers in own environment took place 14 days after discharge. His bed was found to be too low for the carers, one of whom had already had to stop visiting because of lower back pain. He was offered an electric bed, but this was unacceptable to the couple for unrecorded reasons. Instead his bed was raised on blocks at the time of the visit, making transfers easier, but bed mobility remained an issue. Twice-daily care assistance was considered to be working well, but the couple were finding the intrusion difficult, recognizing its necessity for him to remain in his home. At the visit 2 weeks after discharge, they were given information about pressure-relieving cushions and dining-type chairs with arms they were recommended to purchase themselves.

Summary Points

1. Anticoagulation is dangerous with bleeding, a frightening illness typically followed by either death or complete recovery. Stroke in AF is typically severe, death is frequent, and survivors are severely handicapped.

The decision is a balance of risks, where the balance should be between the risk of death from haemorrhage (rather than merely of bleeding) and that of stroke. Anticoagulation should not be stopped without a very good reason with the risk of death greater than that of stroke. There is no reason to stop treatment for fear of bleeding after falls. A person with an annual stroke risk of 5% (CHADS2 score 4–5) would need to fall 295 times for fall risk to outweigh the reduction in stroke risk from warfarin [6].

Age is no barrier to intervention for acute stroke. Stroke risk is higher, treatment risk is higher and stroke is more severe with age, and treatment has been shown in controlled trials and in large registries to be worthwhile in all adults irrespective of age.

There is no, or almost no, age, disability or medical condition in which quality of life or ease of care for others is improved by being very disabled by a large stroke, and unless care is futile, thrombolysis should be offered to eligible patients.

Early care can undoubtedly produce very good outcome—this stroke looked to be very severe on admission.

The door-to-needle time was longer than ideal at about 70 min. An inexperienced and cautious RMO somewhat delayed the assessment and treatment process, fortunately with no obvious consequence. The stroke team should be well trained and contain a senior staff member motivated to drive the process as quickly as possible.

Transfer of care from in-patient to community or home rehabilitation is often lethargic. Assessment and early care in the home need to be seamlessly integrated.

Desire for independence that drives recovery can at times cause conflict with carers.

Advanced Parkinson's mild cognitive impairment is inevitable between 10 and 20 years of illness. Daytime sleepiness is a common feature.

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Special Problems in Management of Atrial Fibrillation in the Elderly

15

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Key Points

- Atrial fibrillation is the commonest arrhythmia encountered in clinical practice, the prevalence of which increases with aging.
- AF is the leading cause of cardiovascular morbidity and mortality among geriatric population and is the most common etiology for cardiogenic thromboembolism.
- Management strategies in AF focus on prevention of thromboembolism and management of symptoms related to tachycardia.
- Oral anticoagulation with warfarin and more recently non-vitamin K-dependent compounds is highly effective in preventing thromboembolism related to AF.
- Rate control and rhythm control are the two major approaches for managing atrial fibrillation.
- Rhythm control is preferred in symptomatic paroxysmal AF especially in young patients. Catheter ablation is evolving as a promising strategy for rhythm control in this subset over antiarrhythmic therapy which is limited by efficacy and toxicity of these drugs.
- Prevalence of atrial fibrillation increases with aging.
- Majority of AF in developed countries are from non-valvular heart disease.
- AF causes significant morbidity and mortality, the major complication being strokes.
- Older people have much to gain from oral anticoagulation, which is underutilized in this age group, even though treatment has to be individualized.
- Rate control is acceptable in more persistent and less symptomatic patients. Stricter rate control over a more lenient approach is preferred in those with symptoms and ventricular dysfunction where as both approaches yield similar long-term results in rest of the patient population.

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Case Study

Mr. John Smith is an 85-year-old gentleman, presenting with worsening shortness of breath and effort intolerance of 2 weeks duration. He also noticed increasing bilateral ankle swelling and weight gain of the same duration. While trying to get up and walk around with the use of a walker, he notices heart racing and feels dizzy and lightheaded. He is known to have hypertension for more than 20 years for which he takes medications. His other medical issues are diabetes, which is well controlled with medications, history of two heart attacks in the past, and diagnosed stroke which recovered completely in 48 h. He is also known to have prostatic enlargement and chronic kidney failure (creatinine 150 μmol/L), which has been stable. His wife noticed a gradual decline in his cognitive functions over the last year.

His medications included atenolol, aspirin, ramipril, metformin, tamsulosin, nitrates, and multivitamin supplements.

In the ER, he was mildly tachypneic, and saturations are 90% at room air. His pulse rate was 130 beats a minute, and blood pressure measured 180/100 mmHg. Jugular veins were distended, and mean JVP measured 12 cm from sternal angle. Cardiovascular system examination revealed cardiac enlargement with a murmur of mild-to-moderate aortic stenosis. There were fine rales over the lung bases suggestive of heart failure.

His ECG revealed rapid atrial fibrillation at a rate of 120 bpm, features of left ventricular hypertrophy, and possible old inferior wall MI. Blood biochemistry revealed marginally elevated troponins, normal electrolytes, creatinine of 200 mmol with a calculated GFR of 40, normal total and differential leucocyte counts, and normal liver function tests and TSH.

An echocardiogram performed demonstrated left ventricular hypertrophy, mild dilatation of the ventricles, global left ventricular function of 40%, severely dilated atria, and sclerosed aortic valve with moderate transvalvular gradient. There was mild mitral regurgitation also.

How should we manage Mr. Smith and optimize his medical treatment? What should be the long-term plan for Mr. Smith?

Clinical presentation of Mr. Smith is suggestive of rapid atrial fibrillation and features of left ventricular failure.

15.1 Epidemiology of Atrial Fibrillation

Atrial fibrillation (AF) is the commonest sustained cardiac arrhythmia encountered in clinical practice. The prevalence of AF increases with age, and approximately the prevalence is 20% among those over 85 years of age [1]. After the age of 50 years, the prevalence of AF doubles every decade, and two-thirds of all the cases of AF are above the age of 75 years [2].

The global burden of AF is on the rise as a result of aging population, increasing prevalence of other cardiovascular risk factors like hypertension, coronary artery disease, heart failure, etc. In developed countries, majority of AF cases are non-valvular because of the abovementioned factors [3].

15.2 Clinical Manifestations of Atrial Fibrillation in Elderly

The most common symptoms of AF are palpitations, heart failure symptoms, chest pain, and syncope and presyncope in elderly population. Because of the declining compliance of the ventricles with aging and associated hypertension, loss of atrial contribution to ventricular filling coupled with short and irregular diastolic intervals result in increase in ventricular filling pressures and pulmonary congestion. A major complication of AF is stroke in elderly population, and this also could be the initial manifestation. Polyuria because of increased atrial natriuretic hormone release is another symptom of atrial fibrillation [4]. Prolonged periods of tachycardia can lead to heart failure secondary to tachycardiomyopathy and systolic heart failure [5]. There is an increasing prevalence of AF with worsening heart failure symptoms. The prevalence is less than 10% in NYHA class 1 and up to 50% in NYHA class 4 patients [5]. In patients with permanent AF, symptoms may be absent in up to 40% cases [6], and stroke could be the first manifestation. Asymptomatic cases are more common in males.

15.3 Prognosis of AF in Elderly

AF contributes to significant morbidity and mortality in geriatric population. It is a major reason for poor quality of life, cognitive decline, heart failure, hospitalizations, stroke, and systemic embolism. Mortality rates are also increased by 1.5–1.9 times in AF patients across a wide range of age, both in men and women [7–11].

AF has been implicated in cognitive decline and dementia. The proposed mechanisms involved are cerebral microvascular occlusions from recurrent microembolism mostly related to subtherapeutic anticoagulation, micro-hemorrhages, (factors directly influenced by the time in therapeutic INR range), irregular heart rate resulting in cerebral hypoperfusion, and a pro-inflammatory state induced by AF. Shared genetic factors are also implicated in predisposing AF patients for dementia [12].

Heart failure bears a complex relationship with atrial fibrillation. AF is a major risk factor for development of heart failure and can establish a vicious cycle between the two conditions. The prevalence of AF increases with increasing severity of heart failure. AF can worsen the heart failure by tachycardia, impaired ventricular filling and resultant diastolic dysfunction and pulmonary congestion, and also by inducing systolic dysfunction (tachycardiomyopathy) [5, 8, 13].

One of the most devastating and common complications of AF is thromboembolism especially to the brain. AF increases the risk of stroke up to fivefold. The stroke risk increases with age and is up to 23.5% between 80 and 89 years and 35% for the ages over 90 [13, 14].

When compared with those in sinus rhythm, there is a 50–90% increase in mortality among patients in AF irrespective of their age. The annual mortality in AF is 5–8% and half of the same is due to cardiovascular causes [11, 14].

Mortality rates are higher among women, although when adjusted for age, men had a higher mortality. Annual mortality rates are almost twice even in asymptomatic patients (9.4% vs. 4.2%) [6].

Hospitalization rates also increase with age. Among patients between 65 to 69 years, hospitalization rate was 511 per 100,000 population where as it was 1367 per 100,000 population per year among those over 85 years [15].

The economic impact of AF poses a significant challenge for healthcare systems. The annual cost of AF is about 6–26 billion dollars, mainly due to hospitalizations [16].

15.4 Management Approaches

Approaches to manage AF target on the following issues:

1. Prevention of thromboembolism.
2. Improvement of symptoms.
3. Improvement of quality of life.

The treatment strategies include anticoagulation, rate, or rhythm control of atrial fibrillation. These goals can be achieved either by pharmacological or non-pharmacological approaches.

15.5 Prevention of Thromboembolism

The use of anticoagulants is indicated in patients who have high risk for thromboembolism [8, 9]. Warfarin therapy has been demonstrated to reduce the stroke risk by 64% [17]. In spite of this fact, oral anticoagulant therapy is significantly underused in elderly population. Risk of bleeding, which is seen in 1–13% per year in patients on anticoagulants partly, explains this underuse [14].

There are different scoring systems to assess the risk of stroke as well as bleeding which assist the clinician to select patients to initiate anticoagulation. Current guidelines recommend anticoagulation for patients with a CHA_2DS_2-VASc score of more than two unless contraindicated [9, 10]. Scoring systems are available for calculation of bleeding risk including HAS-BLED (hypertension, abnormal liver/renal functions, stroke, bleeding history or predisposition, labile INR, elderly (9 > 65 years), drugs/alcohol use concomitantly). This score is a better discriminator of bleeding risk compared to other scoring systems and if the score is >3, would indicate a higher risk of bleeding. Closer monitoring and risk/benefit analysis is recommended in such cases (Tables 15.1, 15.2, 15.3 15.4 and 15.5).

Table 15.1 CHADS2-VASC2 scoring system and calculated stroke risk

CHAD2-VASC2 risk criteria	Points
Congestive heart failure/ LV dysfunction	1
Hypertension	1
Age >75 years	2
Diabetes mellitus	1
Prior stroke, TIA, thromboembolism	2
Peripheral vascular disease or coronary artery disease	1
Age 65–74 years	1
Sex category (i.e. female sex)	1

Table 15.2 Adjusted stroke risk according to CHADS2-VASC2 scores

Score	Adjusted stroke rate (% per year) based on CHADS2-VASC2 score
0	0
1	1.3
2	2.2
3	3.2
4	4.0
5	6.7
6	9.8
7	9.6
8	9.7
9	15.2

Refs. [9, 10]

Table 15.3 HAS-BLED scoring system

HAS-BLED score: determination of patient's risk of bleeding							
Hypertension SBP>160 mm Hg	Abnormal renal/liver function	Stroke	Bleeding history	Labile INR	Elderly Age	Drugs/ Alcohol	Maximum score
1	1 or 2	1	1	1	1	1 or 2	9

Renal: ESRD or Cr > 200 μmol/L, *Liver*: cirrhosis or bilirubin > 2× upper normal limit (ULN), with AST/ALT>3× ULN
Labile INR: Time in therapeutic range <60% or frequent unstable INRs
Drugs: Antiplatelet/NSAIDs
Score ≥2 indicates high risk and warrants caution/regular evaluation of anti thrombotic therapy

Table 15.4 Incidence of major bleeding with HAS-BLED scores

Score	Risk of major bleeding (%/year)
0–1	1
2	1.9
3	3.7
4	8.7
5	12.5

Ref. [11]

Table 15.5 Summarizing pharmacological characteristics and dosages of oral anticoagulants

Drug characteristics	Warfarin	Dabigatran	Rivaroxaban	Apixaban
Mechanism of action	Vitamin K antagonism	Direct thrombin (factor II) inhibition	Direct factor Xa inhibition	Direct factor Xa inhibition
Plasma protein binding %	96	35	>90	87
Time to peak levels (h)	1	3	2–4	1–3
Half-life (h)	36–42	12–17	5–12	9–15
Excretion	Hepatic/renal and fecal	80% renal	33% renal, 66% liver	25% renal, 75% fecal
Dosage	Initiation with 5 mg or less, dosage adjusted to maintain INR 2–3	150 mg BID 110 mg BID in patients >80 years or those with high risk of bleeding 75 mg BID for those with low Cr Cl (15–30 ml/min)	20 mg daily 15 mg daily for Cr Cl (15–49)	5 mg BID 2.5 mg BID for patients with impaired renal function, >80 years or <60 kg body weight

15.6 Selection of Oral Anticoagulant Medication

Vitamin K antagonists especially warfarin was the only oral anticoagulant agent available since the 1950s till recently. With the introduction of direct thrombin inhibitors and factor Xa inhibitors, the options are now open to more convenient and flexible anticoagulation regimens. The most studied non-vitamin K-dependent anticoagulants (NOACs) are dabigatran, rivaroxaban, apixaban, and edoxaban.

Warfarin has been used effectively in elderly patients for many decades. However, the major difficulties in managing warfarin in elderly patients are its interaction with food, drugs, alcohol, liver function, age-related variations, and genetic variations. Periodic monitoring of international normalized ratio (INR) and frequent dosage adjustments are required to ensure protection from thromboembolism and prevention of bleeding complications in patients treated with warfarin. The clinical

benefits and risks of anticoagulation therapy with warfarin are directly related to the proportion of time that INR values are between 2 and 3, which is designated as time in therapeutic range (TTR) 21. It has been shown that TTR on warfarin is suboptimal, only 59% in ORBIT-AF study analyzing 5210 patients [18].

Another obstacle encountered in warfarin-based anticoagulation is compliance and discontinuation rates. Discontinuation of warfarin therapy has been alarmingly high 25–50% [19, 20].

The use of NOACs circumvents some of these inconveniences of warfarin. NOACs are in clinical use since 2008 and offer similar or better efficacy, safety, convenience, and freedom from frequent laboratory monitoring. There is no age-related dose adjustment for NOACs. Dose adjustments are required for patients with renal dysfunction. NOACs are not recommended for patients with end-stage renal disease on hemodialysis and in patients with mechanical heart valves [9, 10, 21, 22].

When selecting a specific anticoagulant, patient preference, renal function, and cost should be considered.

15.7 Rate and Rhythm Control

Five major prospective randomized trials (PAF2, STAF, PIAF, RACE, and AFFIRM) compared rate control strategy with that of rhythm control, and all of these trials have had similar results [23–27]. Most of the subjects enrolled in the trials were elderly as a reflection of the epidemiology of AF. These studies have shown no advantage of rhythm control strategy over that of rate control. A prespecified subgroup analysis of AFFIRM [27] revealed that rhythm control strategy was associated with higher mortality than rate control. There were no significant differences in functional capacity or cognitive status with either management strategies [28, 29]. Rhythm control strategy is more costly and consumed more resources compared to rate control strategy [30].

In septuagenarians, rate control when compared with rhythm control was associated with lower mortality and hospitalizations [31]. Based on the evidence, rate control is the preferred mode of management on AF in elderly. However rhythm control may be appropriate in certain circumstances such as highly symptomatic patients despite rate control, exercise intolerance, and personal preference.

15.8 Strategies Used for Rhythm Control in AF

The three major approaches for rhythm control in atrial fibrillation are antiarrhythmic drugs, cardioversion which could be chemical or electric, and catheter ablation.

Cardioversion can be safely performed without anticoagulation if the duration of AF is less than 48 h and if there is no risk of stroke. If the duration of AF is more than 48 h, anticoagulation with warfarin (to maintain INR between 2 and 3) or NOACs should be done for at least 3 weeks prior to and 4 weeks after cardioversion.

Transesophageal echocardiogram (TEE) can be used to rule out the presence of left atrial/LA appendage thrombus to perform cardioversion acutely if duration of AF of more than 48 h and waiting for 3 weeks on anticoagulation is deemed inappropriate [32]. Cardioversion can be achieved by direct current shock or with the use of antiarrhythmic drugs. Among drugs, flecainide, propafenone, dofetilide, or intravenous ibutilide are considered class 1 of recommendation and amiodarone class II a recommendation for cardioversion of AF.

The decision about continuation of long-term anticoagulation depends on the stroke risk assessed by CHA2DS2-VASC score. AAD is moderately effective in maintaining sinus rhythm in long term after cardioversion; however, the long-term risk benefit of these drugs remains unclear. Among the antiarrhythmic drugs, amiodarone is found to be most effective for maintenance of sinus rhythm with less mortality risk than class 1 drugs, and the choice of AAD depends also on comorbidities of the patient and the presence of underlying structural heart disease [33]. Class 1 drugs should be used with extreme caution in patients with structural heart disease because of the risk of pro-arrhythmia. Regular monitoring of QT interval is recommended in patients on class 3 drugs like sotalol or amiodarone.

15.9 Control of Ventricular Rate

Most of the symptoms in AF is related to tachycardia, and rate control is an attractive and cost-effective strategy in improving the quality of life of AF patients. Rate control can be achieved by AV nodal blocking medications or by AV node ablation and implantation of permanent pacemaker. The common drugs used for ventricular rate control are (1) beta-adrenergic blockers, (2) non-dihydropyridine calcium channel blockers, and (3) digitalis. Both beta-blockers and calcium channel blockers are equally effective in rate control in atrial fibrillation. Digoxin is a lesser preferred drug as a first-line rate control medications except in-patient with systolic heart failure. The mechanism of action of digoxin is by enhancement of vagal tone on AV node and useful for rate control at rest. Because of the vagal withdrawal associated with exertion, digoxin is not a very useful drug for exercise related tachycardia, which is fairly common in atrial fibrillation. A narrow therapeutic window, interaction with other cardiac drugs and warfarin, and propensity for toxicity with declining renal function on elderly make digoxin a less favorable drug in management of atrial fibrillation.

Another important consideration is about the target heart rates while attempting rate control. A more lenient rate control (resting heart rate < 110 bpm) is found non-inferior to more strict rate control of resting heart rate < 80 bpm and heart rate < 110 with exercise in a randomized controlled trial of permanent AF in patients [34]. Another study compared three strategies of rate control and found no difference in clinical outcomes [35].

Guidelines recommend a stricter rate control of resting heart rate < 80 bpm in symptomatic cases (class IIa). For asymptomatic patients with preserved LV function, a more lenient rate control (<110 bpm) is reasonable (class IIb) to prevent tachycardiomyopathy.

15.10 Non-pharmacological Approaches in Management of AF

Non-pharmacological approaches in AF include catheter ablation, surgical ablation, and left atrial appendage occlusion.

15.11 Role of Catheter Ablation of AF in Elderly Population

Catheter ablation (pulmonary vein isolation) is a class 1 indication for drug refractory (to at least one class1 or class 3 antiarrhythmic drug) paroxysmal AF. Results of catheter ablation in octogenarian patients are comparable to younger patients, and complication rates were not greater [36]. Age over 65 is found to be a factor for progression of AF in spite of initial success [37]. In patients over 75 years undergoing AF ablation and those maintaining sinus rhythm, mortality and stroke rates are lower than those in AF (failed ablations or non-ablated cases) [38].

Surgical MAZE procedure is recommended for patients undergoing cardiac surgery for other reasons (class IIa), and results are comparable in elderly patients [39].

Left atrial appendage occlusion or excision is a non-pharmacologic therapy for stroke prevention in non-valvular AF patients who are at high risk for bleeding with anticoagulation. It is a class IIb indication in patients undergoing cardiac surgery [40]. Percutaneous LAA closure devices are also used in this patient subgroup. Percutaneous LAA occlusion using Watchman™ device has been approved for patients who are at high risk for stroke and bleeding.

A meta-analysis of two randomized trials of LAA occlusion has shown improved rates of hemorrhagic stroke, cardiovascular/unexplained death, and bleeding compared to warfarin [41].

Currently the US clinical guidelines for management of AF does not include recommendations for the use of LAA closure devices for stroke prevention because only one device (Watchman™ from Boston Scientific) has been approved by the USFDA. Currently Watchman™ is the only device, which has undergone testing against warfarin therapy, which is considered as the gold standard for anticoagulation. The focused update by the European Society of Cardiology (ESC) in 2012 for the management of AF provides a relatively weak recommendation for LAA closure/occlusion/excision with percutaneous technologies. The procedure is recommended in patients at high risk for stroke unable to take long-term anticoagulation (class IIb recommendation, level of evidence B) [9] (Fig. 15.1).

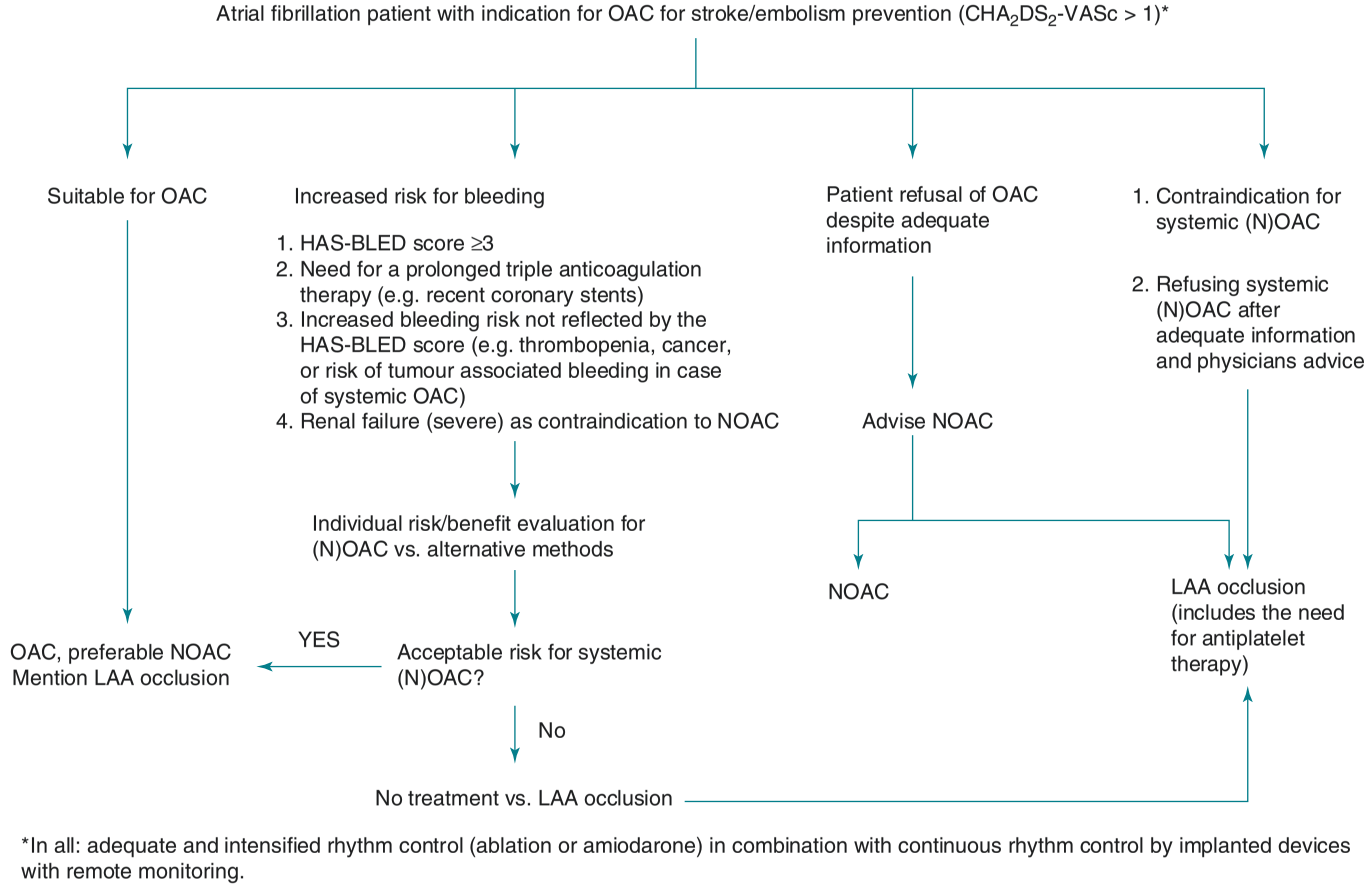

Fig. 15.1 Algorithm for stroke prevention in atrial fibrillation. *LAA* left atrial appendage, *NOAC* non-vitamin K antagonist oral anticoagulant, *OAC* oral anticoagulant (adapted from Ref. 42)

Conclusions

Atrial fibrillation is the commonest sustained arrhythmia in clinical practice, and the incidence and prevalence increases with age. AF is associated with significant morbidity and mortality and has huge impact on healthcare system. Management of AF should include stroke prevention by the use of anticoagulation and control of ventricular rates either by rate control or rhythm control strategies to improve symptoms and quality of life. The decision of rate or rhythm control should be individualized as there are no significant differences in hard clinical outcomes between these approaches. Advent of NOACS, improvement is catheter-based technologies for ablative treatments, and strategies for LAA occlusion/exclusion for stroke prevention are some of the advances made in the field of management of atrial fibrillation. Ongoing research and randomized trials will help in refining the pharmacotherapy as well as interventional management of atrial fibrillation.

Case Continued

Mr. Smith's case provides an opportunity to review the management options in a case of AF and heart failure. Being hemodynamically unstable, he needs cardioversion, which is best achieved by DC shock. Since the duration of AF is not clear and the stroke risk being very high, ideal strategy is to perform a TEE and cardioversion after exclusion of an LAA thrombus. Long-term anticoagulation is required, and choice of medication is either warfarin or apixaban in view of lower GFR. Mr. Smith's LV function is 40%, which could be primary cardiomyopathy or tachycardiomyopathy. A repeat echocardiogram after restoration of sinus rhythm would aid in making the distinction. Both rate control and rhythm control can be attempted in this case to prevent tachycardiomyopathy. In view of LVH and LV dysfunction, the only useful antiarrhythmic drug is amiodarone in this case. Amiodarone intolerance and recurrence of symptomatic AF are indication of non-pharmacologic approaches for rate or rhythm control by catheter ablation. AV node ablation and pacemaker implantation or pulmonary vein /LA ablation for rhythm control are strategies for rate control and rhythm control, respectively. A decision for long-term management should be made based on a consensus between the patient and the physician.

Mr. Smith underwent a TEE, which was followed by electrical cardioversion. He was loaded with amiodarone with a dose of 10 g over 3 weeks and a maintenance dose of 200 mg. Anticoagulation was initiated with apixaban 2.5 mg BID. In view of his LV dysfunction, beta blockade with bisoprolol and ACE inhibition with small dose of ramipril were started with continued monitoring of renal functions. A long-term plan for AV nodal ablation with permanent pacemaker implantation was discussed in case if he becomes drug refractory or develops side effects from medications. Six monthly liver function and thyroid function assessments, yearly chest X rays, and ophthalmic examinations were planned as a part of his follow-up as he is on amiodarone.

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Isolated Systolic Hypertension

16

Syamkumar M. Divakara Menon

Key Points

- ISH is diagnosed when systolic blood pressure is more than 140 mmHg with a normal or low diastolic pressure (less than 90 mmHg).
- Prevalence of ISH increases with age, and it is one of the special problems in hypertension among geriatric population.
- Contrary to traditional thinking, systolic hypertension is a strong predictor of cardiovascular morbidity and mortality.
- Increased arterial stiffness resulting in augmented reflection of the pulse wave is the major pathophysiological mechanism in ISH along with functional changes like endothelial dysfunction, enhanced sympathetic tone, and abnormal sodium hemostasis.
- Management of ISH can be a challenge, and drugs which reduce the augmentation index play a pivotal role in refractory cases.

Case Study

Mr. JS is an 84-year-old gentleman diagnosed with systemic hypertension. He is physically active and does moderate physical exercise for 45 min daily and maintains a healthy body weight. He has mild type 2 diabetes which is being managed with met for min 500 mg daily. He had suffered a minor stroke in the past from which he has recovered completely without any residual neurological damage. His blood pressure has been a challenge to his GP and was very difficult to control with three antihypertensive drugs, viz., atenolol 50 mg, amlodipine 10 mg, and lisinopril 10 mg.

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During his last clinic visit, his pulse rate was 55 beats/min, BP 170/75 mmHg, and normal cardiac physical findings. ECG showed sinus rhythm and features of left ventricular hypertrophy (LVH). Echocardiogram results reported mild concentric LVH with normal LV function. Blood chemistry was normal with regard to renal function, electrolyte status, liver functions, and blood sugar levels including HbA1C, but serum uric acid levels were at upper limits of normal.

How to manage Mr. JS' hypertension?

16.1 Isolated Systolic Hypertension

Definition: According to WHO/ISH guidelines and the Sixth Joint National Committee on Hypertension report, ISH is diagnosed when the systolic BP is ≥140 mmHg and diastolic BP (DBP) < 90 mmHg.

Population-based studies have demonstrated age-related increase in both SBP and DBP up to the sixth decade. In elderly population, there is a slow decrease in DBP in contrast to SBP [1, 2]. Traditionally it was thought that elevated diastolic BP, not the systolic BP, is the major risk factor for increased vascular morbidity and mortality. DBP was the main target of any antihypertensive drug therapy. However retrospective as well as prospective epidemiological studies have demonstrated beyond any reasonable doubt that SBP is an important risk marker irrespective of the DBP.

16.2 Pathophysiology

16.2.1 Genesis of Pulse Wave

An understanding of the genesis of the pulse wave is necessary to comprehend the pathogenesis of isolated systolic hypertension. The pulse wave is generated by left ventricular contraction and is propagated throughout the arterial vascular bed. The normal pulse wave consists of an upstroke, peak, and a descending limb. The first upward excursion is the rapid upstroke or percussion wave. The percussion wave is followed by the sharp dicrotic notch which is caused by aortic valve closure at the end of systole. The dicrotic notch is followed by the dicrotic wave, which is the second upward component which is late in systole. The dicrotic notch and dicrotic waves are better recorded in central arteries and less discernible toward the periphery. The dicrotic wave is due to the reflection of the incident wave from the arterial bed. In normal vasculature, the reflection is small and is in diastole, and therefore, no summation with the first wave happens in a normal vasculature (Figs. 16.1 and 16.2).

Age-related decrease (structural and functional) in the arterial compliance is the major pathophysiological mechanism in development of ISH. These changes affect mainly the intima and media [3–5]. Functional properties as well as anatomy of the large vessels are altered due to changes in collagen, ground substance, as well as extracellular protein matrix. The amount of elastin on the arterial walls decrease with

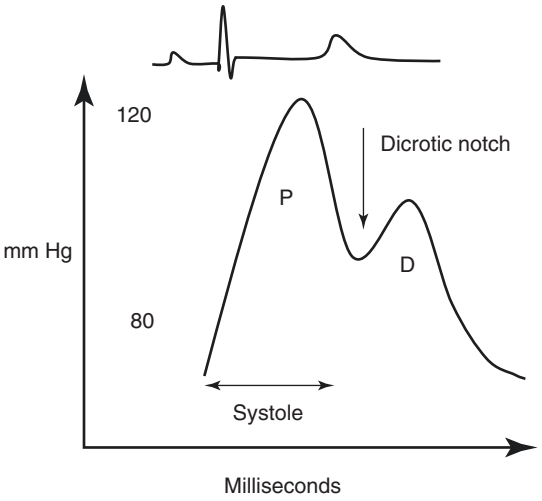

Fig. 16.1 Pulse wave form from healthy vasculature. *P* percussion wave, *D* dicrotic wave. The *arrow* indicates the dicrotic notch. The reflected wave or dicrotic wave is small and is in diastole, and there is no summation with the percussion wave

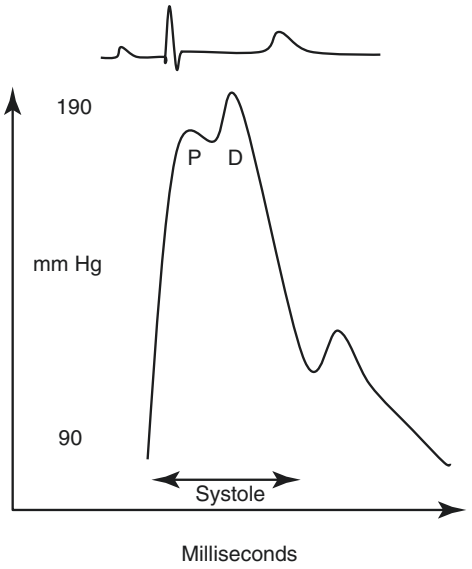

Fig. 16.2 Pulse wave form in ISH. Dicrotic wave is earlier and in systole because of accelerated reflection, and there is summation with the first wave. There is augmentation of the systolic pressure because of this summation effect

aging, which result in fragmented and poorly demarcated media. Atherosclerotic process and calcification of the media also contribute to increasing stiffness and reduced elasticity of the arterial walls. Through the porous internal elastic lamina, undifferentiated smooth muscle cells migrate to the intima and proliferate there, laying down collagen contributing to fibrosis of the intima. This in turn results in increase in arterial wall stiffness. The end result of these processes is decrease in lumen-to-wall ratio and overall cross-sectional luminal area and decrease in arterial stiffness. Changes are predominantly seen in elastic arteries like aorta and larger arteries [6, 7].

These changes cause increase in pulse wave velocity. This results in early return of reflected pressure waves from peripheral reflecting sites, a summation with the first component and an increase in systolic pressure [8]. The widening of the arterial pulse pressure caused by the reflected component is expressed as the "augmentation index" (AIx) [9]. It also causes increased wall stress, augments the processes involved in atherosclerosis, and also predisposes to development of left ventricular hypertrophy (LVH).

16.3 Functional Changes

There is an increase in sympathetic tone with aging. Circulating nor adrenaline levels are high, which is likely due to a lowered beta receptor sensitivity and decreased baroreceptor sensitivity. A preserved alpha-receptor activity in elderly population with an increased sympathetic tone will result in a state of generalized vasoconstriction and increased vasomotor tone [10].

16.3.1 Endothelial Dysfunction

Cardiovascular risk factors especially diabetes, renal dysfunction, dyslipidemia result in endothelial dysfunction as evident by impaired nitric oxide (NO) production and loss of vasodilator tone. The resultant tonic vasoconstrictive state of the vascular bed results in an amplified reflective wave and systolic augmentation [11–14].

16.3.2 Volume Status and Sodium Hemostasis

Elderly hypertensives are more sensitive to the volume perturbations secondary to sodium intake. There is an increased sensitivity for salt-induced inhibition of endogenous NO production, which can increase the vasoconstrictor tone [15, 16].

16.4 Epidemiology of ISH

There is a clear linear relationship between age and ISH. The prevalence of ISH is 0.8% in people < 50 years of age and up to 23.6% in persons 80 years of age [17, 18]. Prevalence is more in females and African Americans compared to Caucasians [17, 18]. However, these data are from studies which defined ISH as systolic BP > 160 mmHg and diastolic BP < 90 mmHg as per the WHO guidelines [19, 20]. As indicated earlier, the diagnostic criteria has been redefined with SBP > 140 mmHg and DBP < 90 mmHg by the Sixth Joint National Committee on hypertension [21].

16.5 Morbidity and Mortality of ISH

The deleterious effects of ISH were first demonstrated in 1959 in the *Build and Blood Pressure Study*. The relation between SBP and mortality was demonstrated in the retrospective analysis of insurance company data. A close relation between mortality and high systolic pressures was demonstrated, which was age independent [22]. This data from retrospective analysis was later confirmed by prospective studies. Data from Multiple Risk factor Intervention Trial (MRFIT) and the US Hypertension Detection and Follow-Up Program confirmed the association between increase in SBP and cardiovascular risk [23, 24]. Every 1 mm increase in SBP has been shown to increase the cardiovascular mortality by 1% in multiple regression analysis. Framingham study data also reiterated the cardiovascular morbidity and mortality. There was a twofold increase in the risk of nonfatal MI and threefold increase in the risk of strokes with ISH in Framingham population [11, 12].

Data from MRFIT trial have confirmed the fact that systolic BP elevation is a more important risk factor for cardiovascular events than diastolic BP.

16.6 Modification of Cardiovascular Complications by Treatment

Table 16.1 summarizes the results of three major randomized placebo-controlled trials in ISH management. Undoubtedly treatment of ISH resulted in significant reduction in cardiovascular morbidity and mortality in treated group [25–27].

Table 16.1 Randomized trials in management of ISH

Study	No. of patients	Age group	Enrollment BP (mean)	Drugs	F/U (years)	Mean BP reduction (S/D)	End point reduction
MRC	4396	65–74	183/91	Diuretic/ atenolol	5	−20/−10	25% stroke 19% cardiac
SHEP	4736	>60	170/77	Diuretic/ atenolol	4.5	11–14/3–4	36% stroke 27% MI(NS)
SYST-EUR	6403		160–219/95	Nitrendipine/ enalapril/ diuretic	2	23/7	42% fatal stroke 44% nonfatal stroke 26% fatal/ nonfatal cardiac events

16.7 Management of ISH

The diagnosis should be confirmed by at least three different BP measurements. Attention must be paid to detect any evidence of postural hypotension. Rare and potentially curable secondary causes like aortic insufficiency, thyrotoxicosis, anemia, beriberi, arteriovenous fistulae, and Paget's disease of the bone should be eliminated before making a diagnosis of ISH. Ambulatory BP monitoring is advised in suspected cases of white coat hypertension and in cases demonstrating significant variability in BP recordings.

16.8 Non-pharmacological Management

These include weight reduction, physical activity, restriction of dietary sodium, and moderation of alcohol intake. Low-sodium diet (in the range of 60–90 mmol/day) had appreciable favorable effects on systolic BP in patients with ISH. Reduced dietary sodium also was associated with reduced arterial stiffness and reduction in systolic BP [28–30].

Effect of physical exercise on elderly patients needs further studies, as the current data is inconclusive. Favorable effect of significant lowering of SBP has been noted in a study done in 109 elderly hypertensives, half of them being ISH. SBP was found significantly lower among those who moved more than 5 h a day compared to those with lesser mobility [31]. However, another study did not demonstrate a significant change in arterial stiffness with moderate-intensity exercise for 8 weeks [32]. These lifestyle changes alone may be necessary in mild cases of ISH. These should be continued along with drug therapy in more severe cases of ISH. Drug therapy is indicated in cases with SBP $\geq$ 160 mmHg in spite of lifestyle changes. Threshold to start drug therapy should be lower, even if the BP is between 140 and 160 mmHg in patients with comorbid conditions like diabetes, coronary artery disease, and features of end-organ damage like left ventricular hypertrophy.

16.9 Selection of Antihypertensive Drug in ISH

Most antihypertensives used in treating young hypertensives can be used in managing elderly with ISH. However, there are some special considerations to be made while treating this patient population. Excessive reduction in blood pressure could result in orthostatic hypotension and increase the risk of falls. To avoid this problem, drug therapy should be started at the lowest dose and carefully titrated up to get the target blood pressure level which is typically a systolic BP of $\leq$140 mmHg. In fact antihypertensive therapy has been found to improve the clinical outcomes in patients up the age of 80 years in spite of the risk of postural hypotension. Concomitant reduction in diastolic blood pressure might compromise coronary perfusion especially if there is atherosclerotic narrowing of coronary arteries. A lowered coronary perfusion pressure coupled with left ventricular hypertrophy and

Table 16.2 ISH therapy based on pathophysiological mechanisms

Drug class	Pathophysiological target	Desired change	Side effects
Diuretics	Sodium sensitivity, blood volume	Reduced systolic BP, reduced sodium sensitivity of vasculature	Metabolic: hyperuricemia, worsening renal dysfunction, diabetes
CCB: non-DHP type	Arterial stiffness, wave reflection	Vasodilatation, smooth muscle relaxation, reduced reflection, improved AIx	Peripheral edema
ACEI/AT II blockers	Arterial stiffness, wave reflection	Vasodilatation, smooth muscle relaxation, reduced reflection, improved AIx	Cough (ACEI) angioedema
Nitrates	Arterial stiffness, wave reflection	Vasodilatation, smooth muscle relaxation, reduced reflection, improved AIx	Tolerance
Beta-blockers	Afterload/forward pulse velocity	Reduction in forward pulse velocity/reduction in afterload	No mortality reduction. Diabetes

concomitant increased demands might result in worsening of myocardial demand ischemia.

The pathophysiological mechanisms of ISH would guide the practitioner while choosing the antihypertensive drugs. Selection of the drugs should be individualized based on the presence of comorbid conditions.

Table 16.2 summarizes targeted therapy for ISH based on pathophysiological mechanisms.

16.10 Selection of Antihypertensive Drugs Based on the Pathophysiological Mechanism

While planning the drug therapy, every attempt should be made to select a program to match the pathophysiology in the patient group. It has been demonstrated that drugs that decrease the wave reflection and augmentation index (AIx) are more effective in selectively lowering the systolic BP (e.g., nitrates) than those that have little effect on dicrotic wave reflection and Aix (e.g., beta-blockers) [8, 9, 33].

In a head-to-head comparison of the four major classes of antihypertensives (beta-blockers, calcium channel blockers, ACE inhibitors and diuretics), it was found that the beta-blockers had significantly lower effect on AIx than the other three drug classes: nine diuretics, calcium channel blockers, and ACE inhibitors [34]. These three classes of medications were compared in the ALLHAT trial and have shown comparable efficacy [35]. Two studies have shown thiazide diuretic-based treatment effective in ISH [36, 37]. Indapamide and chlorthalidone were used in these studies, respectively.

A diuretic-based therapy has been suggested in patients with ISH; however, long-term renal and metabolic effects of diuretics should be considered in patients with comorbidities like diabetes, even though the trial of chlorthalidone in ISH has demonstrated improved long-term outcomes in ISH cases. Patients who developed diabetes on chlorthalidone also had a better prognosis than those with preexisting diabetes [37].

16.11 Other Antihypertensive Drugs in ISH

Based on the results of SHEP and SYST-EUR studies, the JNC VI recommended a combination of beta-blockers and diuretics with a target BP < 140/90 mmHg in ISH patients (130/85 in diabetics). Further evidence of the favorable effects of BP reduction below 140 mmHg emerged after JNC VI from ALLHAT trial. Even though ALLHAT showed similar efficacy in reducing clinically significant end points, a meta-analysis of published trials showed a trend for CCBs to be superior to diuretics/beta blockers in reducing stroke and conversely diuretics/beta-blockers and ACEI in reducing heart failure compared to CCBs [38].

Beta-blockers have lost their charm in treating ISH as they were found inferior in preventing stroke compared to other antihypertensive agents [39, 40]. Based on these results from the LIFE trial and ASCOT trial, it has been suggested that beta-blockers should not be used as primary treatment of hypertension.

A substudy of ASCOT-BPLA named as CAFÉ study has examined the hemodynamic effects of two treatment arms. Atenolol ± thiazide therapy was compared to amlodipine ± perindopril arm. In spite of comparable brachial BP reduction, the central aortic pressures and pulse wave augmentation were significantly less with the latter arm thus confirming the importance of reflected waves and augmentation index pathophysiological basis of ISH and associated complications. Agents decreasing the wave reflectance may thus be associated with better clinical outcomes apart from lowering the BP.

Not infrequently, patients already on standard antihypertensive drugs exhibit ISH. Adjuvant therapy with nitrates has been shown to reduce the AIx and systolic hypertension in these cases [13].

Alpha-blockers and central sympatholytics are not suitable for these patients due to their propensity to induce postural hypotension. Per se beta-blockers are not recommended unless there are other indications like heart failure, arrhythmias, or coronary artery disease. Nitrates are valuable add on to those who are not responding to multiple antihypertensives, especially in those with high pulse pressure.

Selection of antihypertensive drugs in ISH thus should be individualized depending on patient's medical history, preexisting medical therapy, and past experiences with individual medications. Thiazide diuretics are a good choice to start with except for those with diabetes, hyperuricemia, and renal impairment. Vasodilators like non-DHP calcium channel blockers and ACE inhibitors/ARBs are also useful in patients especially those who are diabetics.

Conclusions

Isolated systolic hypertension is a major risk factor for cardiovascular morbidity and mortality. The prevalence of ISH increases with increasing age, upto 23% of hypertensives in elderly population have ISH. Contrary to previous concepts, elevated systolic pressures are more deleterious than diastolic hypertension. The pathophysiology of ISH is related to increase in arterial stiffness and pulse wave reflection. These in turn are related to endothelial dysfunction and sodium hypersensitivity. Principles of pharmacotherapy should therefore address these mechanisms. Diuretics and vasodilators specifically non-DHP calcium channel blockers and ACE inhibitors are the mainstay of treatment. Drugs, which reduce the wave reflection and AIx, are especially useful in lowering the blood pressure as well as reducing the cardiovascular/morbidity and mortality in these cases.

Case Continued

Mr. JS depicts a typical scenario of ISH. He is already on near maximal doses of amlodipine and ACEI, and atenolol is one drug which can be increased. However, his heart rate is in bradycardia range, and any further increase in beta-blocker dosage could result in worsening of bradycardia. Diuretic therapy is a choice, but high normal levels of uric acid needs close monitoring. Among the diuretics, indapamide is the most metabolically neutral drug, at the expense of lower potency compared to other thiazides like hydrochlorothiazide or chlorthalidone.

Given these comorbidities, a long-acting nitrate like extended release isosorbide mononitrate (ISMN) which has a favorable effect on AIx can be a drug of choice for managing the ISH of Mr. JS.

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Heart Failure with Preserved Ejection Fraction in the Elderly: Challenges and Management

17

Sanjay Ganapathi

Key Points

- In elderly, heart failure with preserved ejection fraction (HFPEF) is a prominent cause of hospitalization.
- The syndrome often coexists with other common morbidities.
- This condition is caused by abnormalities affecting left ventricular relaxation.
- Control of symptoms and risk factors and treatment of comorbid conditions are the important steps in management.
- The long-term prognosis is similar to that of heart failure with reduced ejection fraction.

Case Study

Mr. AB, an 83-year-old obese gentleman, presents with worsening shortness of breath and fatigue over the past 2 weeks. He also noticed increasing bilateral ankle swelling and weight gain in the same duration. While trying to get up from bed, he feels dizzy and light headed. He is known to have hypertension for the last three 3 decades for which he is on lisinopril 20 mg and chlorthalidone 12.5 mg and has diabetes for which he has been advised long-acting insulin as well as oral medications. Apart from these, he is on tamsulosin for symptomatic prostatic hypertrophy. Fifteen years ago, he had pacemaker implanted for symptomatic sick sinus syndrome with sinus bradycardia and had the pulse generator replaced 4 years ago. There is a history of inferior wall myocardial infarction 10 years ago for which he underwent primary angioplasty with drug-eluting

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coronary stent implantation and is on 81 mg ASA and nitrates and 20 mg of rosuvastatin daily. His wife reported gradual decline in his activities, listlessness, and increased daytime somnolence before the recent deterioration. She also is not sure about the adherence to bedtime medications since she retires before him.

In the ER, he is tachypneic, and saturations are 90% at room air. His pulse rate is 60 beats per minute, regular, and blood pressure is 180/75 mmHg. Jugular veins are visible at 12 cm with absent a wave, prominent v wave, and y descent. Cardiovascular system examination reveals cardiac enlargement, soft first heart sound, single and loud second heart sound, and an early peaking ejection murmur of mild aortic stenosis. There are fine rales over the lung bases suggestive of heart failure. There is pitting edema of both legs.

His ECG reveals absent P waves and a regular broad QRS paced rhythm at 60/min. Biochemistry shows normal troponins, NT-Pro BNP value of 8000 pg/mL, serum sodium 135 mmol/L, potassium 3.6 mmol/L, creatinine of 1.5 mg/dL with a calculated GFR of 48, hemoglobin of 6.5 g%, normal total and differential leucocyte counts, serum total protein of 7 g/dL, albumin of 3.4 g/dL, and normal bilirubin and liver enzymes and TSH. Stool guaiac test turns out to be positive. HbA1c level is 6.8%.

An echocardiogram demonstrated left ventricular hypertrophy, mild dilatation of the ventricles, global left ventricular function of 52%, dilated atria, and sclerosed aortic valve with mild transvalvular gradient. There is mild mitral regurgitation also. The estimated pulmonary artery systolic pressure is 60 mmHg.

Review of his previous medical records reveals that he had undergone last pacemaker check 9 months ago and was noted to have predominantly paced ventricular beats with occasional atrial pacing.

How should we manage Mr. AB and optimize his medical treatment?

17.1 Introduction and Definition

Almost half of the patients with congestive heart failure in various registries were detected to have normal left ventricular ejection fraction [1]. This entity found its expression in the term diastolic heart failure [2] and subsequently with a wider scope as heart failure with preserved ejection fraction, when it was found that this entity has distinct epidemiological and pathophysiological features and therapeutic challenges. Currently, the diagnosis is invoked when a patient presenting with typical symptoms, signs, and biochemical evidence of heart failure has features of left ventricular diastolic dysfunction in imaging or cardiac catheterization and an ejection fraction of 50% or higher while noncardiac causes of symptoms of HF are excluded (Table 17.1).

17.2 Epidemiology

The prevalence of HFPEF increases with age, and the incidence doubles every decade after the age of 65 years. HFPEF is the leading cause of hospitalization in this age group [7]. Almost one in ten of those aged ≥ 80 years has this condition [8]. The

Table 17.1 Definitions of HFPEF used in various guidelines—a synopsis

ESC 2012 [3]	HFSA 2010 [4]	ACC/AHA 2013 [5]	ESC 2016 [6]
Symptoms and signs typical of HF BNP > 100 pg/mL NT-proBNP > 800 pg/mL	Clinical signs/ symptoms of HF Lab: biomarkers or chest X-ray or cardiopulmonary exercise testing	HFPEF: EF ≥ 50%, diastolic HF. Exclude other potential noncardiac causes of symptoms suggestive of HF	Symptoms/signs of HF LVEF ≥ 50% Elevated natriuretic peptides[a] • *Acute setting*: – BNP ≥ 100 pg/mL – NT-proBNP ≥ 300 pg/mL • *Non-acute setting*: – BNP > 35 pg/mL – NT-proBNP > 125 pg/mL
Normal or only mildly decreased LVEF and LV not dilated (LVEDV ≤ 97 mL/m^2 or indexed LVEDV ≤ 49 mL/m^2)	Preserved LVEF > 50% Normal LVEDV	HFPEF borderline: EF 41–49%. Characteristics, treatment patterns, and outcomes are similar to those of patients with HFPEF	
Relevant structural heart disease (LV hypertrophy or left atrial enlargement) and/or diastolic dysfunction in echocardiography or cardiac catheterization	Use echocardiography, ECG, stress imaging, or cardiac catheterization to distinguish HFPEF and other disorders Exclude non-myocardial disease	HFPEF improved: EF > 40%. Includes a subset of patients with HFPEF who previously had HFREF	At least one additional criterion: (a) Relevant structural heart disease (LVH and/or LAE) (b) Diastolic dysfunction

ESC European Society of Cardiology, *HFSA* Heart Failure Society of America, *ACC* American College of Cardiology/*AHA* American Heart Association. *HF* Heart failure, *BNP* B natriuretic peptide, *LV* left ventricle, *LA* left atrium, *EDV* end diastolic volume, *LVH* LV hypertrophy, *LAE* LA enlargement (adapted from [3, 4, 5, 6])

[a]The values of natriuretic peptides according to the ESC 2016 guidelines are more useful to exclude a diagnosis of HF in the appropriate setting; the positive predictive value of elevated concentrations is lower

5-year survival of patients with HFPEF is almost similar to those with HFREF (heart failure with reduced ejection fraction) and is approximately 50% [9]. Patients with HFPEF are more likely to be elderly women, hypertensive, and diabetic and have atrial fibrillation. More than a fourth (30%) of the patients with HFPEF die of non-cardiovascular causes, while sudden cardiac death accounts for another fourth [10]. As age advances, the prevalence of comorbidities like sleep apnea, chronic kidney disease, and COPD increases as do the prevalence of cardiovascular diseases and risk factors. All these contribute significantly to the development of HFPEF in this age group.

In addition, HF is one of the commonest comorbidity in hospitalized elderly patients, with poor outcomes and prolonged hospital stay.

17.3 Aging and Heart Failure

The process of aging affects the myocardium, vasculature, and results in the activation of the neurohumoral system. Consequent to the increase in collagen and decrease in elastin, the vessels become stiffer, which is compounded by calcification. This increases the afterload and has effects on cardiomyocytes with hypertrophy, fibrosis, and alterations in calcium intake in sarcoplasmic reticulum, resulting in decreased diastolic reserve. The rate of early diastolic filling of the left ventricle decreases in the elderly [11]. The mitochondria in the cardiac myocytes of the elderly have decreased capacity to generate ATP adequately during stress, thereby limiting the peak myocardial performance. The vasodilatory reserve of the vasculature is affected by reduction in the synthesis of endothelial nitric oxide and atherosclerotic changes. Neurohumoral blunting manifests as chronotropic incompetence, decreased heart rate variability, and decreased augmentation of cardiac output in response to exercise. Comorbidities like hypertension, diabetes, renal dysfunction, and obesity result in exacerbation of stiffening of ventricles and arteries. All these result in marked decline in cardiovascular reserve, and elderly are often unable to maintain a normal cardiac output in response to physiological stress like exercise or pathological processes like anemia, infection, myocardial ischemia, etc. (Table 17.2).

Table 17.2 Common conditions which predispose to HF in the elderly

Hypertension
Myocardial ischemia
Excess salt intake
Arrhythmias, especially atrial fibrillation
Anemia
Infections/sepsis
Renal dysfunction
Alcohol
Lung disease
Thyroid dysfunction
Obstructive sleep apnea

17.4 Hemodynamics of Diastolic Dysfunction

Decreased left ventricular compliance affects the LV filling, characterized by disproportionate increase in LV diastolic pressure in response to rise in LV volume. This causes left atrial hypertension and results in pulmonary venous congestion, pulmonary hypertension, and, subsequently, systemic venous congestion. Impaired LV filling also manifests as lower forward cardiac output, even when the ejection fraction is not affected significantly. Ventricular relaxation abnormalities cause left atrial hypertrophy predisposing to atrial fibrillation, which in turn contributes to loss of forward cardiac output. In patients with advanced diastolic dysfunction, atrial systole contributes to 25–30% of stroke volume, and when they develop atrial fibrillation, the loss of this "booster pump effect" renders them more symptomatic.

17.5 HFPEF in the Elderly: Clinical Challenges

17.5.1 Diagnosis

The symptoms of HFPEF in the elderly could overlap with that of general frailty. The elderly often present with fatigue that could be attributed to aging and other comorbidities, and HF in such patients might go on undiagnosed. Atypical symptoms like confusion, anorexia, and decreased levels of physical activity could be the presenting symptoms in the very elderly. Eliciting a history could be challenging with cognitive impairment. Physical findings are often not as helpful as in younger patients. Signs such as ankle edema could occur due to chronic venous insufficiency or from calcium channel blockers. Crackles over lung fields could be due to chronic lung disease or atelectasis.

Echocardiographic evaluation is useful to diagnose this condition, especially velocities of mitral valve flow and mitral annular tissue Doppler imaging. Aging itself is associated with features of mild diastolic dysfunction like prolongation of isovolumic relaxation time, decrease in early mitral inflow velocity, and prolongation of early ventricular filling time in Doppler. Findings of advanced diastolic dysfunction are obtained during echocardiography in severe cases. The various stages of ventricular diastolic dysfunction and the echocardiographic features are listed in Table 17.3; excellent reviews are available which provide detailed discussion on echocardiographic features of diastolic dysfunction.

Biomarkers such as brain natriuretic peptide (BNP) and N-terminal ProBNP are useful to improve the diagnostic accuracy in elderly with dyspnea and nonspecific symptoms. However, the cutoff values for BNP and NT-proBNP for patients older than 75 years are almost two- and fourfold higher, respectively, than those for patients younger than 75 years. Likewise, the cutoff is higher for women and patients with renal dysfunction. In the PRIDE study [12], the sensitivity and specificity of plasma levels of NT-ProBNP >1200 pg/mL for patients with GFR <60 mL/min/1.73 m^2 was 89% and 72%, respectively, as against 85% and 88% for the following cutoffs in patients with GFR ≥ 60 mL/min/m^2 (>450 pg/mL in those less

Table 17.3 Echocardiographic features of various grades of diastolic dysfunction

Parameter	Grade 0	Grade I	Grade 2	Grade 3a	Grade 3b
Nomenclature	Normal	Abnormal Relaxation	Pseudonormalized	Reversible restrictive dysfunction	Irreversible restrictive dysfunction
Hemodynamic abnormalities		– ↑ early LV diastolic pressure – LA pressure normal at rest – ↓ and slow early LV filling, compensated by late filling	– LA pressure increases restoring the early filling – LV relaxes slowly after entry of blood in LV inflow from LA – Early diastolic LV filling gets completed quickly due to the shift in pressure-volume relationship	– Further increases in LA pressure and more prominent "atrial kick" – Marked slowing and delay in LV relaxation throughout the diastole – More rapid rise in LV early diastolic pressures – Can be partly reversed by preload reduction	– The same as in 3a, but the features cannot be reversed by preload reduction (nitroglycerin, Valsalva strain)
Mitral valve Doppler	E/A 0.8–1.5 DT 140–240 ms	$E/A < 0.8$ EDT > 200 ms	E/A 0.8–1.5 EDT 160–200 ms	$E/A \geq 2$ EDT < 160 ms	
Tissue Doppler	Septal $e' \geq 8$ cm/s	Septal $e' < 8$ cm/s Average $E/e' \leq 8$	Septal $e' < 8$ cm/s, Average $E/e' = 9–12$	Average $E/e' \geq 13$	
Pulmonary vein Doppler	Ar velocity < 35 cm/s	$S/D > 1$ Ar − A duration = 0 ms	$S/D < 1$ Ar velocity ≥ 30 cm/s Ar − A duration ≥ 30 ms	$S/D < 1$ Ar velocity ≥ 30 cm/s Ar − A duration ≥ 30 ms	
Valsalva strain	E/A not changed	$\Delta E/A < 0.5$	$\Delta E/A \geq 0.5$	$\Delta E/A \geq 0.5$	E/A does not change
IVRT		≥100 ms	<60 ms	≤60 ms	

LV left ventricle, *LA* left atrium
E early LV filling wave velocity, *A* late LV filling wave velocity obtained by Doppler echocardiography
e' = mitral annular velocity during early diastole obtained using tissue Doppler imaging
E/e' = ratio of *E* and e' velocities
Pulmonary vein Doppler velocities: *S* systolic filling wave, *D* diastolic filling wave, Ar atrial reversal wave. Ar − *A* duration: difference in durations of Ar wave and late diastolic left ventricular filling wave
IVRT isovolumic relaxation time (duration between the closure of aortic valve and opening of mitral valve during diastole, when the LV volume remains unchanged, unless the patient has regurgitant valves or ventricular septal defect, in which this condition is not satisfied)

than 50 years and >900 pg/mL in older patients) to diagnose HF in 599 patients presenting to emergency with a complaint of dyspnea and having serum creatinine ≤ 2.5 mg/dL. Plasma levels of BNP and NT ProBNP are lesser in obese patients. Low plasma values of BNP (<100 pg/mL) or NT-ProBNP (<300 pg/mL) [13] in patients presenting with dyspnea have an excellent negative predictive value to exclude a diagnosis of HF. Certain other conditions could also result in higher levels of natriuretic peptides like sepsis and anemia, but usually indicative of cardiovascular impairment. Interestingly, treatment with neprilysin inhibitors (sacubitril) can increase the plasma levels of BNP, since BNP (not NT-ProBNP) is a substrate for the enzyme.

17.5.2 Comorbidities and Frailty

Elderly patients with HF often have comorbid issues which affect the management and prognosis of HF. The development of HF itself can affect such illnesses unfavorably. Some commonly associated problems and interactions are listed in Table 17.4.

Table 17.4 Comorbid conditions in elderly and their interactions

Comorbid condition	Cause	Effect
Anemia	Nutritional, chronic illnesses GI blood loss	Worsens symptoms of HF Affects prognosis Poor exercise capacity Worsens ischemia
Renal dysfunction	Ageing related Medication induced—RAAS blockers, diuretics	HF and CKD mutually impair the treatment of either Diuretics less effective in renal dysfunction Increased risk of electrolyte imbalance
Lung disease		Confounds diagnosis Worsens severity of HF with increased work of breathing
Obstructive sleep apnea		↑ sympathetic nervous system activity, ↑ LV afterload, and hypoxic pulmonary vasoconstriction, all result in reduced cardiac output Increases HF admission and mortality
Postural hypotension	Autonomic dysfunction Worsened by medications (vasodilators, diuretics)	Interferes with therapy Risk of falls Interferes with activity
Cognitive dysfunction		Interferes with medication adherence and non-pharmacological therapy
Osteoarthritis		Therapy with NSAIDs worsen HF and renal dysfunction
Stress incontinence	Common in very elderly, more in women Exacerbated by diuretics or ACE inhibitor-induced cough	Patients might skip medications without divulging this to avoid embarrassment

17.6 Management

Unlike in patients with HFREF, medications have not been shown to improve survival in patients with HFPEF. Treatment is aimed at relieving pulmonary or systemic venous congestion and management of underlying cardiac disease and the precipitating factors. These can be attempted using medications as well as with non-pharmacological approaches. While blockers of renin-angiotensin-aldosterone axis and certain beta adrenoceptor antagonists (carvedilol, metoprolol succinate, and bisoprolol) prolong survival in patients with HFREF, such therapies (angiotensin-converting enzyme inhibitors, angiotensin II receptor blocker and beta blockers) have at the best been found to improve HF admissions in some of the trials (candesartan in CHARM-Preserved trial, perindopril in PEP-CHF, and nebivolol in SENIORS showed some effect in decreasing hospitalizations with HF with the respective agents, and spironolactone did not have any effect in HFPEF in the TOPCAT trial) without any substantial effects on survival. Diuretics provide symptomatic relief though patients can develop electrolyte disturbances and have worsening of fatigue due to decrease in cardiac output.

Control of hypertension commensurate with the guidelines is the most important measure in patients with HFPEF to decrease cardiovascular events, mortality, and hospitalization for HF. Coronary revascularization could be considered in patients with significant angina or myocardial ischemia contributing to HF in patients with significant stenosis in coronary arteries. In patients with atrial fibrillation, attempts at control of heart rate or conversion to sinus rhythm might help in mitigating symptoms due to HF. Digoxin could be useful in patients with fast ventricular rate, to control the response.

The clinical evaluation of an elderly HF patient should also be aimed at identification and treatment of factor(s) which resulted in development of heart failure. Occasionally when the health care provider focuses on control of HF, the precipitating factors are overlooked. A carefully elicited history and detailed general and systemic examination might help identify situations which might be unrecognized otherwise. Elderly maintain a delicate balance which can easily be tilted by factors like altered bowel habits, sleep, infections, etc. Management should include correction of these abnormalities too.

17.7 Non-pharmacological Interventions

While observational studies have indicated increased risk of hospitalization and fluid retention in patients due to higher dietary sodium intake, other studies have indicated worse outcomes with sodium restriction in patients with HF, especially in those with HFREF. Guidelines currently recommend restricted dietary intake of sodium in patients with HF. The degree of fluid and salt restriction during acute hospitalization is decided based on the urine output and hydration status. In patients with decompensated heart failure, the lack of sodium restriction and administration of nonsteroidal anti-inflammatory drugs can result in loop diuretic resistance and worsening of HF. It is often noticed that patients develop decompensation of their heart failure status when they go easy on salt and fluid restriction or skip their medicines. Tobacco control

strategies and modification of alcohol consumption patterns should be advised when needed. Diet advice should incorporate energy requirements, since the basal metabolic rate increases by a fourth in such patients and malnutrition is common. The volume status and electrolyte balance of the patient need to be taken into consideration during planning of diet. Exercise training has been found to be effective in improving the cardiorespiratory fitness of patients with HFPEF without affecting the systolic and diastolic function significantly [14]. This could be instituted once the decompensated state improves during hospitalization and improved upon after discharge.

Management of the Patient: Continued

Mr. AB who was apparently maintaining a compensated hemodynamic profile has presented with decompensation, the precipitants of which could be evidenced from history and investigations. Anemia due to GI blood loss, possibly related to ASA, possible noncompliance with night dose of Lisinopril, obstructive sleep apnea, and recent development of atrial fibrillation seems to have resulted in his present clinical state. In addition, his wife also revealed that he occasionally took over-the-counter analgesics for osteoarthritis. A blood gas revealed hypercarbia too, and the initial management involved positive pressure ventilation. Nitroglycerin infusion could help to decrease the pulmonary venous congestion. Intravenous loop diuretics along with potassium sparing diuretic (eplerenone/spironolactone) or oral potassium supplementation with cautious monitoring of electrolytes and renal function could be instituted. Potassium sparing diuretics do not accord any survival benefit in patients with HFPEF, but in such situations might help to optimize the loop diuretic dose in the background of hypokalemia. However, the decision to continue with these groups of diuretics should be with caution, in the presence of reduced GFR. The patient's cardiac conduction abnormality has apparently worsened or has been affected by the metabolic abnormalities as suggested by the regular paced rate of 60/min. Patients with HFPEF rely significantly on the atrial booster pump action and become severely symptomatic with the onset of atrial fibrillation. The pacemaker could be programmed to faster rates so as to improve the cardiac output. Attempts at restoring atrioventricular synchrony might also be made if the patient's clinical status does not improve, and restoration of sinus rhythm might help in presence of the implanted dual-chamber pacemaker. Packed cell transfusion and optimizing antihypertensive regimen by adding on another class of medicines—beta blockers (which are acceptable since there is an implanted pacemaker)—are important considerations at this stage. Prophylaxis against venous thromboembolism might be initially restricted to non-pharmacological methods like elastic compression stockings till the evaluation of GI blood loss is complete. Monitoring weight daily adds important information to volume status of the patient. Sleep studies should be undertaken at discharge, and domiciliary positive pressure ventilation strategies may be planned. Counseling about diet, adjusting the timing of medicines, information about monitoring weight, avoidance of unsupervised nonsteroidal anti-inflammatory agents, planning the anticoagulation strategies after assessing the bleeding risk, close monitoring of renal function, and preventive strategies for postural falls should be incorporated.

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Osteoarthritis

18

Vasi Naganathan

Key Points

- Osteoarthritis is a very common disabling condition in older people.
- Obesity and injury are common risk factors.
- Non-pharmacological treatment is equally important to pharmacological treatment.
- Other pathologies should be excluded before making a diagnosis of OA.

Case Study

Case Study: Mrs. Mavis Reynolds is an 83-year-old lady who lives alone. Her husband passed away 6 months ago. She comes to see you because she is getting more pain in her knee that is limiting her function. She had a vertebral fracture as a result of a fall 12 months previously and is concerned about having another fracture. Her comorbidities include chronic heart failure, type 2 diabetes and peptic ulcer in the past. On examination she has evidence of bilateral osteoarthritis of the knees (bone deformities, crepitus and restriction of knee flexion and extension) as well as quadriceps wasting and weakness. She walks with the aid of a pick-up frame.

18.1 Introduction

Osteoarthritis is one of the most common diseases in older people. A longitudinal study in the United States concluded that nearly half the adults in the population of interest

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would develop symptomatic knee osteoarthritis by age 85 years [1]. Symptomatic hand osteoarthritis is more common, while symptomatic hip osteoarthritis is less common. A recent systematic review on the risk factors for knee osteoarthritis in adults aged 50 and over found that the main factors associated with onset of knee pain were being overweight (pooled OR 1.98, 95% confidence intervals (CI) 1.57–2.20), obesity (pooled OR 2.66 95% CI 2.15–3.28), female gender (pooled OR 1.68, 95% CI 1.37–2.07) and previous knee injury (pooled OR 2.83, 95% CI 1.91–4.19) [2]. It was determined in patients with new onset of knee pain 5.1% of cases were due to previous knee injury and 24.6% related to being overweight or obese. Osteoarthritis is a one of the main reasons or contributing cause for functional limitation and disability in many older people [3] as well as having a significant detrimental effect on quality of life [4]. The main goals of osteoarthritis management are to minimize pain and maximize function.

18.2 Osteoarthritis

18.2.1 Assessing a Patient with Osteoarthritis

Patients with pain due to OA generally describe pain that is worse with activity, with limited morning stiffness (<30 min) and stiffness with rest. On examination the key things to look for are bone enlargements, crepitus and reduced range of movement in the affected joints. One of the most important aims in assessing someone with possible osteoarthritis is to make sure that the pain and disability are due to osteoarthritis and not some other pathology or co-existing condition. For example, knee osteoarthritis needs to be differentiated from an inflammatory anthropopathy. For knee OA some of the important symptoms and signs to be aware of are that a "locking" sensation at the knee could be due to loose bodies or meniscal lesions. Effusions can be present but usually the joint is not hot or red. Quadriceps weakness is important to identify because it may require specific treatment. Hip pain could be due to hip osteoarthritis, but conditions such as trochanteric bursitis, avascular necrosis or even referred pain from lower back pathology need to be thought of. Facet joint arthritis is a common reason for back pain in older people, but osteophytes and disc degeneration can lead to sciatica nerve compression. It is important to ask about sciatica-like pain and examine for signs of nerve compression.

Pain assessment is very important. Acute onset of pain for short duration is less likely to be due to osteoarthritis but could still be due to a "flare" of chronic osteoarthritis. The disability as a result of OA needs to be established. Apart from the use of validated tools to determine activities of daily living, it is important to ask specifically about what activities are affected by symptoms and diminished function in affected joints. The Western Ontario and McMaster Universities Arthritis Index (WOMAC) is an example of a validated tool used widely in the research setting that can be used as a guide to the type of questions that can be asked to assess pain, stiffness and function [5].

In older patients it is important to undertake a comprehensive geriatric assessment to both fully understand the context and impact of OA because many factors

will influence the management of OA. For an example, a comprehensive assessment may reveal that exertional dyspnea due to heart failure is the main limitation on physical function rather than OA of the knee or vice versa, which has implications for treatment priorities. Older people are at higher risk of adverse effects due to non-steroidal anti-inflammatory drugs often due to the co-existence of comorbidity such as chronic renal failure, peptic ulcer disease or chronic heart failure. Cognitive impairment can influence pain perception. It can be difficult to gauge how much OA pain someone with dementia has which can lead to under- or overtreatment. It may be important to get information from family members and caregivers. Simple questions can be helpful in determining the impact of OA in terms of pain and function such as "how much pain do they look like they are in?" and "how much is the knee problem impairing their everyday function?"

It is not necessary to undertake many investigations in the assessment of OA. The diagnosis is primarily a clinical one and can usually be made on the basis of history and clinical examination. Radiographs are not always required. CT and MRI scans are useful to exclude avascular necrosis, stress fractures or osteomyelitis. Laboratory testing is mainly to look for other treatable conditions that may present in similar ways to OA or exacerbate the symptoms of OA such as gout.

18.2.2 Management of Pain and Functional Impairment Due to Osteoarthritis

The management of OA is focused on pain relief, maximizing function, reducing the impact of disability and quality of life. In older people this is often in the context of a comprehensive Geriatric Assessment and Management Plan. OA-specific treatment can be non-pharmacological, pharmacological or surgical [6, 7]. In older people it is likely that the management will involve a number of strategies.

18.2.2.1 Education and Psychosocial Interventions

Talking to the patient and their family about the nature of OA is important. Patient may find it reassuring to know that OA is not rapidly progressive but need to know that there is no cure. The importance of non-pharmacological interventions such as exercise needs to be emphasized and realistic goals set in collaboration with the patient.

The psychological health of the patient is important to assess. The importance of psychological interventions in treating chronic persistent pain should not be underestimated [8]. There is good evidence for the role of cognitive behaviour therapy in chronic persistent pain in adults of all ages and a few trials specifically in older people showing that it is acceptable, people are adherent to the self-management strategies they are taught and there are clinical benefits [9]. Mood disorders such as depression are important to look for. Successful treatment of underlying clinical depression can sometimes result in dramatic improvements in pain and functional impairment that were initially thought to be due to mainly OA.

18.2.2.2 Weight Loss

Epidemiological studies have shown that obesity is a risk factor for knee OA, and BMI is a risk factor progression of OA of the knee. A systematic review found that weight reduction in obese patients with OA of the knee is effective in reducing pain and disability [10]. A clinical trial specifically in older adults aged 60 and over with a body mass index of >28 kg/m^2 and knee OA found that moderate weight loss plus moderate exercise resulted in a greater improvement in self-reported measures of function and pain and measures of mobility than either intervention alone [11]. There is less evidence for weight loss in obese people with OA of the hip.

With regard to older people and weight loss however, things are not so simple. In non-obese older people, epidemiological data would suggest that weight loss could be harmful [12]. Many older people with symptomatic OA are frail and/or have sarcopenia where maintaining weight and even increasing weight for overall health benefit, physical function and quality of life are the priorities rather than weight loss for OA. In addition, there is increasing recognition that some older people have sarcopenic obesity in which obesity due to high fat mass is accompanied by relatively low skeletal muscle mass and muscle strength [13]. Currently there is not enough evidence to give precise advise on the best type of exercise programmes in combination with dietary interventions that should be recommended to people with sarcopenic obesity let alone with OA as well [14].

18.2.2.3 Exercise

Quadriceps weakness is common in people with OA of the knee, and there is evidence for the benefit of quadriceps-strengthening exercise for knee OA [15, 16]. A systematic review that included ten clinical trials found that land-based therapeutic exercise programmes can reduce pain and improve physical function in people with symptomatic hip OA [17]. With older people in mind, there is evidence that home-based exercise intervention and hydrotherapy can help with symptoms of knee and hip OA [18]. The intensity of exercise should depend on what the older person can tolerate and remain adherent to as there is no strong evidence that high-intensity exercise is more effective than low-intensity exercise [19]. The limitations of the evidence are that few trials have been specifically been conducted on older frail people and most trials have been of short duration. Many of the exercise trials in older people have been aimed at preventing falls. There is evidence to suggest that lower-extremity OA increases the risk of falls [20] and there is good evidence that the strength and balance exercises (that may be prescribed to help OA) will also reduce the risk of fall [21].

18.2.2.4 Other Modalities

A single-blind trial showed that a walking stick diminished pain and improved function in patients with knee OA [22]. There is some evidence that therapeutic ultrasound may be beneficial for patients with knee OA although the quality of evidence is low and magnitude of effects on pain and function are uncertain for ultrasound [23]. There is conflicting or less evidence for the benefit of diathermy, electrical stimulation, bracing, heel wedges, orthotics, magnetic stimulation [15] and

acupuncture [7, 24], but it has been shown that even placebo treatment can be effective in treating OA for pain, stiffness and function [25] so these treatments should not be discouraged if patients say they are clearly helping and not impacting the patient adversely in terms of time, inconvenience or expense. After all, most of these treatments are safer than the pharmacological treatment described below.

18.3 Pharmacological Agents

Pharmacological agents used in OA are aimed at relieving pain rather than altering the disease itself.

18.3.1 Topical Non-selective Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Topical NSAIDs are seen as an appealing therapy to prescribe to older people because of the concerns about traditional oral NSAIDs in older people. Results of the trials are mixed with a recent systematic review suggesting that for diclofenac and ketoprofen, about six people out of ten with painful knee OA had much reduced pain after 6–12 weeks, compared with five out of ten with topical placebo (moderate quality evidence) [26].

18.3.2 Paracetomol

Paracetomol is often the first-line oral medication used to treat pain due to OA especially in older people because of its favourable side effect profile. It is the first-line recommendation in many of the of the OA guidelines. Recent evidence however from clinical trials and systematic reviews has questioned the efficacy of paracetomol in knee and hip OA [27], and observational studies questioned the safety of regular high-dose paracetomol because of gastrointestinal and cardiovascular toxicity [28].

18.3.3 Oral Non-selective Non-steroidal Anti-inflammatory Drugs (NSAIDs)

Clinical trials would suggest NSAIDs are marginally more effective than paracetomol in treating pain [29]; however, few studies have assessed their efficacy beyond 6 months. There is a feeling that oral NSAIDs are more effective in an acute flare of OA pain especially if there is substantial inflammation. Many older patients will report that NSAIDs are what provide them with the best pain relief when they have a "flare" of OA pain. It is worth first exploring whether topical NSAIDs are just as effective for them. The risk of gastrointestinal, renal and cardiac side effects (particular heart failure), drug interactions particularly with angiotensin-converting enzyme inhibitors and angiotensin receptor blockers is why there is a reluctance to prescribe these drugs to older people especially if there is history of peptic ulcer disease and

renal or hepatic impairment or if the patient is also taking aspirin. The use of oral NSAIDs is therefore an individualized decision weighing up the risks and benefits. If they need to be used, then it is better to use them on a need basis, for short duration, at the lowest dose possible, co-prescribe a proton pump inhibitor or misoprostol and discontinue if an intercurrent illness develops.

18.3.4 Cyclooxygenase-2 Inhibitors (Coxibs)

In older people there are similar concerns with the coxibs as there are with non-selective NSAIDs. The possible lower risk of ulcer complications may be counterbalanced by a higher risk of cardiovascular complications. The same suggestions as described for the NSAIDS above apply for the coxibs including co-prescription of gastroprotective agents.

18.3.5 Opioids

Opioids are increasingly being used to treat chronic pain and specifically chronic pain due to OA in older people. Despite this there have been no clinical trials specifically looking at the benefits and harms of opioids to treat OA in older people. The trials done in younger people have shown that they are effective in terms of decreasing pain, but as one might expect, patients receiving opioids (oral or transdermal) were much more likely to withdraw due to adverse events [30]. In practice it may be worth a trial of oral oxycodone or transdermal opioids but not at the expense of non-pharmacological means to manage OA and closely monitoring of benefit versus harm. The problem with tramadol- and codeine-based opioids is that they are less effective in terms of pain relief but are just as likely to result in adverse effects.

18.3.6 Intra-articular Corticosteroids and Intra-articular Hyaluronic Acid

The idea of local treatments compared to oral medications in older people with multiple comorbid conditions and polypharmacy is attractive especially if there is a one or two predominantly symptomatic large joints with OA. A recent systematic review and network meta-analysis comparing pharmacological treatments for knee OA found that intra-articular hyaluronic acid was the most efficacious treatment based on effect size on pain over a short duration [31]. Other guidelines have been less certain of the benefits [30]. Intra-articular corticosteroids were also of benefit compared to placebo but again only for a short duration. What is interesting is that the data suggested that some of this superior efficacy could be explained by the integrated intra-articular placebo effect. Intra-articular placebo has an effect size greater than that of oral NSAIDs. In practice, patients report a range of responses to intra-articular injections that range from immediate relief that lasts for months to no response at all. There is much less data on intra-articular injections for OA of the hip.

18.3.7 Disease Modification

Most guidelines do not recommend medications such as chondroitin and glucosamine for disease modification because of uncertainty of the results of trials due to a number of factors including mixed results, small effect sizes when large high-quality studies were pooled and inconsistency in result between industry-sponsored and independent trials [30].

18.4 Surgical Modalities

There is limited evidence for arthroscopy with debridement for symptomatic knee [32]. The evidence is weak or limited for osteotomy or partial replacement of unicompartmental knee OA [7], although there is a thought that osteotomies can provide effective pain relief. They tend to be done in younger patients with the aim of delaying the need for joint replacement surgery.

Joint replacement surgery can provide effective pain relief and improvement in function for many older patients with knee or hip OA [33, 34]. Since the joint replacements have a finite longevity, there is a thought that surgery should be delayed for as long as possible to minimize the chance of needing revision surgery. Many older people with severe pain and/or restriction in function however may benefit from immediate improvement in quality of life that is possible with joint replacement and may be less concerned about the potential for revision. In older frail people, their perioperative risk is clearly an important consideration when weighting up the pros and cons of joint replacement therapy. One of the most important considerations however is whether the patient will be able to undertake the level of rehabilitation that is required to gain reasonable function of the replaced joint.

18.5 Clinical Vignette

The assessment of worsening pain in the right knee should be to confirm that the diagnosis is an exacerbation of knee OA and assess for any other condition that may be responsible for the increased pain in the knee such as acute gout, septic arthritis or un-displaced tibial plateau fracture. Regular paracetomol can be tried first to help the pain. Based on the latest concerns about long-term paracetomol use, this may only be for a finite period of time. Topical NSAIDs can also be prescribed during the acute exacerbation of pain, but there would be a reluctance to prescribe oral NSAIDs or coxibs given the comorbidities of chronic heart failure and previous peptic ulcers. Opioids may be considered if the pain is still severe but with close monitoring for adverse effects and with aim to use them for the shortest period possible. Muscle-strengthening exercise with a focus on quadriceps exercise should be taught to the patient along with balance exercise with the aims of improving pain and function limitation due to OA and decreasing risk of falls. The key considerations that need to be taken into account when thinking about whether a total knee replacement would make a difference to her quality of life are her perioperative risk

due to her heart disease and her ability to participate in rehabilitation after the joint replacement which could be limited by the fact that she has OA in the other knee and has chronic heart failure.

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Ethics and the Care of the Elderly

19

Michael Lowe

Key Points

- While people across all cultures agree about the value of respecting elderly people, levels of elder abuse in most communities are high.
- Elderly people require access to appropriate care in all settings and hospitals need to be more 'friendly' to elderly people.
- In many cultures, dementia is seen as a form of mental illness rather than a neurological condition, and this means that it is widely stigmatized and often hidden.
- It is possible for elderly people to express their future wishes in advanced care plans so that their wishes will be respected, even if they develop dementia.
- There is a need for increased advocacy for the needs of elderly people.

Case Study

MS is an 82-year-old Indian man living with his son and daughter-in-law in a large city in Australia. He was brought to Australia by his son 3 years ago after the death of his wife as neighbours reported that he was not being cared for well. He now lives in a self-contained flat under his son's house and has gained permanent citizenship—which means he is eligible for government-subsidized healthcare.

Both MS's son and daughter-in-law work and are away from home from 8 a.m.–7 p.m. The old man is left alone by himself during the day and spends his day pottering around his flat. He also appears to drink several whiskeys each day. Recently he has become more confused. He has been in some shouting matches with his son and on one occasion placed his hands around his son's neck. He

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usually supervises the grandchildren at home each day after school but has become more irritable and angry with them.

MS has a visit each day from a home-care provider who helps with showers and reminds him to take his medications. Recently, the care provider has suggested that he should start going daily to a respite centre at a nearby residential aged-care facility (RACF) or consider full-time placement in a RACF. The son and daughter-in-law would be happy for him to have respite care but would like to avoid RACF placement if possible. Nonetheless, they have been urged to start the paperwork for this, in case their options become limited. They have looked into paying for full-time carers, who are too expensive for them, and they have also looked into getting a family member from India to help care for MS. They cannot afford for either wife or husband to stop working.

Both feel that the family should be caring for MS but cannot see a way to manage this in their current living situation.

In this chapter, we will look at ethical issues in the care of elderly people. Definitions of who is 'elderly' vary from population to population. In Australia, the definition of the elderly currently refers to people aged over 65 (although some government departments use the population of people over 70 instead). Aboriginal people in Australia aged over 50 are regarded as elderly. In countries such as India and Malaysia, people are regarded as elderly when they are 60 or over.

Ethics can also be defined in a range of different ways: one approach is that the field of ethics looks at what we *should* do. If we think about it in this way, then the aim of this chapter is to understand how we *should* provide care for the elderly. In the case study above, the family of MS are faced with the ethical question of how they should care for the old man. One of the hallmarks of ethical questions is that people feel strongly about the outcomes [1]. It is possible that no matter what approach his family find for the care of MS, they may feel guilty themselves or be told by family members or those outside the family that they have done the wrong thing.

As a general principle, the clinical care of an elderly person should be based upon an honest and sympathetic attempt to come to terms with the individual problems that each old person and their family face. This requires good communication skills, adequate time, the provision of appropriate resources (including hearing devices and translators where necessary), good clinical skills and knowledge and some insight into the living conditions of each elderly person, as well as good faith on the part of the doctor or therapist in approaching the patient's difficulties with a patient-centred focus. There is also a tradition in geriatrics that the best way of understanding a patient's living condition often includes home visiting as a way of understanding his or her social and environmental context.

19.1 Respect for the Elderly

Most societies pride themselves on the way that they provide care and respect for elderly people. Yet in all societies, there are elderly people who do not have access to family supports and who may not receive the social care they require. For

example, Janice Reid has written about the role of elderly people in aboriginal societies (the Yolngu people) in Northern Australia:

> The treatment and status of the elderly is probably no more uniform in Aboriginal society than it is in Western societies. Differences between the fortunes of individual elders largely reflect their personalities and their differential location in the economic, political and social structures. Some old Yolngu today have been able to take advantage of the direction of social change to enhance their status and material security; others have been bypassed or marginalized by the forces of modernization and seen their fortunes dwindle with their age…[A major theme] relating to the care of the aged seems to be the importance of having someone willing to take on a caring role. 'Big men' have young wives or caring children; many women have their children or co-wives, but aged widows, widowers or bachelors may have had no-one to nurse them at the end [2].

The same is likely to be true of most other societies—elderly people who have built up stores of social capital in their lives, through families, friendship and other social structures around them, are likely to do well as they age and be supported and respected in the ageing process. People who have become isolated in their lives—whose families have died or lost contact, who have been heavy drinkers or experienced mental illness or whose families are unable to manage for some reason—are not likely to have good social resources as they grow older.

Trajectories of ageing are greatly mediated by cultural differences. For example, in India, the notion of kinship stipulates that it is the duty of a child—particularly a male child—to provide support for parents in their old age, traditionally in the form of co-residence. About 60% of elderly men, and 25% of elderly women live with their spouse, children and grandchildren; 12% of men and 45% of women live in the same situation but without their spouse. About 2% of elderly men and 10% of elderly women live alone [3].

Living with children and grandchildren gives older people social and financial support, as well as providing them with a social role. These advantages are missing for those who live alone but also for those who live only with their spouse (20% of elderly men and 11% of elderly females in India) [3]. The difficulty that comes from elderly couples living separately to their families is not something that is discussed greatly in the West, where couples living alone are seen as almost the ideal living arrangement for the elderly.

19.2 Elder Abuse

To escape from the experience of abuse is one of the reasons why elderly people may want live alone. Elder abuse is both a consequence of the increasing powerlessness of some elderly people as they age and is a reflection of wider experiences of family abuse in most societies, including such forms of abuse as child and spousal abuse.

Elder abuse is sometimes divided into:

- Financial abuse
- Physical abuse

- Sexual abuse
- Psychological abuse
- Social abuse
- Spiritual abuse
- Neglect

Of course, one form of abuse can easily lead to another, such as when an elderly person is asked for money, refuses and then is pushed over or physically abused.

Elder abuse is unfortunately common. In a study of elderly people in New York, the past-year prevalence of elder emotional abuse was 1.9%, of physical abuse was 1.8% and of neglect was 1.8%, with an aggregate prevalence of 4.6%. Emotional and physical abuse were associated with being separated or divorced, living in a lower-income household, functional impairment and younger age. Neglect was associated with poor health, being separated or divorced, living below the poverty line and younger age [4]. In a community-based study in urban Chennai of 400 community-dwelling older adults, the prevalence of mistreatment was found to be 14%. Chronic verbal abuse was the most common followed by financial abuse, physical abuse and neglect. A significantly higher number of women faced abuse as compared with men, adult children, daughters-in-law, spouses, and sons-in-law were the prominent perpetrators [5].

19.2.1 Hospital Care of the Elderly

Elderly people are hospitalized at higher rates than young people, have longer average admissions and have higher rates of complications. Yet acute care hospitals are often said to provide an inappropriate setting for the care of elderly people. As Nichol and Wilson note:

> The acute hospital is a dangerous place for frail elderly people, which should act as a stimulus to improving the safety of patients through better hospital design, improved staffing levels and mix and improving standards of catering and cleanliness. [6].

While hospitalization may be dangerous for elderly people in itself, lack of access to hospitalization may also be a problem, as may be lack of access to appropriate care within hospitals. Care in the hospital system is often accessed through long waits in crowded waiting rooms, uncomfortable and disorienting stays in emergency rooms and long periods of waiting on trolleys in corridors. Inadequate public hospital infrastructure in many countries means that there is sometimes little that can be done to alleviate these stresses. In some countries, the government has tried to improve the experiences of elderly people in hospitals through policy, for example, the Indian government has mandated that elderly people should be able to wait in separate queues and have some beds reserved for them [7].

In the United States, emergency departments specifically designed for elderly people are now opening in many places. These aim to decrease noise and sensory overload, increase day/night orientation and decrease the rates of falls and disorientation

through better design. Existing emergency departments can also be made more 'geriatric-friendly' through attention to factors such as noise and lighting, decreasing falls risks, education of staff about recognition of delirium and management of cognitive deficits and through provision of elderly liaison nurses and increased allied health services to improve care and better coordinate discharges [8].

19.3 Dementia

The leading risk factor for dementia is increased age. As elderly people age, their risks of dementia rise, and as societies throughout the world age, the prevalence of dementia will continue to rise. In the Asia-Pacific region, the number of people with dementia is predicted to increase from 23 million in 2015 to almost 71 million by 2050. That means that by 2050, more than half of the people with dementia worldwide (135 million) will live in this region [9].

Discussions of the ethics of dementia care in Western countries include considering when people should transfer care from families to institutional settings, how people with dementia should be managed in acute care settings and how the decisions that someone takes before they have dementia can carry over to when they are no longer competent to make decisions. As with other elderly people, issues of powerlessness, exploitation and abuse are also important with this group of people.

Shaji has suggested that the following issues are common to dementia care in developing countries:

1. Dementia is a hidden problem and is underestimated.
2. Dementia is not thought of as a health condition.
3. Dementia is a stigmatized condition.
4. Traditional care is under strain.
5. The problem of care burden is not acknowledged properly.
6. Healthcare systems are not sensitive to the needs of people with dementia.
7. Lack of development of services [10].

Shahji's discussion of his first three points centres largely on the issue of stigmatization. The behavioural disturbances that occur with dementia may often be interpreted as 'craziness', and so dementia is stigmatized as part of a wider stigmatization of mental health in general. A common response is to hide people away, but with inadequate resources available for respite care, people with dementia may be looked after by family members or untrained servants when trained carers are unavailable. For many people, 'The simplest way out is to lock them up in their houses' [11].

Another of Shaji's points is that traditional care is under strain. As Western lifestyles emerge in developing countries, family members may migrate away, and it is more common for women to work and for families to break up. This places elderly people at risk of having no one to care for them.

Institutional care is starting to be more common in Asian countries but is still widely stigmatized. In Australia, ethnic groups such as people with Chinese and Indian heritage continue to care for elderly people at home—often until late in the disease process. Institutional care is probably less stigmatized in these groups in Australia than it is in their home countries, and people from these ethnic groups appear to be finding that there is a place for high-quality institutional care.

An alternative to institutional or family care is also possible in countries where labour is affordable. Many middle-class or well-off families can afford to hire 24-h care by trained care workers in the home. Such care is simply not possible in Western countries because of the cost. This sort of care may provide a more culturally appropriate care model for those who can afford it than institutional care.

In Western countries, institutional care has a particular role to play in people with dementia—including those with behavioural and psychological symptoms of dementia (BPSD). Among people with dementia in India, BPSD are common and cause significant distress to patients and carers [12]. And yet BPSD should be manageable in most cases with adequate education about behavioural interventions, appropriate medication and provision of respite for caregivers.

19.4 People with Impaired Mental Capacity

People who cannot make decisions for themselves may be referred to as having ‘impaired capacity’ or ‘decreased mental competence’. We will use these terms interchangeably.

The terms ‘capacity’ and ‘mental competence’ refer to a person’s ability to take in information that is important for some reason, understand it, come to a decision about what should be done and express that decision. Different cognitive abilities are required for different types of information and different types of decision. For example, a person’s ability to make a will (the so-called testamentary capacity) depends upon a person having long-term memory so that they know who they have debts to and an understanding of their current possessions and financial situation. By contrast, a person’s ability to consent to an operation requires the ability to understand the proposed procedure and weigh up the risks and benefits of undergoing it.

People with dementia do not automatically have impaired capacity for all decisions. The approach to judging whether a person has impaired capacity for a particular decision is based upon firstly talking through the particular decision at hand and then also supplementing this information with a more general cognitive examination. It is important not to confuse the assessment of competence with the assessment of cognition—a person with mental illness may have excellent cognition but may not be competent (e.g. if their decision is being driven by a delusion). A person with poor cognition may be competent for some decisions (such as the appointment of a wife or child as their surrogate decision-maker). However, among elderly people, where the prevalence of dementia is high, disorders of competence and cognition often go hand in hand.

There has been an ongoing debate in ethics as to whether the degree of competence that a person needs to make a decision depends primarily on the complexity of a decision or upon the severity of the consequences of a decision. A useful approach is that the more complex a decision is, then the more cognitive skills are required to come to an outcome. However, the more severe the outcomes of a decision are, the more certainty the assessor should be in their judgement of the person's competence. For example, if a person has to decide whether their leg should be amputated—and it is clear that they will die if they do not—then this is in many ways a very simple decision, and many people with very limited cognitive status would be able to understand this choice. If, however, a person refuses the operation, then a consultant who is asked to assess their competence would want to be very certain that the person was competent, since the consequences of refusal would be so severe. It is important to note that there is no test or questionnaire that absolutely assesses a person's competence—and this assessment will always be to some extent subjective.

19.5 Who Can Make Decisions for People with Impaired Capacity?

If a person is found to be not competent to make a decision, then the usual practice in Western countries is firstly to search for a relevant advance care directive, and if one is not found, then proceed to make decisions through the use of a surrogate decision-maker [13]. Advance care directives are uncommon in many countries (see below) so the use of surrogate decision-makers is the more usual approach.

Different authors use different terminology around the concept of surrogate decision-making. In this chapter, 'surrogate decision-making' refers to any situation in which another person makes a decision for a person on the grounds of the person's lack of capacity. A 'substituted judgement' refers to when surrogate decision-makers attempt to use their own knowledge of the person who lacks capacity and to make a decision that the person would have made himself/herself. This process may also be called 'substituted decision-making'.

There are a number of ways that surrogate decision-makers can make decisions or assist in decision-making for people with impaired capacity. The organization 'Alzheimer's Australia' suggests that surrogate decision-makers can modify the decision-making process through a hierarchy of responses that escalate as the capacity of a person with dementia decreases [14]. Some of the ways that decision-making can be facilitated include:

1. Assisted decision-making, which may involve simple things such as taking the person to meetings and making sure they understand documents
2. Supported decision-making, which may involve exploring and explaining issues but allowing the person to make the final decision
3. Substituted decision-making, which involves making decisions on behalf of the other person

Both assisted and supported decision-making are important tools in helping people with dementia, but a caveat must include that they should not involve elements of coercion. In some jurisdictions, court-appointed guardians must make decisions 'in a person's best interests' rather than through substitute decision-making.

The most natural people to make decisions for those who have impaired cognition are their close family members. Many elderly people trust their partners and family members to make decisions for them in the belief that the family's decisions are most likely to reflect their own wishes and values [15, 16]. Family members do generally try to do the right thing for their loved ones and are often more accurate than physicians at predicting patients' preferences for treatment.

However, family members may also have mixed motives—and it is relatively common to see younger family members exploiting elderly people who have diminished capacity by stripping them of financial and other assets, attempting to have them change wills in the relatives' favour or acting in other ways that do not seem in the person's best interests. Another way that family members sometimes appear to act against an elderly person's interests is when a relative insists that 'everything be done' including futile surgery and other procedures, and this seems to be not for the patient's best interests, but rather so that the relative can defend themselves from the judgement of other family members. Finally, families may often disagree about the care of an elderly relative.

In situations where there are no appropriate surrogate decision-makers, or where surrogate decision-makers do not appear to be acting in the elderly person's best interests, it may be possible for a legal guardian to be appointed, including a public guardian where no suitable family member or friend can be found. In many jurisdictions, there is provision for separate management of financial and property matters and health and social matters. In some jurisdictions, such as India, guardianship of elderly people with dementia comes under mental health legislation (http://keralalaw.blogspot.com.au/2010/02/laws-relating-to-guardianship-in-india.html), whereas other jurisdiction such as those in Australia subsumes people with psychiatric illness, those with developmental disability and those with dementia under legislation based on impaired decision-making capacity rather than 'mental health'.

Given the long-time interval required to settle many legal applications for guardianship, and the fact that increasing numbers of people have no suitable relatives available, it is not uncommon that people with impaired capacity have no one available to make decisions for them. In these situations, health workers need to rely on 'common law' arguments to justify treating people. Common law in many countries has provision to treat people without consent if doing so will save their life or save them from significant injury. This is sometimes used to argue, for example, that a person with impaired capacity but without a legal guardian should be held in hospital against their will, as they would be likely to come to major harm if they left.

19.6 Advance Care Planning

'Advance care planning' is the process whereby a person who is still capable of making decisions sets down their preferences for what should happen if they lose decision-making capacity. The idea of advance care planning started with decision-making around cardiopulmonary resuscitation and the provision of no-CPR orders. Advance care planning continues to be often linked with questions of end-of-life planning. In Western countries, there is a wide public support for the idea of advance care planning, and some types of advance care planning—such as decisions to withhold CPR—may be legally binding.

Non-Western countries often have different views of this. For example, Htut and colleagues interviewed elderly Malaysians about advance care planning and found that although the majority agreed on the importance of planning for future medical management and having open discussion on end-of-life issues with their doctor, they felt it unnecessary to make a formal written advance directive. According to Htut, 'Most felt that the future was best left to fate or God, and none had made any contingency plan for severe future illnesses citing religion as reason for this view' [17].

It seems unlikely that end-of-life decision-making, in the Western sense, will have much impact in cultures where end-of-life circumstances are thought primarily to arise from the will of God. However, advance care planning in other areas—such as financial planning and discussions about preferences for care if a person becomes demented—might still gain some support.

Conclusion

In this chapter, we have looked at various ethical issues involved with the care of people, and tried to look beyond Western constructs, with an emphasis on South Asia. There is a major debate in ethics about the role for Western ethical thought in other cultures, and there seems to be both rooms for some Western ethical concepts and a place for non-Western ideas of ethics.

One of the major differences between ethics in the West and elsewhere is that different topics have prominence in different places.

The question of whether the future is best left to fate or God is a good example of this—it is not something that usually enters Western discussions of end-of-life care but may be a major underlying issue in non-Western discussions.

Another area that is different in emphasis between non-Western countries and Western countries is the stigmatization of dementia by including it as a 'mental illness'. Whereas, in many developing world countries, dementia is stigmatized by its association with mental illness, in the West, dementia, like other disorders with an organic basis (including epilepsy, developmental disability and, more recently, substance abuse), has been distinguished from 'mental illness'. Laws in countries like Australia make distinctions between an 'incapable person' (through 'mental infirmity') and a 'mentally ill person'. The 'mentally ill' person requires care, treatment or control for his own good or the public interest, whereas the mentally infirm

person is only incapable of managing his own affairs and not in need of treatment or control [18]. Guardianship, originally intended for the protection of the affairs of minors, has become the standard approach for managing the affairs of people with dementia, while mental health legislation—with its greater emphasis upon control—is used for those with other mental illnesses.

In Australia, organizations such as Alzheimer's Australia appear to have been successful in decreasing the stigmatization of dementia, in part through severing its link in the public mind with mental illness. While it can be argued that this sort of redefinition does nothing to affect the main problem of the underlying stigmatization of mental illness, in countries like Australia, dementia, now freed from its links with mental illness, gets increased public visibility and support, and those with dementia are treated more with sympathy than with fear.

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Advance Care Planning

20

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Key Points

- Advance care planning (ACP) has potential personal, societal and economic benefits; however, uptake remains low and variable.
- Any healthy, competent older person can participate in ACP, but it is particularly important for those with complex health needs.
- Optimal time to initiate end-of-life discussions depends on the circumstances of each individual.
- Patient understanding of current and future health status and their general values and goals of care should be elicited, including how the person would want decisions to be made, who they would want to make decisions and their most important priorities.
- Patients should be encouraged to nominate a substitute decision-maker and document their preferences in a care plan that can be shared with all members of the healthcare team, reviewed and updated regularly.

Case Study

Mr. J. Smith is an 88-year-old retired bank manager who was admitted to hospital from home. He had a history of ischaemic heart disease, myocardial infarctions, atrial fibrillation, permanent pacemaker, chronic renal failure and chronic obstructive pulmonary disease. He had spinal canal stenosis and bilateral knee

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replacements. Mr. Smith was mentally alert and had previous falls at home. His usual medications were warfarin, simvastatin, frusemide, spironolactone, clopidogrel, puffers for his COPD and opioids for his back and hip pain.He lived with his wife, and all the four daughters were very supportive, visiting him very often. During the past 6 months, his mobility was getting worse and he was house bound.Mr. Smith was admitted with shortness of breath and increasing leg oedema. The treatment offered by the cardiology team was to maximize his cardiac failure treatment. In spite of 3 weeks of inpatient treatment, his symptoms and signs did not improve. He developed worsening renal functions when his diuretics were increased. His back pain increased and he developed pressure sores in the heels and gluteal area. His cardiac echo showed aortic sclerosis and severe systolic and diastolic cardiac failure.During the fourth week, the family wanted to keep him comfortable and did not want any more treatment offered to him. They believed his quality of life to be poor and that extending his life would not be appropriate. He was becoming more confused and incontinent of urine and faeces. He became drowsy when his creatinine went up to 400 mml from the preadmission level of 260.

20.1 What Is Advance Care Planning?

Advance care planning (ACP) is a process "whereby an individual, in consultation with family members, health professionals and/or significant others is able to discuss and document decisions about his or her future medical care, in case he or she later experiences loss of capacity" [1]. Capacity refers to a person's ability to understand and apply information to make and communicate decisions [2] across three broad domains: financial (e.g. buying a house), personal (e.g. where to live) and health decisions (e.g. refuse treatment). ACP may take the form of a written instruction describing the care a person would want or not want and the values that guide the person's decisions (i.e. advance directives or living wills) [3]. People may also choose to appoint someone to make medical decisions for them should they lose capacity (i.e. substitute decision-maker) [3].

20.2 Why Is Participating in Advance Care Planning Important for Older People?

Older people represent a group for whom ACP is important for a number of reasons. The number of older people, defined as those aged 65 or over, is expected to rise to more than two billion in 2050 globally. Coupled with this ageing population is a predicted rise in the number of people who die each year [4]. Three patterns of functional decline prior to death are prominent among older people, including (a) steady progression and a relatively clear terminal phase, typical as cancer; (b) gradual decline with intermittent acute episodes with some recovery, typical of organ failure; and (c) prolonged gradual decline, typical of frail older people or those with dementia [5]. Therefore, many are at risk of loss of capacity,

as cognitive ageing and medical conditions such as dementia become more prevalent [6, 7]. Despite this, these capacity issues are not always identified or managed appropriately. For example, a recent systematic review reports that physicians correctly identified only 42% of patients independently judged as lacking capacity to make medical decisions [8]. Older people may also have families living at geographical distance, so they may not have substitute decision-makers readily available to make decisions on their behalf should the need arise [9]. Consequently, while quality of life and avoidance of functional and cognitive impairment are important goals for many older people, end-of-life interventions are often inappropriately aggressive [10]. Further, most older people will die in acute care hospitals and residential aged care facilities, despite many reporting a desire to do so at home [4, 11–13]. This raises questions about the appropriateness of current end-of-life care practices and has led to increasing demand for ways that may assist older people facing death to achieve end-of-life preferences.

20.3 What Are the Potential Benefits of Older People Participating in Advance Care Planning?

An estimated 70% of people will lack the capacity to make decisions at the very end of life [14]. It is then recommended healthcare providers and families work together to decide the best options for the patient, basing this decision on the patient's wishes and values as much as possible [15]. Efficacy studies have traditionally focused on the impact of completing advance directives and do-not-resuscitate orders on patient outcomes and quality of care delivered in institutional settings, with mixed results [16]. Systematic reviews of comprehensive ACP programmes report moderate success in improving communication between patients, families and providers, improving satisfaction with care and quality of life, reducing unnecessary and unwanted medical interventions, reducing hospitalizations and length of stay, improving access to hospice care and increasing concordance between preferred and actual end-of-life care [1, 16, 17]. Expressing preferences in ACP instruments can also ease the emotional and financial burden on those called on to make decisions on another's behalf [1]. ACP may reduce the likelihood that conflict arises between family and healthcare providers about end-of-life decisions as a consequence of differing cultural and moral values, or understanding of their disease [18]. These key others may therefore be more likely to comply with a patient's end-of-life wishes [17]. Associations between end-of-life care discussions and lower healthcare costs have also been reported [1, 19, 20].

20.4 Do Older People Currently Participate in Advance Care Planning?

Despite the potential benefits of advance care planning, rates of uptake are low and variable among older people across a range of settings. In the United States, the rate of end-of-life discussion is as high as 37% for oncology patients, while rates of

completion of advance directives are as high as 70% [19, 21]. However, lower rates for advance directives and enduring guardian appointments have been reported internationally [22, 23]. For example, in an Australian population-based study of 2764 residents in residential aged care facilities, only 0.2% had a formal Advance Care Directive, 1.1% had a not-for-resuscitation order documented in their medical records and 2.8% had an enduring guardian [24]. Only 14% of 171 community-dwelling older people had an advance directive and 37% an enduring guardian in another Australian study [25]. There are a number of factors that may contribute to such poor uptake. Many older people have a poor understanding of their legal rights to plan for future medical decisions [26], their prognosis and the potential ramifications of different medical interventions [27, 28]. There may be disagreement between older people and their substitute decision-makers about end-of-life preferences, or whether discussions have even taken place. One-third of patient-surrogate dyads disagreed about whether a healthcare proxy was completed and whether preferences for treatment had been communicated in one US study [29]. Health professionals working with older people report critical knowledge gaps about relevant law, such as determining capacity and the validity of advance directives [30, 31]. System-related barriers to ACP include gaps in access to health and legal services, particularly for those who cannot afford private solicitors and health insurance [26], a lack of standardized procedures for determining capacity [31], difficulties in storing and retrieving documents as older people transition through multiple care settings [3] and variation in the terminology used and the format and content of documents [31].

20.5 When Should ACP Discussions Be Initiated with Older People?

"One-size-fits-all" approaches to end-of-life care have proved controversial, [15] highlighting the need for flexibility and tailored approaches. In response, some have conceptualized ACP as a phased "stages of change" process that involves transitioning an individual through five steps: (1) *pre-contemplation* (i.e. no knowledge or desire to participate in ACP), (2) *contemplation* (i.e. intention to participate in ACP), (3) *preparation* (i.e. clarifying values, beliefs and goals of care), (4) *action* (i.e. discussing and/or documenting preferences) and (5) *maintenance* (i.e. reviewing and updating preferences) [32]. This suggests the optimal time to initiate discussions depends on the circumstances of each individual. Any healthy, competent older person can participate in ACP, but it is particularly important for older people with complex health needs [33]. A routine visit with primary care, community and home care providers may represent an opportune time to initiate discussions; however, ACP does not occur in a systematic way in the community [34, 35]. For example, GPs are well placed to initiate discussions as older people use these services at a much higher rate than those under the age of 65, and people are more likely to have the capacity to engage in discussions. People expect healthcare providers to initiate ACP discussions; however, providers will often wait for patients or families to raise the topic or perceive these

discussions as irrelevant (i.e. *they are too healthy*) [3, 36–38]. Concerns have also been raised about introducing ACP too early, as people's preferences can change over time [39]. Plans prepared early without being regularly reviewed risk errors in medical care. However, ACP discussions that are delayed until a medical crisis occurs, such as admission to hospital, can place extra burden on all those involved [28]. The likelihood that care preferences are achieved may also be diminished in these circumstances [40].

Suggested Triggers for ACP Discussions May Include [3, 41, 42]:

- Routine health assessments for older people (e.g. the 75+ health assessment in Australia).
- A diagnosis of a chronic or life-limiting illness or serious injury.
- Changes in prognosis of an existing condition (e.g. diagnosis of metastatic cancer).
- A person whose doctor would not be surprised if they were to die within 12 months.
- At admission to an acute care hospital or residential aged care facility.
- Changes in a person's family or living situation.
- A person or family member raises the topic.

20.6 What Process Should Be Followed When Conducting ACP Discussions?

20.6.1 Step 1: Open the Discussion and Gaining Acceptance

While some people will raise the topic with clinicians, most expect their clinician to initiate ACP conversations. Clinicians should begin by providing a clear and concise definition of the purpose and potential benefits of ACP, as not everyone will be aware of these concepts. Consensus-based guidelines for communicating about prognosis and end-of-life issues have highlighted the need to establish rapport and active listening [43]. Discussions should take place in privacy, and when possible, a longer time should be set aside. Clinicians should also avoid the use of medical jargon and use plan English language at all times [43].

20.6.2 Step 2: Gain Patient Acceptance for Discussion

Clinicians should begin by assessing the individual's willingness to have ACP discussions [32]. Not everybody will perceive that these discussions are relevant to them (e.g. *I'm not at that point yet*) [44]. Some older people may find these discussions upsetting, or prefer a more passive role in decision-making. Providers should therefore ask the older person how active a role he/she wants to play in decisions and if the older person would like another person of their choice to be present (e.g. substitute decision-maker) before beginning the discussion [45].

20.6.3 Step 3: Establish Understanding of ACP and Their Current and Future Health Status

People need relevant information presented in a way that they can understand in order to meaningfully participate in healthcare decisions. Clinicians have medical knowledge about options that are available to people at the end-of-life, as well as their potential effectiveness or futility [46]. Many older people lack that knowledge, and what they perceive may be very different from medical reality. For example, in a study of older hospitalized patients' understanding of cardiopulmonary resuscitation (CPR), 45% could not identify what happens during the procedure [47]. Poor understanding of disease and prognosis, coupled with unfamiliarity of the burden or likely outcomes of treatments, can hinder patients' ability to make informed choices [48, 49]. Identifying and correcting misperceptions about health status and treatment options are therefore critical. First, clinicians should establish the person's preferences for information, including the amount and type of information they would prefer to receive. When information is presented in a way that is consistent with preferences and circumstances, it is more likely to be attended to, understood and acted upon [50]. It is important that information provided is tailored to the health literacy, communication and cultural needs of each individual. For example, when consulting with those who are not fluent in English, qualified interpreters may need to be used [51, 52]. It is important to regularly check understanding as people may find it difficult to absorb all the information at once. Evidence-based strategies shown to increase patients' recall and understanding should be used when providing information, including explicit categorization, chunking of information, use of plain language and repetition [53, 54]. Supplementing verbal information with written information can also increase recall and comprehension [55].

20.6.4 Step 4: Elicit the Patient's Values, Beliefs and Experiences

People's goals of care are influenced by their personal beliefs, values and experiences. These may be very different to those of the healthcare provider or family members and should not be judged as right or wrong. Many older patients indicate a preference for comfort care at the end of life; however, a minority may still wish to receive life-extending care [48, 56]. Clinicians must therefore be sensitive to the values and circumstances of each individual when conducting ACP discussions. A stepwise approach to eliciting end-of-life preferences is recommended, given that people's end-of-life preferences may change over time [3, 28, 41]. Relying solely on a person's preferences for specific treatment may also be insufficient to effectively guide care if these choices are not relevant to the particular circumstances being faced. Studies have shown that some people are more likely to avoid more invasive, long-term treatments than less invasive, short-term treatments [57].

Providers should begin by assessing the patient's preferred mode of decision-making, including the involvement of different family members [58]. Patients may vary according to preference for passive (i.e. provider makes decision), shared (i.e.

patient and provider make decision together) or active (i.e. patient makes decision) roles [58]. General values and goals of care should be elicited first [3, 59]. Open questions about how the person would want decisions to be made, who they would want to make decisions or speak on their behalf and their most important priorities if they became sick of injured can help guide discussions. These general values can then be followed up with specific scenarios regarding particular treatment options relevant to the individual's circumstances [42]. People should also be encouraged to identify a surrogate decision-maker and discuss preferences with that person [3]. Without such discussions, the degree of concordance between patient preferences and substitute decision-maker judgements may be low [60]. It is also useful to discuss how much leeway the patient would like her or his decision-maker to have [42]. Decision aids may be used to assist those in the general population making end-of-life decisions, as well as to target disease-specific conditions with predictable end-of-life choices [61, 62]. Allowing a subsequent appointment to discuss and document decisions when feasible may give people the opportunity to absorb and reflect on the information provided before finalizing decisions.

20.6.5 Step 5: Prepare and Complete Advance Care Planning Documents

The transfer of patients' ACP information to medical records is consistently poor among community-dwelling older adults [63], as well as those receiving care in institutional settings [40]. Failure to document preferences is likely to result in poorer adherence to patients' wishes given that multiple clinicians may be involved in a patient's care both within and across care settings [3]. Providers should begin by summarizing and reflecting back what has been discussed to ensure that their own understanding is consistent with that of the older person and their substitute decision-maker. Decisions should then be documented in the medical record and in ACP documents [3, 41, 42]. Substitute decision-makers and/or significant others not present during the discussion should be informed of any decisions made, as well as the location of all relevant ACP documents. Copies of relevant documents should also be made available to other members of the healthcare team (e.g. general practitioner, other specialists), given that poor communication between members of the healthcare team is an oft-cited barrier to effective ACP [36].

20.6.6 Step 6: Review and Update Regularly

A common barrier to ACP participation is the belief that decisions that are made and documented cannot be changed or altered. Providers need to make it clear to patients and their substitute decision-makers that all decisions and associated documents can be reviewed and updated as desired. At the conclusion of the discussion, clinicians should discuss with the person their preferences for revisiting these plans. Again, there is no optimal schedule for reviewing documentation; however, triggers such as changes in health or personal circumstances may prompt a review.

Steps	Example phrases
Open the discussion	• Right now you're healthy. This is a good time to think about your health in the future. It's often easier to talk when there isn't a crisis • Have you heard the term advance care planning? It involves thinking about and planning for your future medical care in case you aren't able to make decisions later • Have you ever thought about your wishes for care in case you became suddenly unwell?
Gain patient acceptance for discussion	• "ACP gives everyone involved in caring for you a clear understanding of your wishes so that you don't get care that you do not want. Would you be interested in talking about what care you might want in the future?" • How do you feel about discussing these issues now? • Is there anyone you would like to be present when we discuss this?
Establish understanding of ACP and their current and future health status	• If you got sick how much information would you want to know about your illness and what to expect in the future? • Have you ever had a discussion with anyone about what you medical care you might want if you became too sick to make decisions? • What do you know about your current health status, and what you might expect over the next 12 months?
Elicit the patient's values, beliefs and experiences	• How much would you want to be involved in decisions about your healthcare? • Is there anyone else you rely on to help you make important decisions? Would you prefer that person to follow your wishes exactly, or to use their own judgment? • What are the most important things that you want your friends, family and/or doctors to know about how you would like to be cared for if you were dying?
Prepare and complete advance care planning documents	• So I think I understand your main goal is to that you don't want to get to the point where you are unable to communicate or recognise your family or friend. Is this right? • It's really helpful if we can write down what we have discussed today so that everyone knows what you your preferences are and how you want decisions to be made. • It's really important that your family are aware that you have prepared these documents and that they know where to find them.
Review and update regularly	• Even though we have talked today about what you might want if your circumstances change, you can always change your mind and we can make a new plan • Let's think this over the next few weeks and talk again when we next meet. • These are decisions that might change depending on how you are going. We can revisit this as often as you want.

Applying ACP to the Case Study

Fortunately Mr. Smith had an enduring power of attorney and advance care plan that was documented well and witnessed by a solicitor. This had been reviewed during the preceding 6 months.

The family advised that he had told them that he did not want to prolong his life, and they wanted him to be kept comfortable if the medical treatment did not improve the situation. They produced a copy of his "enduring power of attorney" witnessed by his solicitor 3 years previously. His wife and eldest daughters were his legal guardians. This document stated the family could decide where he will live, the healthcare he will receive and whether to have or refuse treatment. It also stated if he is in a terminal phase of any incurable illness or in a coma or unlikely to recover, he did not wish to have any medical treatment (even if it was going to prolong his life) other than palliative care. He had clearly stated in the document that in this situation he did not want to receive any artificial hydration or resuscitation.

The family requested all his medications to be withdrawn and he be kept comfortable. The treating team decided that this was the best thing to do and further medical treatment was futile. Mr. Smith received comfort care and was kept pain-free. All blood tests were cancelled and intravenous lines were removed.

He died peacefully surrounded by Mrs. Smith and his daughters. The family thanked the team for caring for him and providing him "good death" after 88 years of good life.

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Additional ACP Resources

Advance Care Planning Australia (http://advancecareplanning.org.au).
Alzheimer's Australia Start2Talk (http://start2talk.org.au).
National Health Service Improving Quality (http://www.nhs.uk/Planners/end-of-life-care/Pages/planning-ahead.aspx).
The Conversation Project (www.theconversationproject.org).
PREPARE (www.prepareforyourcare.org).
Speak Up (http://www.advancecareplanning.ca/).

Palliative Care of the Older Person

21

Susan Newton

Key Points

- Palliative care should be offered to all patients (regardless of age or disease process) who are suffering from a life-threatening illness.
- Older persons have distinct palliative care needs.
- Elderly patients should initially receive smaller or less frequent doses of opioids for pain and/or dyspnoea.
- The diagnosis of dying is a complex and objective assessment of symptoms and signs.
- In the last days of life, routine observations shift from the measurement of vital signs to attending to "vital comforts".

Palliate…Medieval Latin *palliare*: to cloak…to alleviate a problem without addressing the underlying cause.

This chapter is presented as a processional case discussion reflecting the nature of the palliative phase. At the completion of this chapter, the reader should be able to:

1. Define palliation, palliative care and frailty.
2. Recognize the clinical features of a palliative care patient.
3. Recognize the specific palliative needs of the elderly patient.
4. Develop general knowledge of symptoms and their management.
5. Recognize the terminal phase, i.e. "diagnose dying".
6. Implement measures for the provision of comfort.

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Mrs. Good is an 83-year-old widow, a former nurse who lives alone and the mother of a supportive daughter and son. She has a number of comorbidities including type 2 diabetes, chronic obstructive pulmonary disease (COPD), ischaemic heart disease (IHD), congestive heart failure (CHF) and hypertension. Despite excellent compliance and maximal treatment, in the last few months, she has become more fatigued, has lost weight and is less keen to mobilize. At a recent review with her general physician, she and her family were gently told and were accepting of the fact that her illnesses were advanced and that her management focus was entering the "palliative" phase.

Palliative care, as defined by the World Health Organization, is an approach that improves the quality of life of patients and their families facing life-threatening illness, through prevention and relief of suffering, by the early identification, impeccable assessment and treatment of pain and other problems. Palliative care affirms life and regards dying as a normal process, intends neither to hasten nor to postpone death and uses a team approach to address the needs of patients and their families, including bereavement counselling if indicated [1].

Traditionally, palliative care has been synonymous with the end-of-life care of the cancer patient; however, it is now acknowledged that palliation can and should be offered to all patients, regardless of age or disease process, who suffer from a life-threatening illness. Moreover, palliation can be offered at any phase of the disease trajectory, in conjunction with active treatment, as an essential part of "supportive care".

As our society ages and the proportion of people older than age 65 steadily increases, there is a pressing need to integrate two areas of medicine that have been "relatively neglected in the past" [1]. It makes both moral and intellectual sense to focus attention upon the palliative care of the older person.

With the aim of integrating the principles and practice of palliative care into geriatric practice, the following core concepts [2] have been highlighted:

1. Clarifying and documenting individual and family preferences and goals of care
2. Providing care that is patient/family centred and evidence based
3. Employing an interdisciplinary team approach
4. Careful attention to medication management
5. Using interpersonal and communication skills that result in effective information exchange with patients, their families and other health professionals
6. Coordination of care, especially as patients transition across settings of care and stages of illness
7. Respecting the importance of family caregivers and recognizing and addressing their needs
8. Offering treatment plans that are developed with consideration of cost-effectiveness and economic burden
9. Maximizing quality of life and functionality
10. Providing psychosocial, spiritual and bereavement support to patients and caregivers

Specifically, it is important to recognize that older patients have "distinct needs in the provision of palliative care" [3]. Older persons:

- Undergo unique physiological changes that occur with ageing
- Often have multiple chronic medical diseases, suffered for long periods of time, each one occupying a different phase in the illness trajectory
- Have a high prevalence of symptoms that are not often recognized [4]
- Have a higher prevalence of dementia and therefore less capacity to make informed decisions
- "Lack carers" [3] and rely on a "full spectrum of institutional settings for the provision of care" [5]

The family discussion about Mrs. Good's deterioration and phase change was prompted by her physician's identification of three triggers [6] that suggest she may be approaching the end of life.

1. Based on his/her clinical judgement, the physician would not be surprised if this was the last year of Mrs. Good's life, i.e. the answer to *The Surprise Question* ("Would you be surprised if the patient were to die in the next few months, weeks, days?") was "No".
2. There are *general indicators of decline and increasing needs*: her functional performance status is deteriorating, and she is becoming more dependent on her family for assistance.
3. There are *specific clinical indicators of decline*: her chronic illnesses are less responsive to treatment. Mrs. Good fulfils the criteria for frailty, a process of "physiological decline that reduces homeostatic reserve and predisposes to organ failure" [7].

The anticipation of further deterioration allows for the opportunity to discuss preferences and needs in advance of any further serious decline. Resources and support services can be mobilized; plans can be put in place determining the approach and place of care; and caregivers can prepare to mobilize and provide their support.

At home, Mrs. Good deteriorates over a number of weeks with increasing dyspnoea, an occasional non-productive cough and fatigue. One night her daughter visits and finds her very unwell. An ambulance is called, and she is taken to the local emergency department, acutely dyspnoeic and very frightened. A chest X-ray and routine blood tests reveal pulmonary oedema, cardiomegaly and deteriorating renal function, respectively. The emergency physicians (after discussion with Mrs. Good, her family and her general practitioner) treat the symptoms with small doses of diuretic and morphine. A resuscitation plan is put into place.

A smooth transition from home to the hospital emergency department will prevent unnecessary (i.e. futile, uncomfortable and costly) tests and investigations. Ideally the family and primary health team (general practitioner, community and/or palliative care nurses) will communicate directly with the emergency staff about the

person's current condition, the therapies already initiated and any investigations performed and, most importantly, provide formal details of a consensual approach to care, often known as an advanced care plan.

This plan represents discussions about "preferences for future care between an individual and a care provider in anticipation of future deterioration" [1]. The plan can address many goals, including death preparation, assistance in asserting control over the remaining part of one's life and relieving the burden of care.

From a thoughtful advanced care discussion, several outcomes may arise [1]:

1. An *advance statement* of wishes and preferences about the person's general values and views about care (although, not legally binding)
2. An *advance decision* to refuse specific treatment in a predefined potential situation (only legally binding in some countries if an individual loses capacity)
3. Lasting or *enduring power of attorney* (or guardian) appointing a proxy to make decisions for a person if they lose capacity to do so

Understanding the goals of care and where the person is located on the disease trajectory determines the palliative management [8]. On arrival at the emergency department, any advanced care plan should be acknowledged by the treating team and discussed with the patient and carers. Once deemed up-to-date and appropriate for the situation, a hard copy should be placed prominently in the medical record. When there is acknowledgement that the approach should be palliative, the clinical focus must then shift from diagnosis and disease management to symptom management, comfort and relief of suffering.

To facilitate the palliative management of the patient, where possible, a quieter emergency bed space should be provided in direct line of sight of the medical station, with provision for family and carers to be at the bedside for support. A gentle symptom history and examination should be performed, supplemented by corroborative evidence from family and carers. Succinct closed questions in the vernacular about everyday function and activity (e.g. Can you walk and talk? Can you eat and drink? Can you "wee" and "poo"? Do you have pain? Can you sleep? Are you worried or frightened? Can you be with your family?) should not overly tire the patient and may quickly reveal areas of symptom disturbance to focus clinical attention upon. Minimally invasive tests and investigations can be performed at this point to elucidate easily reversible causes: if the patient's clinical condition allows and the burden to the patient is small.

Dyspnoea, the subjective sensation of difficulty breathing, occurs in 55–70% of patients with advanced illness [2]. The older person is particularly susceptible to experiencing dyspnoea or "shortness of breath". Lung elasticity, diffusion capacity and gas exchange decrease with age, exacerbated by the long-term effects of smoking and chronic illness. The musculoskeletal system, compromised by malnutrition and degenerative disease, serves to reduce lung volumes and further compromise respiration.

Mrs. Good's dyspnoea is severe and is intimately associated with fear and anxiety. In the first instance therefore, the management should be directed towards the

relief of the sensation of breathlessness rather than pursuing the treatment of her underlying cardiorespiratory disease. If possible, prop the patient up and support their head, neck and arms. Simple interventions, such as using a fan or opening window, increase the movement of air, which may relieve dyspnoea [9]. Low-dose diuretics can be given (PO or IV) to ameliorate fluid overload.

Supplemental oxygen use should not be considered automatic [9] but can be offered in the acute phase (e.g. 2 L/min by nasal prongs) when there is air hunger or when oxygen saturation is less than 90% on room air. Oxygen requirements should be monitored over 72 h, discontinuing if the benefit is not sustained.

Opioids are the primary treatment for dyspnoea in the palliative care patient; however, individual patients differ in their response to specific opioids [10]. In older persons, the systemic clearance of opioids diminishes because of changes in liver mass and blood flow. These changes, combined with a higher fat-to-lean body mass ratio, may increase the accumulation of opioid metabolites and increase opioid bioavailability. Additionally, glomerular filtration rates decrease with age. As most opioids are eliminated in the urine, dose adjustments are therefore required in patients with renal impairment.

Morphine is used most commonly because of its availability and multiple routes of administration (i.e. oral and parenteral). Morphine reduces dyspnoea by decreasing the ventilatory response to hypoxia and hypercapnia, reducing the metabolic rate and therefore oxygen consumption, altering the perception of breathlessness and causing vasodilatation.

Signs of opioid metabolite accumulation include myoclonus, confusion and somnolence. Specifically, accumulation of morphine metabolites in patients with renal impairment can cause respiratory depression, sedation and nausea and vomiting [10]. When used cautiously, concerns over respiratory depression as a potential side effect are generally unfounded as respiratory capacity is maintained by increased tidal volumes compensating for decreased respiratory rates [3].

Elderly patients should therefore, initially, receive smaller or less frequent doses [3] of opioids for pain or dyspnoea: “start low and go slow”. In an opioid-naïve patient with acute respiratory distress (assuming there is no true allergy), morphine should be given as 2.5–5 mg Q2-4H, subcutaneously. Less severe dyspnoea can be treated with morphine mixture 2 mg/1 ml 1–2 ml Q2-4H, orally.

With severe renal impairment or true morphine allergy, fentanyl 25–50 mcg S/C or hydromorphone mixture 1–2 mg Q4H P/O can be given instead. (Fentanyl may be less affected by renal impairment compared to other opioids [10].) If the person is already on maintenance opioids, the dose can be increased from 25–50% with mild-to-moderate dyspnoea or 50–100% with severe distress.

Low doses of sustained-release opioids have a significant and persistent therapeutic effect on dyspnoea [9], and these should also be a consideration once the patient settles, e.g. slow-release morphine sulphate (MS Contin 5–10 mg BD PO).

Patient reports of dyspnoea usually cluster with the presence of anxiety or depression, and treatment with anxiolytics is an important adjunct to consider [9]. Benzodiazepines may relieve the anxiety and panic (often associated with severe dyspnoea) but are not first-line management of dyspnoea itself. Like opioids,

benzodiazepines depress the ventilatory response to hypoxia and hypercapnia. If opioids are not effective on their own, give midazolam 2.5 mg Q2H S/C or lorazepam 0.25–1 mg PO Q4H.

Opioids are effective in managing dyspnoea and pain in patients with advanced disease, but "adverse gastrointestinal effects potentially undermine their clinical utility" [11].

Anticipate the side effect of nausea or vomiting and prescribe anti-emetic coincidentally with morphine. Nausea is an unpleasant subjective sensation in the stomach and throat associated with flushing, tachycardia, sweating, hypersalivation and a desire to vomit. Opioids cause nausea by directly stimulating the chemoreceptor trigger zone, delaying gastric emptying and increasing vestibular sensitivity. Either a prokinetic agent (e.g. metoclopramide 10 mg TDS PO or S/C) or a centrally acting phenothiazine (e.g. haloperidol 0.5 mg TDS PO or 1 mg Q8-12H S/C) can be started. Watch for extrapyramidal side effects, especially in the elderly patient.

Additionally, anticipate constipation and prescribe aperients. The definition of constipation differs between clinicians and patients. Functional constipation is best defined (Rome III criteria) as straining at stool, passage of lumpy or hard stools, sensation of incomplete evacuation or anorectal obstruction, the need to use manual manoeuvres to facilitate defecation and passing fewer than three stools per week [11]. As the definition alludes, there are multiple pathophysiologies involved.

Opioids cause constipation by opioid-mediated actions on the central nervous system and gastrointestinal tract, reducing bowel tone and contractility, thereby prolonging colonic transit time. Non-pharmacological management of opioid-induced constipation (increasing fluid intake, dietary fibre and physical activity) is seldom enough, especially in elderly debilitated patients. There is consensus that patients should start laxatives at the beginning of opioid therapy and continue throughout treatment [11]. The commonest regime is the commencement of a stimulant (such as senna or bisacodyl) in combination with a stool softener. Starting Coloxyl with senna 1–2 tablets BD and/or adding an osmotic softener such as Movicol 1 sachet daily would be appropriate, in the first instance, for Mrs. Good.

Prior to transfer to the ward, in order to smooth the transition of care, PRN or rescue medications should be provided: morphine, midazolam and metoclopramide are commonly prescribed, along with antisecretory medications, via the intermittent subcutaneous route.

For example, in an opioid-naïve patient:

- Morphine 2.5–5 mg Q2H S/C PRN
- Metoclopramide 10 mg Q6H S/C PRN
- Midazolam 2.5–5 mg Q2H S/C PRN
- Glycopyrrolate 200 mcg Q6H S/C PRN

Importantly, gentle discussion with the patient and the family about the seriousness of her condition and the potential for her to deteriorate further should be had before leaving the emergency department. At this point, consent should be sought for a not-for-resuscitation order (or equivalent), and once obtained this should be

recorded clearly in the notes and communicated verbally at every patient transition (geographical and clinical) throughout the admission.

Mrs. Good settles well overnight in the ward, but dyspnoea on minimal exertion remains. The following afternoon she complains to the nursing staff of left-sided posterior chest pain, deep and diffuse, relieved by intermittent S/C morphine. When questioned she admits to experiencing this pain intermittently for 3 months. The medical team note a left-sided pleural effusion on examination. Mrs. Good undergoes a CT scan of her chest that reveals a large spiculated lesion in the left lower lobe, a small pleural effusion and two mediastinal lymph nodes. The medical team discuss these findings with Mrs. Good and suggest referral to a cardiothoracic surgeon (to elucidate the nature of the lesion) and, hinting at the possibility that this might be a malignancy, an oncologist. Mrs. Good and her family decline both referrals, preferring instead to "leave things be".

Pain is a subjective experience (i.e. it is what the patient says it is) with sensory and emotional aspects. Approximately 40% of patients dying in hospital experience moderate to severe pain in the last 3 days of their life [12].

Pain is classified as nociceptive or neuropathic in nature, and treatment is different for each mechanism. Nociceptive pain occurs when a painful stimulus is detected by nociceptors and transmitted via peripheral nerves to the central nervous system. There are two main types of nociceptive pain, each with distinct qualities:

- Somatic pain, from the musculoskeletal system, is often described as well localised, "constant", "sharp", "aching" or "throbbing". The pain of osteoarthritis or a fracture exemplifies this.
- Visceral pain, from the thoracic or abdominal viscera, is often poorly localized, episodic, "deep", "aching" or colicky in nature. The pain of bowel obstruction or from renal calculi is a good example of visceral nociceptive pain.

Neuropathic pain, on the other hand, is pain arising from damage to the peripheral or central nervous system and is often described as "burning", "stabbing" or "shooting" pain, constant or episodic in nature, accompanied on occasions by sensory disturbance (paraesthesia). The pain of trigeminal neuralgia is typical of neuropathic pain.

Taking an accurate history is the key to elucidating the pain type and therefore determining the most appropriate treatment. In the elderly patient, this can be difficult because of age-related decline in vision, hearing and mentation. Under-reporting because of fears about opioid addiction or fear of complaining also occurs. Questions about pain behaviour should be asked of the family or carers, and the use of pain synonyms also garners more information. Do you have pain? Are you sore? Do you have discomfort? Asking the person "where does it hurt" or "where is it sore?" while examining them also adds to the clinical picture.

Pain intensity can be quantified with a verbal rating or descriptor scale. Pain qualities can be further fleshed out by enquiring about pain duration, its onset and periodicity and concomitants. Non-verbal indicators of pain (e.g. moaning, grimacing, restlessness, altered behaviours) offer further clues and are pivotal when assessing

the person who is unable to communicate verbally. Patients with pain described as "mild" or 1–3/10 on a verbal rating scale may only require treatment with a non-steroidal anti-inflammatory medication or regular paracetamol. Opioids are the drugs of choice for moderate to severe pain.

Mrs. Good has nociceptive visceral pain generated from a probable lung malignancy. Intermittent opioids for dyspnoea, although helpful, are currently inadequate for her analgesic requirements. Commencing slow-release morphine, MS Contin 10 mg BD, in combination with regular paracetamol 1 g TDS/PRN or rescue medications (including Ordine 2 mg/1 ml 1–2 ml Q4H), Coloxyl with senna 2 tabs nocte and metoclopramide 10 mg TDS will round out her symptom control. Mrs. Good's response to these measures should be monitored daily and medications adjusted if she remains uncomfortable or continues to suffer.

Should she remain unsettled, opioid doses can be gently titrated upwards, with side effects determining the ceiling doses. Refractory cancer pain (i.e. pain related to cancer or its treatment, of at least 3 months of duration, that hasn't responded to standard treatment with opioids and co-analgesics) can occur in up to 10–20% of patients [13]. Management involves opioid manipulation, use of non-opioid and co-analgesic medications (e.g. corticosteroids, antidepressants and anticonvulsants) and consideration of interventions (nerve blockade) or oncological treatment modalities (radiotherapy or chemotherapy).

Three days after admission, Mrs. Good deteriorates dramatically with cough, fever and increasing chest wall pain. She is unable to swallow her medications and becomes disorientated. The medical team diagnose pneumonia on clinical grounds. Intravenous antibiotics are commenced; however, her condition continues to deteriorate over the next 48 h. She becomes drowsy, restless and incontinent, with a low-grade fever, rattly respirations, dry mouth and early pressure changes on her heels and sacrum.

For end-of-life care to be timely and effective, it is essential to recognize when a person is in the last few hours to days of their life, i.e. to "diagnose dying". This is not a subjective exercise but rather a complex and "objective assessment of signs and symptoms" [14]. Many health practitioners are fearful and uncertain of making such a diagnosis. This uncertainty contributes to:

- Poor communication between doctor and patient/carer and between health teams
- Unnecessary investigations, procedures and treatments
- Physical and emotional burden on the patient
- Physical and emotional burden on the patient's caregivers
- Complex bereavement issues
- Formal complaints about care

Until such a diagnosis is made gently and openly communicated to the patient and carers, the approach to management is often in the "eye of the beholder" and can vacillate between false hope and outright denial. Making the diagnosis, however, focuses perspective and frees up emotional space to allow the patient and their family or carers to plan the last final days of life: choosing the place of death, outlining their preferences about dying and the resources required and shoring up funeral

and bereavement arrangements. The diagnosis of dying "unifies and clarifies" [15] and helps to build trust in the doctor-patient relationship [16].

There are key signs and symptoms that a person is dying, often more easily recognized in cancer patients than in those with chronic incurable disease.

The dying phase:

- Is usually preceded by a gradual deterioration in functional status.
- The person fails to respond to changes in medications.
- They become bedbound with increasing weakness, fatigue and drowsiness.
- There are decreases in appetite and fluid intake.
- There is a loss of ability to swallow medications.
- There are neurological signs of fluctuating levels of consciousness, confusion and restlessness.
- There are alterations in respiration with changes in breathing patterns, gurgling or rattly breathing and use of accessory muscles.

Most patients will lose consciousness over a period of hours to days, ultimately becoming comatose. Delirium occurs in 85% of dying patients [17] in the last few weeks of life. Delirium of either type (agitated or non-agitated) indicates impending death. Up to 80% of patients develop a hypoactive non-agitated delirium [17]. It is often undertreated and as a result can lead to frightened patients and distressed caregivers. The cause is often multifactorial and a sign of significant physiological disturbance. Reversibility is highly dependent on the aetiology [2], and therefore consideration of the burdens vs. benefits in pursuing delirium causes and treatment must be carefully considered. Controlling the agitation or restlessness with antipsychotic medications (e.g. haloperidol 1–5 mg via syringe driver over 24/24) is recommended in the first instance, with the addition of benzodiazepines (e.g. midazolam 5–10 mg via syringe driver over 24/24) if antipsychotics fail or cause side effects.

Once the diagnosis has been made and dying is recognized, "intensive palliative care should come into action" [16]. Mrs. Good is dying. It is likely that she has overwhelming sepsis secondary to pneumonia, developed as a complication of advanced carcinoma of the lung.

Apart from communicating this gently and respectfully to the patient and carers, the word "dying" should be recorded in the medical record and handed over at clinical meetings. A discussion with Mrs. Good and her family should be had about her preferred place of care (i.e. hospital or home or aged care facility), and appropriate action to facilitate this request should be put in place. Care at home or in an aged care facility is dependent on easy access to palliative care support and equipment to ensure comfort and safety, respectively. In a hospital, preference for a single- or multiple-occupancy room should be canvassed. Often a single room, if available, allows for easier family/carer access to the dying person and provides privacy and quieter surroundings compared to a shared room.

Because Mrs. Good is no longer able to swallow her medication, only essential medications (analgesics, anxiolytics, anti-emetics and antisecretory medications) should be given, and these should be converted to the subcutaneous route. Where

possible a syringe driver should be used to provide continuous medication delivery over 24 h. Conversion of oral morphine to a subcutaneous infusion via syringe driver is done by dividing the total 24/24 dose of oral morphine by 2, i.e. 50% of total daily dose. For example, MS Contin 60 mg BD is equivalent to 60 mg morphine via syringe driver over 24/24.NB: the contents of the syringe driver reflect the current oral/parenteral medications and any additional medications necessary for an individual patient's symptom control. Syringe driver orders SHOULD NOT BE fixed recipes (one size fits all) that serve every patient every time.

As-required or PRN medication for a person on a regular subcutaneous infusion of opioid is calculated as 1/6th to 1/10th of the total 24/24 dose; e.g. if on 100 mg of morphine via subcutaneous infusion in 24/24, then the breakthrough dose will be 10–15 mg of morphine Q4H PRN (rounded for convenience of use).

Comfort measures should be initiated:

1. All current medications should be audited and non-essential medications ceased.
2. As-required (PRN) medications should be prescribed to cover pain, nausea/vomiting, agitation/confusion and respiratory secretions, respectively.
3. Interventions should be ceased or minimized:
   - Stop recording vital signs.
   - Stop "calling criteria".
   - Stop blood tests, antibiotics, intravenous fluids and intravenous drugs. (There is limited evidence to suggest that continuing artificial hydration is of benefit [16].)
   - Minimize pressure area turning regimes.
4. Review or initiate recording of a not-for-resuscitation (NFR) order (or equivalent). (Cardiopulmonary resuscitation is a futile and inappropriate medical intervention in the dying phase [16].)

Routine observations of the patient must shift from measuring vital signs to attending to vital comforts:

- Eye care: routine eye toilet QID prevents dry sore eyes.
- Mouth care: routine meticulous mouth care is essential in the dying patient to prevent ulceration, fungal infection and xerostomia. Artificial saliva, antifungal drops and salt and soda mouthwash can all be given, either directly or using a mouth swab. Keeping the mouth moist and clean minimizes thirst.
- Skin care: application of moisturizer each day acts as a skin protectant and encourages the family/carers to provide sensory comfort. Prevention of pressure areas is managed with pressure-relieving devices. Specific dressings and wound management are initiated for all grades of pressure damage.
- Bowel care: ensure that elimination is comfortable and record its frequency and type. There is no need for invasive bowel intervention in the terminal phase.
- Urinary care: often, urinary incontinence can be managed without the use of a catheter. Pads serve to keep the urine away from the skin. If an indwelling catheter is necessary, check daily for excoriation of the perineum and meatus.

- Syringe driver care: regular checks of S/C site, drug delivery volume and battery viability should be standard assessment.
- Carer care: ensure ready access to the facility (parking and 24/24 visiting) and to communication and support from staff. Offer and provide access to counselling and pastoral care as needed.

The family are encouraged to assist with care if they feel comfortable doing so. Psychosocial and spiritual comfort should be sensitively and respectfully explored. Regularly "checking in" with the dying person about their feelings and concerns and attending to these where possible lessens the distress of both patient and family. If appropriate and requested, providing the patient and family with information about the dying process and features of dying helps to minimize anxiety. Attention to the person's religious and spiritual needs is essential and may determine aspects of care in both the dying and post-mortem phases.

Mrs. Good dies peacefully 4 days after admission with her family by her side.

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