Lecture Notes in Medical Informatics 46

Patsy B. Marr Rita L. Axford
Susan K. Newbold (Eds.)

Nursing Informatics '91

Proceedings of the Post Conference on Health Care Information Technology: Implications for Change

Springer-Verlag
Berlin Heidelberg New York
London Paris Tokyo
Hong Kong Barcelona
Budapest

Editors

Patsy B. Marr, RN, MSN
Director, Hospital Information System Department
New York University Medical Center
New York, NY, USA

Rita L. Axford, RN, PhD
Senior Lecturer
Department of Nursing
Lincoln School of Health Sciences
La Trobe University
Melbourne, Victoria, Australia

Susan K. Newbold, RN, MS
Health Application Specialist
IBM
Bethesda, Maryland, USA

ISBN-13: 978-3-540-54124-0 e-ISBN-13: 978-3-642-46746-2
DOI: 10.1007/978-3-642-46746-2

Typesetting: Camera ready by author

27/3140-543210 - Printed on acid-free paper

PREFACE

For over a decade, Working Group 8 (Nursing) of the International Medical Informatics Association has sponsored, in conjunction with a host country, a triennial international symposium on nursing informatics. Each conference consists of a main conference and an invitational working conference following the main event. In 1991, the symposium was held in Melbourne, Australia and hosted by the Nursing Computer Group, Victoria and the Royal College of Nursing, Australia. Nine Pre-Conference workshops offered participants indepth exploration of a variety of information technology topics. The main conference attracted 700 participants from 19 countries and over 150 peer-reviewed papers. The invitational working conference was held at Whitehall in Sorrento, Victoria and involved the individual and collective work of 40 experts in nursing informatics from around the world. This group addressed the theme

HEALTH CARE INFORMATION TECHNOLOGY:

IMPLICATIONS FOR CHANGE.

Health care organizations are faced with growing demand for information technology and must cope effectively with the processes and outcomes of its introduction. As the impact of information technology is felt both on the local and the global level, the conference selected for its theme a three tiered approach to information technology and organisational change - through the lens of society, the organization, and the individual. The conference was organized around three forms of contribution: plenary talks, working groups, and individual contributions by the participants.

Part one of this book contains the papers of the plenary speakers for the conference. These papers set a framework for working groups to develop their ideas around the themes presented to them and from within their collective wisdom. **Part two** contains the papers of the four working groups developed during their two-and-one-half days together. **Part three** contains individual papers which participants brought to the conference and which reflect their specific domain of relevant expertise.

Only limited editing has taken place with the papers. It was the intention of the editors to retain each author's style and flavor.

Patsy B. Marr, Rita L. Axford, and Susan K. Newbold (Eds.)

PARTICIPANTS

Maisa Antti-Poika
Data Processing Coordinator
Peijas-Rekola Hospital, Sairaalakatu 1
SF-01400 Vantaa, FINLAND

Rita L. Axford, RN, PhD, FRCNA
Senior Lecturer
Lincoln School of Health Sciences
Department of Nursing
La Trobe University
Abbotsford, Victoria 3182, AUSTRALIA

Albert Bakker, Professor
BAZIS Foundation
Central Development & Support Group
Hospital Information System
Schipholweg 97, 2316 XA Leiden
THE NETHERLANDS

Barry Barber, MA, PhD, FBCS, F.Inst.P., C.Eng., C.Phys.
National Health Service
Information Management Centre
19 Calthorpe Road, Edgbaston
Birmingham B15 1RP, ENGLAND

Penny Baxter, RN, FCNA
Clinical Information Systems Analyst / Programmer
Information Systems Departments
Austin Hospital
Heidelberg, Victoria 3084, AUSTRALIA

Barbara E. Carter, RN, DNE
Coordinator Computer Education (Nursing)
Alfred Hospital
Prahran, Victoria 3181, AUSTRALIA

Merle Cooke, RN, BAppSci (Nursing) FRCNA
Nursing Manager Information Systems
Fremantle Hospital
Fremantle, Western Australia 6160
AUSTRALIA

Albert J. Creevey, BAppSci (Comp) MACS
Deputy Director
Management Information Services
Alfred Hospital
Prahran, Victoria 3181, AUSTRALIA

Joan Donoghue, RN, MN
Assistant Director of Nursing
St Vincent's Hospital
Melbourne, Victoria 3065, AUSTRALIA

Joan Edgecumbe, RN, RM, Dip.N.Admin.
Nursing Projects Officer
Royal Womens' Hospital
Melbourne, Victoria 3053, AUSTRALIA

Linda Edmunds, RN, MS
HealthQuest, LTD
303 Perimeter Center North
Atlanta, Georgia 30346, USA

Yolande Elsig
Assistante de la Directrice
Des Soins Infirmiers
Hopital Cantonal
Universitaire de Geneve
24 rue Micheli-du-Crest
1211 Geneve 4-SWITZERLAND

Vernice Ferguson, RN, MA, FAAN FRCN
Assistant Chief Medical Director
for Nursing Programs
The Department of Veterans Affairs
Washington D.C. 20420 USA

Carole A. Gassert, RN, PhD
Assistant Professor
Department of Education,
Administration and Health Policy
University of Maryland at Baltimore
Baltimore, Maryland 21201-1512, USA

Carol F. Gaston, RN, BAppSci, BEd GDipEnvSt
Director Nursing Branch
South Australian Health Commission
Adelaide, South Australia 5000
AUSTRALIA

Ulla Gerdin, RN
Head of Development Team
Stockholm County Council
Health Care Informatics / GEMI
P.O. Box 9099
Stockholm, SWEDEN

Susan J. Grobe, RN, PhD, FAAN
Associate Professor and Director
Center for Health Care Research and
Evaluation
School of Nursing
The University of Texas at Austin
Austin, Texas 78701-1499, USA

Edward J. Halloran, RN, PhD, FAAN
Associate Professor
School of Nursing
CB #7460 Carington
University of North Carolina
Chapel Hill, North Carolina 27599, USA

John Hinterreiter, RN, RM
Systems Officer, Nursing
Western Hospital
Footscray, Victoria 3011, AUSTRALIA

William L. Holzemer, RN, PhD, FAAN
Professor and
Associate Dean for Research
School of Nursing
University of California, San Francisco
San Francisco, California 94134-0604
USA

Evelyn J. S. Hovenga, RN, BAppSci FRCNA
103 Westgarth Street
Northcote, Victoria 3070, AUSTRALIA

Shirley Hughes
Director, Marketing & Account Services
EMTEK Health Care Systems Inc.
2929 South Fair Lane
Tempe, Arizona 85282, USA

Wendy King, MBA, BA, RGN, RM RHV, MBIM
Senior Consultant
CSL Group Ltd, 54 Calthorpe Rd
Edgbaston, Birmingham B15 1TH
ENGLAND

Tricia Leeder, BHA, MComm
Nursing Director of Informatics
John Hunter Hospital
New Lambton, New South Wales 2300
AUSTRALIA

Salah H. Mandil
Director - Adviser on Informatics
World Health Organization
Geneva, SWITZERLAND

Margaret P. Marion, RGN
General Manager, Acute Services
Royal Hampshire County Hospital
Winchester, Hants SO22 5DG
ENGLAND

Patsy B. Marr, RN, MSN
Director
Hospital Information System
Department
New York University Medical Center
550 First Avenue, Room AH 201
New York, New York 10016, USA

Kathleen A. McCormick, RN, PhD FAAN
Director, Office of the Forum for Quality and Effectiveness in Health Care
Agency for Health Care Policy and Research
Executive Office Center
2101 East Jefferson Street, Suite 327
Rockville, Maryland 20852, USA

Bill McGuiness, RN, DipT, BEd (Nursing)
Lecturer
Lincoln School of Health Sciences
Department of Nursing
La Trobe University
Abbotsford, Victoria 3182, AUSTRALIA

Susan K. Newbold, RN, MS
Health Application Specialist
IBM Health Industry
6600 Rockledge Drive
Bethesda, Maryland 20817, USA

Marcia Orsolits Stevic, RN, PhD
Director, Quality Research
Cleveland Clinic Foundation
9500 Euclid Avenue - P.3115
Cleveland, Ohio 44195-5001, USA

Elly Pluyter-Wenting SRN
Vice-President, BAZIS Foundation
Central Development & Support Group
Hospital Information System
Schipholweg 97, 2316 XA Leiden
THE NETHERLANDS

Roberta Rochman, RN
Director of Marketing, Patient Care
TDS Healthcare Systems Corporation
200 Ashford Center North
Atlanta, Georgia 30338 USA

Judith S. Ronald, RN, EdD
Associate Professor
Coordinator of Nursing Informatics
School of Nursing
State University of New York at Buffalo
Buffalo, New York 14214, USA

Sheila A. Ryan, RN, PhD, FAAN
Dean, School of Nursing
Director, Medical Center Nursing
University of Rochester
601 Elmwood Avenue, Box 703
Rochester, New York 14642, USA

Roy L. Simpson, RN
HealthQuest
303 Perimeter Center North
Atlanta, Georgia 30346, USA

Diane J. Skiba, PhD
Director of Informatics
and Associate Professor
University of Colorado
Health Sciences Center
Campus Box C288
4200 East Ninth Avenue
Denver, Colorado 80262, USA

Denis Vandewal, SRN
Nursing Logistics Department
University Hospitals of Leuven
Capucijnenvoer 33
3000 Leuven, BELGIUM

Beverly C. Walker, RN, MNS, FRCNA
Director of Nursing
Bundoora Extended Care Centre
Bundoora, Victoria 3083, AUSTRALIA

Rita D. Zielstorff, RN, MS
Assistant Director
Laboratory of Computer Science
Associate Computer Scientist
Department of Medicine
Staff Specialist, Department of Nursing
Massachusetts General Hospital
Boston, Massachusetts 02114, USA

PARTICIPANTS IN THE NURSING INFORMATICS '91 POST CONFERENCE
18-21 APRIL 1991
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Plenary papers from the Working Conference

An Invitational Working Conference in Conjunction
with the Fourth International Symposium on
Nursing Use of Computers and Information Science

Sorrento, Victoria
April 18-21, 1991

Program Chair
Patsy B. Marr
New York University Medical Center
Hospital Information System Department
550 First Avenue, Room AH 201
New York, New York 10016, USA

Conference Coordinators
Rita L. Axford
Senior Lecturer
Lincoln School of Health Sciences
Department of Nursing, La Trobe University
Abbotsford, Victoria 3182, AUSTRALIA
and
Susan K. Newbold
Health Application Specialist
IBM
6600 Rockledge Drive
Bethesda, Maryland 20817, USA

Conference Hosts
Nursing Computer Group, Victoria
Royal College of Nursing, Australia
and
IMIA Working Group 8

KEYNOTE ADDRESS

ON THE INTERACTION BETWEEN HEALTH INFORMATICS, THE INDIVIDUAL AND SOCIETY

Salah H. Mandil

INTRODUCTION

In my son's first ever contact with a microcomputer he was asked to provide his name, whereupon he said to it: "My name is Basil. What is your name?" No response. He concluded that it is "NOT a clever machine." This reminds us that today's computing tools are not as "powerful" as we think they are because they are not oriented to our natural ways of teaching, comprehending, using and testing things.

This audience is the right one to recall that computing had its origins in, and had been initially driven by, the need to determine fast, repeatedly and numerous calculations. But what if computing had its origins in a socio-economic field such as medicine? It would have certainly evolved differently, maybe in a more "natural" manner! Just compare the evolution of "informatics technology" to the evolution of a "child's capacity". They are the exact reverse of each other. A child, first, recognises voice and facial expressions, then learns to draw, then to write and then to calculate. Computing enabled numerical data processing first, then text processing, then graphics, and more recently imaging and voice recognition. Great care needs to be exercised on how informatics can be introduced to an individual, a group or a whole society. A few good lessons have already been learned.

SIGNIFICANT INFORMATICS DEVELOPMENT

There is wide recognition of significant developments in the informatics methodology and technology. For example, increasing computing power at still decreasing costs; robustness of the hardware, thus requiring lesser and lesser repair and maintenance; and, availability of wide ranges of generalised and special-purpose software packages which enable uses such as:

- word processing and desktop publishing
- spreadsheets
- databases and
- graphics.

Equally significant, relevant developments in computer networking and in computer-based telecommunications enable wider, more popular and less costly services such as those provided today by:

- digital telephony
- facsimile (FAX) and
- public data networks.

The exponential rise in the uses of FAX services within and between institutions and countries and the fact that there are today at least 118 public data networks (that are compliant with the X.25 international standard) in 66 countries, including many developing countries, are testimony to the present and near-future uses of local and wide area communications networks in the health sector. At a minimum, they avail needed information services to the individual health worker, professional groups and the public at large. They also enable those with relevant data bases to reach a wider audience with related services.

Other, relatively more recent developments are enhancing the relevance of informatics to medical and health care and, possibly, making it more directly relevant. Two leading developments are:

- Knowledge-Based Systems, such as Consultation systems; Critiquing systems and Instructional systems whereby nearly the same knowledge-base could be used for any of these purposes; and
- Imaging and signal analysis: that is, the uses of computer-supported storage and retrieval, analysis and interpretation of signals and images.

Both areas marshal the beginning of the development and uses of advanced decision-support systems in medical and health care. The next few years, and for a long period to come, will witness the varied ways with which such support systems will be accepted by the health community, particularly medical groups, and nothing will aid this more than a thorough screening and validation of such systems.

In short, the dramatic and relevant developments in informatics and telematics, and the significant ways with which these are being, and will be, applied in the health/medical sector, are pointers to the need for a more profound (not less as it is sometimes claimed by the "automation prophets") interaction between the providers of the health care, and the consumers and the informatics products/producers.

ISSUES AFFECTING THE INDIVIDUAL

In informatics, the "user" has always been and still is king. The technology has to be relevant, readily absorbed by, and friendly to the user. That is, and should remain, fundamental and uncontested. Less is said about the users' obligations towards the services that informatics technology enables and toward the technology itself.

The individual's training/education: increasingly, informatics applications, services and products provide users' training tools, often as an integral part of these tools. The typical user

benefits from these only to the minimum extent needed to carry out the chore at hand. Sometimes, he/she can't be blamed! But, the importance of informatics services to health/medical care is such that it should be an obligation on the user to influence those services which, in turn, puts an obligation on the user to be trained enough to be constructively critical. In other words, because of the impact of informatics support to health/medical care, the user has an obligation to self-inform, self-train and self-educate.

Self-health-care systems. Increasingly informatics-supported services for the individual's health care are becoming available. Whilst an individual user may or may not get the appropriate services from such systems, it is his/her obligation to the society at large to contribute to the evaluation, or even re-conception and re-design, of such services by responding to users' polls which, increasingly, are an integral part of these services.

Health records. The obligations of the doctor and the medical institution for keeping an individual's health record and to use it in the interest of the individual concerned and society at large - and with due confidentiality and security - are well known and largely appreciated. The individual too has an obligation: to provide information for the health record and to ascertain its accuracy and currency. The individual has also another form of obligation: to authorise where necessary the use of the health record for mass analysis such as epidemiological surveillance. These obligations of the individual will become even more acute if and when the health record takes the form of a "smart card".

The individual medical/health worker: not only should the individual use the parts of the system related to his/her work but, being aware of the overall purpose of the system, he/she should realise the obligation to influence the whole systems (e.g., the nursing component of a hospital management information system). Florence Nightingale is famous and largely remembered for her dedication and pioneering nursing contributions to health care. In fact, one of her most significant contributions was to display the power of information in influencing decisions affecting health care. With the use of figures and graphics, she showed that the mortality of British soldiers was due more to preventable public health problems than to the war!

The use of informatics methods and tools has given a significant upward boost to the levels of work satisfaction. Amongst other things, computing is also fun! It has contributed to making it possible for individuals to honour their obligations to their work, their work colleagues, and their workplace. The early myth that informatics will de-humanise health care, especially those functions with direct contact with patients such as nursing, has been gradually fading away. The real challenge is how the health care provider and consumer should influence and humanise the informatics serving them.

ISSUES AFFECTING SOCIETY

Major issues affecting society include: confidentiality and security of medical information; legal and ethical issues, not only regarding "medical information" but also regarding the practice of medical/health care with informatics support; and organisational changes: the trauma that the

introduction and uses of informatics is always accompanied by ("uncertain") organisational changes, and that any level of "automation" would lead to reduction in the work force.

Further, there is the issue of communications with others. Invariably, and increasingly, public services are carried out with the aid of an informatics tool; "the computer tells me...", "but according to the computer, ...", "can't do anything now, the computer is down, ..." are examples of how the ordinary member of a society may be introduced to informatics and as such views it as a potential impediment to communications (contrary to its purpose). This must be totally averted when it is a communication between a health care provider and the recipient of such care.

Issues at the more international level include:

a. Input/output in local languages. Informatics applications in non-Latin languages such as Arabic, Thai, Chinese and Korean were either costly and relatively difficult, or not possible, when the necessary technical means were a mixture of hardware and software. In recent years, technology evolved to provide total software solutions to the needs for computing in non-Latin languages. This reality is percolating to and affecting the designers and producers of end-user applications rather slowly. Few of these are done with a view to also cater to non-Latin multi-language input/output.

b. Technical standards for efficient and economic interface between applications, devices and networks are essential and vastly lacking, and a lot of effort is being carried out at the international level to fulfill these. Is such a requisite having a negative effect on society, as some claim? Is the standardisation of our data and our verbiage leading to a loss of the colour and variety of our societies? To a certain extent it may be, but it is also sure that the informatics technology can support colourful and varied means of doing the same thing!

CONCLUSION

A great deal has been said, written and demonstrated on how relevant and timely information is power for a business endeavour. Information is also power for social and personal transformation. Informatics technology offers a variety of means: to contribute to information bases; to access and use these; and to influence their development and evolution. Further, it offers these means to the individual (a citizen, worker, professional); to groups, such as professional groups; and to institutions (private, public or governmental). The term "information society" is also a challenge to us all to think in terms of not only what can I use a certain service for, but also what my obligations are to it.

PLENARY ADDRESS

DEVELOPMENT OF AN INFORMATION TECHNOLOGY CULTURE WITHIN THE ORGANISATION

Margaret P. Marion

The process of change involved in introducing Information Technology (IT) into a hospital is complex, difficult and exciting. In my own organisation the implementation of technology is part of a wider process in which a fundamental change in management structure has taken place. A very traditional hierarchical structure with strong functional management has been replaced by a highly devolved management style with doctors in conjunction with nurses assuming full responsibility for the management of specialty areas of the hospital. It was evident that credible, accurate and timely information was essential to the management process at ward, specialty and hospital level and had been conspicuous by its absence in the past.

The information system chosen was an American software product, Technicon Healthcare Systems Corporation (T.D.S.), using IBM hardware. T.D.S. is a ward order and communication system which collects information at the level of the individual patient and provides a comprehensive set of data. This is then downloaded into a case mix management database which can be manipulated to provide a wide range of managerial and clinical information for individuals or groups of users.

The introduction of this comprehensive approach to the collection of information involves the whole organisation in a complex development process. A wide range of staff needs to be involved in the decision making, design and implementation. The management structure must facilitate debate within and between disciplines in order for decisions to be made. These were at times found to be fundamental: for example, that doctors must enter all their orders into the system and should not rely on secretarial or nursing staff to do this for them. This decision was made with comparative ease by consultant medical staff. In implementing it, however, it was found to have very significant implications for the training and support of junior medical staff in a system where this group of doctors changes simultaneously twice a year. This became a major organisational issue with implications for training and support which have proved to be taxing.

There were practices which had been implicit within the hospital but had never been made explicit. A number of these centered on the freedom nurses had, for example, to request investigations and give certain drugs. Once these issues were identified decisions had to be made and policies agreed upon.

In considering the introduction of the technology it was necessary for the infrastructure of the organisation to be challenged as well. An example was that nurses would no longer need

to leave the ward to take new and revised drug prescription scripts to Pharmacy, who had in turn set themselves a standard of filling any such prescription in time for the next scheduled drug administration time. However, the portering delivery service pattern did not allow them to respond to the new procedure resulting from the implementation of the system. If this issue had not been addressed, a nurse would still have had to leave the ward to collect the drug. This is just one example of the importance of exploring in depth the impact of the changes which will be brought about by the introduction of technology.

Any IT system must be seen to produce benefits. Cost benefits are important since it is unacceptable to burden already pressured health care budgets with the operating costs of such a system. Benefits other than cost are far more significant in the longer term and must be demonstrable in three areas:

Direct care to patients and the efficiency of delivery of care.

Management of the ward and clinical practice.

Planning and management of the wider service.

In order to achieve benefits at ward and department level it is necessary to challenge accepted work practices at the point of delivery of care. It is not difficult for the system to be subverted to reinforce existing work practices, thus achieving the worst of all worlds. It is not easy for staff to challenge long established methods of working while at the same time adjusting to a very different way of ordering and recording patient treatment. To gain benefits of quality, timeliness and cost effectiveness, the process must be managed with the focus on the ward and the multi-disciplinary team.

The presence of a devolved management structure is potentially a vehicle for this approach to change and it is essential that there be clear direction from the "top" of the organisation, in this case the management board of the hospital. It is important to remember that those who are directly affected by change may have a very different vision of the changes than those who are leading the change process. As noted in an NHS Training Authority article on change:

> "What exercises the minds of senior managers may be far removed from the preoccupations of other people in the organisation."

It is important to create the capacity for change. There must be common direction with a "route map" for all involved to share, which will clarify what changes are to take place, how they are to be achieved and what the "new" organisation will look like. Information systems will tend to impose standardisation of working practices which may be seen as taking away from professional judgement and freedom, and against the ethos of the hospital. It is important to identify and demonstrate the need for change and the benefits to be gained from these changes.

People are key to this process and in Winchester the most significant are:

Directors of Clinical Services

Nurse Managers and Ward Sisters

Business Managers and Office Managers

Paramedical Heads of Service

Equally important are groups within the hospital, some established management groups and others which are temporary organisational structures.

The Hospital Management Board

The Clinical Directorate Teams

Hospital Information System User Groups

Coder Support Group and the

Trainer Support Group.

Ownership of the development process is essential with the organisation in control of the management of the project and a strategy in place for developing expertise from within. This ensures that those who have a real understanding of how a hospital functions, the complexity of the working relationships within it and the detail of day to day patient care influence all stages of the design and implementation of the systems. In Winchester the team included staff representation from Pharmacy, Radiology, Pathology, Medical Records and Nursing. This in turn ensured that computer expertise was available in departments after the implementation.

But this in itself is not enough to ensure true ownership. The development of user groups to allow each discipline to influence the fine tuning of the system has proved very valuable. There is much cross fertilisation within these groups when, for example, nurses attend the doctors group and medical records staff join the nurses. The chairpersons of each of these groups meet on a regular basis to resolve issues which have widespread implications for the hospital and to agree on priorities for modifications to the system.

Support groups have also been developed for key staff such as coders and ward clerks. Their input to the system is of great importance, providing issues to be addressed in detail to obtain accurate and timely information. It is important to have structures in place which allow prompt feedback on the accuracy of collected data so that the quality of data input can be improved. In situations where frontline staff are entering information throughout their working day, they must be helped to understand the relevance of this to direct management of patient care. They also need to understand the wider organisational issues of the ward or department and of the hospital as a whole.

Important lessons learned in the past two-to-three years fall into the two broad groups of Organisation and Process and Training and Development Issues.

Organisation and Process Issues:

Change the infrastructure and the process as well as the structure.

Support the individual from above and from below and create new peer groups.

Focus on changing the behaviour of people--the individual and the group.

Apply the disciplines of project management to organisational change.

Training and Development Issues:

Administrators need help to manage.

Clinical professionals need help to manage.

Managers learning to listen effectively.

Developing ways to move managers towards leadership.

Developing particular required skills:

Communication

Negotiation

Persuading and

"Change engineering."

The power of information to influence attitudes and management practice is remarkable. It must be validated, however, by those who are to use it and be presented in response to their requirements as managers of clinical services. The availability of relevant information, decentralized management and active involvement of staff directly involved in patient care act as powerful catalysts for change; changes in the management process, the way in which information is used and in the planning cycle within the hospital leading to changes in behaviour. Roles evolve steadily, moving from administration's simply making it work, to management where it becomes possible to change things so that they work better and finally, albeit slowly, and then to leadership where many people in the organisation are helped to change their behaviour so that they manage.

The traditional hierarchy can be turned on its head in this environment. Authority and responsibility can be vested in those who plan and deliver care. They can use information to manage the health care process in the key areas of quality, volume and cost. The multi-disciplinary team can retrieve, interpret and act upon information in achieving their key objectives with integrated decision making which is centered on the patient.

This management style is not easy. In fact, it is time consuming and challenging for those who have the responsibility for general management of the organisation. It is powerful, however, for once key decisions are made they are implemented more effectively and the review and monitoring process which follows creates a more responsive organisation.

This culture can only be achieved with a powerful information system which functions within a management structure that involves those persons who plan and deliver care. It demands a culture which allows teamwork and encourages people to be active in their total contribution to the organisation. Finally, it is essential that those in traditional management roles allow this change to take place by letting go and learning to accept final managerial responsibility through leading and supporting rather than by controlling.

PLENARY PAPER

INFORMATION LEADS TO COMPLIANCE?

Sheila A. Ryan

INTRODUCTION

> Upon this gifted age, in its dark hour falls from the sky a meteoric shower of facts... they lie unquestioned, uncombined. Wisdom enough to leach us of our ill is daily spun: that there exists no loom to weave it into fabric...
>
> Edna St. Vincent Millay

Graves (1990) has suggested that we have the electro-mechanical technology for delivering knowledge; however, conceptual technology is lagging. The goal for this presentation is to stretch our conceptual understanding about knowledge as power and how this can help us develop power strategies for this information age. A presumption for this talk is that health care for the future will occur in a predominantly information based society and that two-thirds of all health care will occur outside the hospital environment.

If Knowledge is Power;
Then Information Leads to Compliance.

Figure 1

George Farquar, a French writer, has said, "those who know the least, obey the best." If knowledge does not necessarily lead to increased compliance, then knowledge as power may lead to increased outcomes, actions and decision options. Perhaps, increased information leads to increased diversity of choices. This paper will examine how the individual and/or patient centered information within the organization and society is affected by the notion "knowledge is power."

Three assumptions to be examined are as follows: Information is Power and leads not to compliance or conformity but rather to increasing diversity of options and expression. Therefore, an expanded knowledge-worker role for the nurse will be to help clients make meaningful choices in decisions. Secondly, knowledge as power is a key resource for fast

advancing world power and is accompanied by wealth and violence. Therefore, is spreading information something we can realistically expect? How exactly are we in nursing engaged in power information? (Or is it in trivial data?) And, lastly, how can we design information systems that are intelligent and helpful in assisting in successful decision making, designs and new discovery?

Data ------> Information ------> Knowledge

Individual ------> Organization ------> Society

Figure 2

As this paper examines the evolution of data into information into knowledge, one must also look at the interrelationships with the individual, organization and society. The relationships between the former and the latter need to be more carefully evaluated. For example, most of the nursing information and health information systems have focused on data about the individuals designed for organizations to lead to increased information to impact on societal reimbursement policies. In other words, most systems are designed to move data about individuals into meaningful information for the organization. However one maps the sequential relationships in Figure 2, the primary construct that is least apparent and most lacking is knowledge. At best, the relationship between these dimensions needs further examination. For example, are we designing knowledge systems to help the provider? or the patient? or the payor? Systems development needs to become more cognizant of the need for knowledge generation, utilization and/or application to be included in the design state.

A lot is known about compliance, as reviewing several recent research abstracts will show. At the University of Tennessee, A.P. Johnson (1989) studied the relationship between disease related knowledge, health locus of control (the dimension of internal, powerful others) and the level of treatment compliance for patients with chronic obstructive pulmonary disease. A significant relationship was found between the level of disease related knowledge and the level of compliance of treatment; however, no significant relationships were found between the level of disease related knowledge and locus of control, or the level of treatment compliance and locus of control. Secondly, the amount of COPD knowledge held by these patients, had a significant positive effect on the level of treatment compliance. Consequently, Johnson (1989) concludes that education concerning COPD self-care will result in increased compliance with treatment. However, one must be careful about that conclusion because the findings in fact do no support the conclusion about self-care knowledge necessarily and may describe more experiential knowledge. Knowledge does not guarantee compliance. Smart people are not necessarily more compliant.

McMillan (1990) studies the extent to which female nurses complied with American Cancer Society (ACS) guidelines and whether their rate of compliance is related to either age

or education. Results indicated that only 28% of R.N.'s practiced breast self-examination (BSE) monthly. Could it be that nurses compliantly teach what we don't compliantly do? Although other forms of cancer screening occurred more regularly, such as pap smears and rectal exams, no significant relationship was found between cancer prevention and detection practices, or either age or education level. Neither age nor education improve compliance. (However, it is not surprising that nurses are once again measuring what difference a level of education makes.) Secondly, this study concludes that R.N.'s are not doing all they could to protect themselves against cancer, and thereby appealing to guilt or moral responsibility as a form of achieving compliance. Guilt and 'shoulds' are often used to achieve compliance, unsuccessfully. DeHaven (1990) evaluated whether staff nurses and head nurses complied with employer-mandated continuing education in a teaching hospital. The study found that staff nurses and head nurses attended an average of twice as many programs as expected. The assertion can be made that nurses attend CE programs for reasons other than complying with requirements. Summarily, we cannot force people to learn. Authority cannot mandate people 'to learn.' However, this study points out how we may dangerously set the standard too low in order to achieve compliance. My fear of trying to achieve standards in nursing information systems design is that we will too readily reduce to the lowest common denominator. To assure greater compliance, set the standard lower.

Next Zahr and Yazigi (1989) studied 150 babies and their mothers in a Well Baby Clinic who were exposed to different teaching and written interventions. The three groups were compared in terms of compliance and improvement in knowledge. The results showed that reinforcement of the doctor's advice by a nurse or written instructions to the patients did not improve knowledge or compliance. How many thousands of studies have we conducted looking at different methods of teaching: verbal, written, visual, two modalities, one modality, three modalities? The point here is that as our information systems continue to advance to pursue voice recognition, visual interactive media, etc., the assumption is that people learn better with multimedia presentations. As in this study it is not necessarily so. Multi-method presentations do not necessarily improve treatment compliance. They may improve patient outcomes.

Nyamathi (1989) studied compliance with medical treatment to prescribed medications with homeless adults in order to describe the factors that enhance or diminish compliance. Although two thirds of the sample reported their health status to be fair to poor, nearly one third reported compliance rates ranging from none of the time to half of the time. Deterrents to compliance included structural variables such as availability of drugs and lack of privacy and storage space. Sounds like sociologists, identifying structures when clearly and logically homeless people need to have food and shelter and hygiene and that perhaps compliance to this medication regime is not as important to the homeless as the preceding variables, all of which the study did not measure. Patients who know their illness severity are not necessarily more compliant. If a patient is non-compliant, there must be some social structural barrier.

There is another study by Dubbert, et al., (1990) evaluating the effectiveness of methods to increase hand washing by nurses working in an Intensive Care Unit. A rigorous

methodology following baseline measures included two interventions, three series of classes on infection control and feedback to the staff about hand washing errors. Staff were aware that hand washing was being observed. The conclusion demonstrated that educational intervention produced an immediate increase in hand washing that was followed by a decline to baseline rates over four weeks. Consequently, feedback produces improvement and high compliance that is sustained as long as feedback is sustained. I wonder how much of our own health care methods are totally arranged around simple feedback mechanism. This could have significant implications for patient systems. However, the most important lesson here is that Compliance is time limited when it is feedback induced.

The last study on compliance that has a valuable lesson is by Brooks (1986). This study was intended to investigate the problem of compliance from the client's perspective using a nontraditional phenomenological approach contrary to traditional paternalistic models of views about compliance. Topics of the study included: 1) what was the subject's perception of hypertension? 2) what was their perception of compliance? and, 3) what did they see as the health professional's role in compliance? The subjects in this study did not think hypertension was serious. However, they understood the consequences of untreated hypertension and could identify the risk factors associated with it. The subjects define compliance differently than do most health professionals: to the subjects, being compliant means keeping blood pressure controlled, not following the clinical prescription 100%. They viewed the health professional's responsibility in helping clients achieve compliance as one of assisting the clients in being more knowledgeable. This could be one of those knowledge systems for the patient. So we do have a relationship between knowledge and compliance, but a difference in meaning. This group of subjects preferred a partnership relationship with health professionals. To assist in compliance, help the client become more knowledgeable. Clarify the meaning and expectations for reasonable compliance with the patient. Ascertain what a partnership might include.

In order to learn more about how knowledge affects compliance, this author referred to Michael Foucault, a French philosopher born in the mid-20's, who first coined the phrase, "knowledge is power." Foucault has examined the analysis of power and knowledge through discipline and punishment, and objects to the notion that truth is in its nature a liberating agent to victims of power (the repressive hypothesis). He further has examined the ways that sovereigns express power through punishment rituals. In his treatise "The Genealogy of the Modern Individual as Subject," he discusses the idea that sex was a deliberate development in the evolution of power. Prominent philosophical issues emerging from Foucault's work include conceptual status of power and power as central to being; the relation between social and natural sciences and the interplay of subject/object.

A few words about the subject/object issue are in order. Heidegger has labelled this subjectivity as the "technological self" where the individual has adopted the symbols of capitalism, wealth, power, and status, and has subjugated human values in lieu of control of the technological self. Dreyfus (1990) compares Heidegger and Foucault and suggests that the individual is the object of the technological modernism and is not the subject of the

technology. In other words, we have become our technology and are heading for a new dark age, which they predict we may not survive unless we gain our objectivity apart from the technological self. Having a free relation to technology is only possible when and if our culture succeeds in getting over our technological understanding of being. We may need not be driven to optimize everything; resistance forces revolutions in science in which an anomaly in science is no longer anomaly but the focus of a new truth. An example of this would be Korpman's (1990) view that the replication of the chart, i.e., automating the chart, is obsessive when indeed the chart itself fails its original and primary purpose, that of sharing information. I would further suggest that the eight hundred forms that he reports nurses use represent an immersion in data that rarely leads to information or knowledge that is relational or utilizable. What nursing information and nursing knowledge will make the power difference in a patient's recovery? How are we creating systems to capture and generate this information and knowledge?

Subjective and objective may well be going 'passe,' says Foucault. In society today, the operationalization of power is less likely to incorporate subjective meaning. For example, signs saying "Speed 15 MPH" near school and housing areas are aimed at a driver's subjectivity, i.e., his sense of moral responsibility and guilt. Increasingly, speed bumps on the road by-pass the driver's subjectivity to produce conformity all the more efficiently. He refers to this as normalizing, a uniquely modern power form, more so than the socializing norms. Foucault refers to this as the historical outcome of a technology of power centered on life. He suggests that new methods of power will be insured not by rights, but rather by technique; not by punishment but by control; and not by law but by normalization. Additionally, Foucault suggested information is not alone scientific. Foucault urges sociologists, and other disciplines such as nursing, to focus on their native intelligence and intellectual fields after extensive preoccupation with American empiricism ("we are readily inclined to measure what we can easily quantify and quantify what we can easily measure").

Foucault originally believed in power as an instrument of exclusion and repression; but he instead came to believe that the new power (bio-power) works to incite, reinforce, control, monitor, optimize and organize the forces under it; is this possibly synonymous to compliance or conformity? He says power is bent on generating forces making them grow and ordering them rather than one dedicated to impeding them into submission or destruction. In essence he is suggesting that power is not finite but rather infinite. Foucault's analyses are intent on trying to open up possibilities for action where people do not accept limits, supposedly based on a fixed reality. Foucault rejects the notion that man has any essence that he must recover, and since power practices always lead to the exclusion of some possibilities and the reinforcement of some conformity, Foucault assumes that each regime of power will have its advantages and concomitant dangers; none will be ideal. With standardization and the need for common language, taxonomy, and classifications, we must be very cautious to not minimize the individual uniqueness and standardize to the norm, the lowest common denominator.

Alvin Toffler in his recent work Power Shift, Knowledge, Wealth and Violence at the Edge of the Twenty-First Century, (1990) examines and defines a "new system of wealth creation" which transforms work, capital and money from the industrial era into new wealth and power structures of the information era namely, knowledge, wealth and violence. Knowledge which includes art, science, values and information provides the key raw material for wealth creation in power structures which deeply affect our mind, psyche, and personal lives. He builds a three legged stool of new world power and develops each with significant examples of our times. However, I will summarize just his relevant comments about knowledge.

By the 70's and 80's Toffler suggests that signs of crisis in the old industrial society were everywhere. The ecological by-products threatened life itself. Basic industries began to shrink in the face of new high tech goods and service production. Urban systems, health systems, education systems, all plunged into crisis. The greatest corporations were forced to restructure. Labor unions declined, and communities were torn by moral conflict, devastated by drugs, crime, family breakup and other agonies.

He chronicles the breakdown of the Soviet Socialist Republic and concludes that its demise was not due to economic collapse secondary to excessive militaristic strength. Rather, the Soviets failed to stay current and find ways to utilize knowledge-driven smart weapons. Fast advancing industries and countries have learned the value of processing its most important resource, knowledge, which is increasingly central to its economies. In the end it was not arms or economics but, what he refers to as the "K factor," knowledge. He further compares fast advancing countries to those smoke stack, industrialist countries and industries of the past as ones that failed to promote new ideas, preferred status quo over economic improvement, and favored nationalist themes as opposed to consortia or new partnerships with other countries, or lastly, expressing a willingness to develop new products or materials. Centrality of information, productivity, and decision making are clues to a smoke stack industry, where information flows vertically, contrary to the market driven economy industries where information flows horizontally and diagonally. The new system for making wealth consists of expanding global networks of markets, banks, production centers and laboratories, in instant communication with one another, constantly exchanging ever increasing flows of data, information and knowledge. Which do our nursing practice and nursing education systems more closely compare?

The historical explosion we now call the industrial revolution stepped up economic metabolism and perhaps some would suggest produced fiscal meltdown. But roads, communications, infrastructures improved. With the cost to technological experimentation less so than before, productive methods can change so much more rapidly, leaving our archaic organizations ever more so archaic. The bar code on the item of grocery, the computer on the Federal Express truck, the scanner at the check-out, the bank's automatic teller, the spread of extra-intelligent data networks across the planet, remotely operated robots and now, fully functioning non-human factories, and the informationalization of capital are all preliminary steps in the formation of a twenty-first century infra-structure and economy that will operate at real time. Such infrastructure already has the consumer prepared.

Continual feedback from intelligent sensors and inventories, locating products at every moment, and information from thousands of users will only help to accelerate the acceleration effect. Each unit of saved time becomes more valuable than the last unit, thus creating a positive feedback loop that accelerates the acceleration period.

Toffler suggests that in the new system of wealth creation, cheap labor is increasingly expensive. In the field of health care, nursing has moved from primary care to the readmission of nurse aides and licensed practical nurses back into care settings. He suggests that as the cost of technology increases and labor decreases percentage-wise, the savings of the lesser percent cost factor saves less. Therefore, cheap labor is no longer enough to ensure market advantage by this factor alone. One might further draw an analogy to the soldiers in the Persian Gulf war. The Army was the least valuable as compared to the Air Force and the Navy and those operating high tech computer-smart weapons.

Toffler, like Foucault, suggests that knowledge power is more than a matter of science and technology; it is a matter of culture and diversity. It includes the value of the cultural exports, such as art, architecture, choreography, fashion, and industrial design; it is the generation and fusion of ideas, information, imagery and knowledge which is most important in power competition. Consequently, information has to be more than just facts and relationships among sets of facts; it must integrate ideas, imagery and lead to knowledge and ideologies in a symbolic way.

Toffler suggests that if the essence of the new economy is knowledge, the ideal of "freedom of expression" becomes a top political priority, rather than a peripheral matter. Whatever the economic costs to the rest of us, those in power will seek ways to harness the information revolution to its purposes, and it will set limits on the free flow of information. It will search for new tools and techniques to retain at least some control over the information, images, ideas, symbols and ideologies reaching its people through the electronic infrastructure.

How much information, decision and choice will we be allowed to extend to the patients and families? Although no society can tolerate total freedom of information, as more societies advance towards super symbols economies, the more important it becomes to permit an extremely wide range of dissent and free expression. Even though the power exchange with wealth and/or violence is less apt to occur, what is likely to change is the states' ability to control knowledge.

In this last section, assistance from decision theory can offer insights for nurses to aid in the patient's achieving knowledge as power mastery through helping the patient with decision making about their treatment goals and compliance. Rousseau and Schumaker (1989) suggest our judgements, estimates and information often suffer from systematic biases, assuming that all information is not researched-based as is the case in our applied profession. From their research work on decision theory they conclude that we are over-confident, we think we know more than we do. This often means we examine too little information, ask the wrong questions, and fail to think critically in making judgements. We rely on the most available information rather than the most valuable. This is especially the case when

information is available because it was acquired recently, or in a particularly vivid experience. We tend to anchor our estimates for what is unknown on something we already know, and usually fail to adjust sufficiently for other factors.

To help patients master intelligence gathering we must start by asking (and possibly answering) three critical questions: 1) how much do we really know; 2) is our knowledge base truly representative; and, 3) are our estimates and judgements sound, or have we relied excessively on an easily available anchor? Most of all, this phase of information gathering requires a systematic approach and awareness of how over-confidence, anchoring and availability can bias us.

A good decision maker should:

- Insist on stating estimates in terms of ranges and levels of confidence for predicting outcomes or activity preferences;
- Create feedback, training and accountability for those who make estimates;
- Ask questions that might disconfirm our initial presumptions;
- Use techniques such as fault trees, scenario building and perspective hindsight to seek reasons why projects maybe more complex and difficult before we embark on them;
- And, avoid collecting extensive amounts of information for estimates and decisions unless there is a way to synthesize into coherent fashion.

If we understand our biases, then we are prone to make and take steps to counteract them and we will have the foundations for sound intelligence, information and decision making. Such is a model of assisting decision making with clients and requires a new role for nurses which is similar to that of coaching. A good coach recognizes that untrained beginners make similar characteristic errors and have developed ways to overcome the most common of these errors. And, lastly, providing more information to assist with client decision making that is broad-based and includes understanding the client, the ideas, the images, the ideologies, the symbols, and knowledge can be powerful enough to help the client achieve his own defined conformity or compliance.

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SUMMATION ADDRESS

HEALTH CARE INFORMATION TECHNOLOGY: IMPLICATIONS FOR CHANGE - SUMMARY OF THE WORKING CONFERENCE

Kathleen A. McCormick

It has been inspiring to reflect on "Health Care Information Technology: Implications for Change" at the society, organizational and individual level with such prestigious international colleagues. Post-conferences are the settings from which Nursing Informatics have been born. After the program theme was established in Baltimore, Maryland, one year ago, I asked Evelyn Hovenga, the conference Chair, to ask the local organizing committee to try to arrange a place at the sea to work on this important topic. It is at this beautiful beach resort of Sorrento that the message of this post-conference can be realized. Here we see so clearly that one individual drop of sea water, taken together makes up organized pools of water, and the pools join to become seas that surround our society. It is by looking at the sea that you realize one drop of water forms a part of a much greater whole. So too, the individual nurse, by providing the data elements at the bedside, participates in organizational information that can then be used by local governments, national health systems, and international bureaucracies. It is that concept that we deliberated. And we defined issues needed to move us ahead toward assuring the linkage from the individual to the organization, and then to society through informatics. We even included that concept in a proposed definition of nursing informatics. The oceans of data that we have produced should form a sea upon which we can now pass.

THE INDIVIDUAL

I'll start with the concept of the individual, since I am from the country that starts its proclamation with, "We the people . . . ." Sheila Ryan approached this through the fact that knowledge is power and there is power in cultural diversity, but neither knowledge nor cultural diversity assures compliance with informatics. From group discussions it was a consistent stream of information that smarter nurses will use technology to practice nursing more efficiently and may reduce costs, or at best balance the high costs of rising salaries and technologic costs.

The Computer as the "Second Self"

The individual also could use the computer as an extension of knowledge. As Turkle says in the book, The Second Self: Computers and the Human Spirit, the computer can be the "Second Self" providing information and extending information (Turkle, 1984). In that book,

Turkle describes that men usually develop computer mastery because they can exert control over a machine through programming. Dr. Turkle also describes that women are not naturally attracted to computers because women use more negotiation, arbitration, and "give-and-take" in their associations. Yet, this conference, with over 700 participants (80% of whom were females) raises the questions: Why have nurses become such partners with computers? What effects have computers had on the individual nurse?

In a paper by McCormick and McQueen (1988), it suggests that computers have allowed nurses to analyze the world of work, the dissatisfactions of human relationships, and the complex political hospital atmosphere. The computers have become a more transparent, simple structure giving the nurse a sense of environmental control. They allow the individual nurse to be in control of information and in control of the environment. An example is a nurse previously given a STAT order for insulin in a manual mode of documentation who may not be in control of all the information: e.g., what was the patient's/client's blood glucose? Without computers, some nurses took the liberty to ask someone what the glucose was. Yet the nurse was accountable for observing the effects of the insulin administration. In the new computer age, the nurse received the order from the computer and requested the glucose level from the laboratory results section of the computer. This example provides two possible reasons individual nurses have taken an interest in computers: 1) the nurse can now enter the computer and find out from the laboratory data what the blood glucose was before administering the insulin, and she knows where the titration point is starting, thereby putting the nurse in control of information; and 2) the nurse received the "order" from a computer and not another human being. Knowledge is power, and the computer puts nurses in control of information.

The computer is also the "Second Self." In this information age with the masses of scientific data that is produced, computers can synthesize knowledge by practice experts and bring it to the bedside of the individual nurse to help in patient/client care and clinical decision making. This role of the computer was predicted in 1984 by Schultz. Now, with this knowledge synthesis, the role of standards and uniform language within computers becomes a paramount issue. This was reiterated by Schultz (1991) in his keynote address at the main conference, and in the paper by McCormick (1991b).

Clinical Practice Guidelines

A new Federal Agency in the United States, the Agency for Health Care Policy and Research (AHCPR) is developing clinical practice guidelines to serve as the knowledge synthesizers developed by expert multidisciplinary panels. These clinical practice guidelines are "systematically developed statements to assist practitioners and patient/client decisions about appropriate health care for specific clinical circumstances" (AHCPR Program Note, 1990). Further, these guidelines are expected to improve methods of prevention, diagnosis, treatment and clinical management for the benefit of many individuals, and reduce clinically significant variations in the outcomes of health care services and procedures. These guidelines will be valuable to nursing as content within the computer to assure that minimum

nursing diagnostic assessments are done, proper interventions are described, and "realistic" outcomes are in sight. Through information technology and clinical practice guidelines, nurses can study the effectiveness and efficiency of their care and differences in delivery system. A recommendation of the Institute of Medicine report on the "Computer-Based Patient Care Record," is the concept that computerized records will be a boon to the usage of clinical practice guidelines as content in information systems that support patient/client care (Dick & Steen, 1991).

The individual nurse is producing data elements at the bedside that become a part of the organization to measure whether nurses make a difference in the delivery of care to patients/ clients. The individual nurse is put in a place of control of information with information technology. For nurses, this is information that we have not been privy to in years. The computer puts each nurse at the bedside in a role of information manager.

Education

For the individual nurse, information technology can serve as an adjunct to education. Information technology can help with self-informing, self-training, and self-educating. As M. Scholes describes in her main paper from the conference, "There are surely some lessons to be drawn from the services given to the more remote areas in countries such as Australia." (Scholes, 1991). The use of the computer as an adjunct to individualized education is demonstrated in the outreach programs that exist in Australia and other countries with large rural and bush populations.

For the individual consumer, information technology provides an accurate longitudinal account of health care. The patient/client can be the beneficiary of this. Again, because clinical practice guidelines involve consumers in the decision process of diagnosis and treatment of their condition, information technology can track consumer selection of: 1) non-invasive versus invasive treatment, 2) low-cost or high-cost technologies, and 3) interventions without complications, risks, and side-effects compared to those that incur known risks. The documentation of the patient's/client's reasoning in the decision will become key data that nurses need to collect. Similarly, documentation systems will need to include an assessment of patient/client satisfaction in order to complete the patient/client involvement in health care.

THE ORGANIZATION

From the organizational perspective, the participants heard the concepts of Margaret Marion. She described the organizational change required to implement technological data systems (TDS) in Winchester, U.K. Her point was that critics of technology become converts by using them in the implementation process. She defined the implementation process and then the organizational benefits of information technology. Basically, she described the contributions made to management based on three areas: 1) the costs and administrative influences, 2) resource identification, and 3) the contributions that information technology makes toward strategic planning. Each group then devoted a large part of their report to organization

change; discussing the influence on people management, communication flow, and the importance of computerized documentation to quality assurance.

Management of Health Care

In fact, computers should be a resource to help in the management of health care. These improvements are made by reminding, recalling, linking, analyzing, and judging health professionals and organizations. Computers and information technology should be an asset in the management of patient/client care, storage of data, and communication of information. Information technology should be the skeletal framework to manage the complexities of nursing care in the 1990's.

The computer also should support clinical decision making, and establish mechanisms for quality assurance linked to clinical practice guidelines at the time and site of patient/client care. The quality assurance, cost components, and the review of the chart should be linked to minimal review criterion in the same way that records are currently summarized for the discharge summary/ discharge care plan. At the selection of the discharge summary, the review criteria should be automatically linked to local, state, regional, or national level review standards for the assurance that guidelines were followed and realistic outcomes were met.

In a new paper by McCormick (1991a), a broad range of outcomes is described that nursing can realistically meet, and that categories of nursing problems can be met. The outcomes that nursing strives to reach are broader than morbidity and mortality and encompass a spectrum of outcomes including, improvement, stabilization, deterioration, and death. In that paper, McCormick identifies content areas where nurses can reach outcomes.

The new information technology provides opportunities for reducing administrative costs, capturing relevant, accurate data necessary for technology assessment, health services research, appropriateness, effectiveness and outcomes of care. Identifying the outcomes and demonstrating that nurses can reach the outcomes efficiently and effectively becomes the central issue for nursing organizations in the 90's.

SOCIETY

From the societal view, Salah Mandil used the analogy, in reverse, of a developing child to describe information technology development. Again, the theme that information is power was iterated in this discussion. He stressed the need for structure, allowing for cultural diversity in using information technology for epidemiologic surveillance, and evaluation of health services. The major issues of society that were described by the Keynote and groups were the need for policies, standards, and data projections, which are broader than confidentiality and security. It was also a consensus that while there is widespread use of computers as tools to increase efficiency in all facets of everyday life (e.g., grocery shopping, banking, going to gasoline stations) the consumer is unaware of the benefit of information technology on health care, and his individual care.

Current paradigm shifts are occurring in society, which are making information technology a more visible tool to access information easily. For example, where one works

and how long one works are changing shifts in society: people now live in Colorado and have their offices in Washington, DC; seniors are working up to 20 years after their first retirement. Computers and FAX machines allow elders to work from their homes, many miles from the job site. Women and mothers are also working from their homes in unique roles and with unique information resources.

A major social force of information technology has been to outreach by providing primary health professionals with information needed to deliver care in the most remote areas of countries, rural and even bush settings. Now with a micro-computer, a telephone, a modem, and very inexpensive software, primary health care professionals can be linked to the National Library of Medicine through Grateful-Med. Most literature from around the world is available to health professionals delivering care.

Needed Health Care Reform

The major social force for information technology is the pressures of society for needed health care reform: the movement toward effectiveness, decision-making, legitimate needs for patient/client data, and improved quality and reduced costs. Despite the type of health care system that we are confronted with, health care reform is being talked about from all continents represented in this post-conference. This could be occurring because the advanced technology required to change health care has been developed and is available. Automation is a crucial element of the infrastructure of a society's health care system.

The challenge for society is to coordinate the development of information technology for health care and for the nursing professional societies to be a part of that coordination in synchrony with societal development. From change theory, one learns that you cannot influence or change a system of health care that you cannot define. With our culturally diverse health care systems, information technology development can only influence global society after the development of policies, standards, and practice guidelines as content in information systems.

POST-CONFERENCE HISTORY

Now, as we close, we reflect on the drop of water, the pool, or the sea and ask ourselves if our development has been more like the different metals. Our initial information technology development was centered on the individual: it was perhaps like brass, very rough, needing almost constant buffing to keep it shining; left with water only, it was corrosive to health care. We were studying the impact of computers on nursing (Scholes, Bryant, & Barber, 1983). During this time we were discussing nurses using computers and information science (Hannah, Guillemin, & Conklin, 1985). We were deciding whether we were bringing nursing to informatics or informatics to nursing. Also during this time, we began to reflect on more advanced uses of the computer through decision support for nursing (Ozbolt, Vanderwal, & Hannah, 1990).

Today we are more like silver: the polishing is less frequent, the metal is harder, the shine is more luxurious. We begin to reflect that the finished products could produce more usefulness to us. We can see the impact on the individual, the organization, and society.

As we enter the golden decade of information technology, we should have a standard of uniformity, a real acid test of usefulness, and a product that you can "sink your teeth into." It should reflect individual, organizational, and societal uses and link us internationally like a gold standard.

By the year 2000, as we approach "Health for All," we need the platinum information technology systems. These will be long-lasting, more valued because of their investment value in health care.

In one more year we will have reached a decade of working conferences in Nursing Informatics. We have advanced from brass to silver. We are not just aged brass, we are a higher grade of metal; but, we have a long way to go until we have platinum information technologies. It is only through these international working conferences that we have, as a group, been able to move from a corrosive brass to a nonrusting metal that even endures the seas. We have developed from a group of pioneers testing the technology to the implementors, bridging caring to technology, researching the uses of the data, and exploring decision support. This year we have moved information technology from the individual to society.

On behalf of the four discussion groups and our keynote speakers for the post-conference, I would like to thank the Australian organizing committee for being the host of this important conference and moving information technology ahead.

In closing I paraphrase a poem by Banjo Patterson:

THE LAST PARADE

With never a sound of a trumpet
With never a flag displayed
The last of the nurse informaticians
Lined up for this recent parade

Weary they were and battered
Shoeless and knocked about
From under their ragged forelocks
Their hungry eyes looked out

And they watched as the organisers
Read out to the cheering men
The nation's thanks, and the orders
To carry them home again

And the last of the nurse informaticians
Sinewy, lean and spare
Spoke for their hungry comrades
Have we not done our share?

Starving and tired and thirsty
We limped on the bars plain
And after a long night's picket
You saddled us up again

We froze on the windswept kopjes
When the sand lay snowy white
A little halt in the daytime
A peaceful rest at night

We knew when the bells rattled
From the hallways bare and brown
And over our weary shoulders
We felt warm blood run down

And as we turned for the stretching gallop
Crushed to the earth with weight
But you carried your riders through it
Sometimes perhaps too late

Steel, we were steel to stand it
We that have lasted through
We are the nurse informaticians
Pitiful, poor and few

Over the seas you brought us
Over the leagues of foam
Now we have served you fairly
Will you not take us home?

Home to the Hunter River
To the flats where the lucerne grows
Home where the Murrumbidgee
Rivers white with the melted snow

This is a small thing surely!
Will not you give the command
That the last of the nurse informaticians
Go back to their native land?

They looked at the grim navy captain
But never a sign she made
"Dismissed" and the nurse informaticians
Moved off to the next parade.

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PART II

HEALTH CARE INFORMATION TECHNOLOGY
IMPLICATIONS FOR CHANGE

Working Group Papers

A major feature of the Invitational Post-Conference was the working groups, structured for the purpose of soliciting viewpoints of nursing informatics leaders from around the world. These experts were asked to express themselves on a variety of issues which are of particular relevance to the field today. Each group leader was responsible for writing a summary report, as follows here, as well as facilitating the discussion.

Over the course of their hours together, the groups developed perspectives on matters pertaining to society, organizations and the individual. They were guided in their thinking by the plenary papers and by the following topical outline:

SOCIETY

- Social issues impacting healthcare, including consumerism, rights to quality care, aging, career mothers.
- The usefulness of large databases in understanding such concerns as the spread of disease and treatment protocol effectiveness.
- The impact of information technology on health care delivery systems and related cost-benefits.

ORGANIZATION

- Using the computer as a communications vehicle for the organization.
- The computer as a tool for building a research database within healthcare institutions.
- The impact of information technology on organizational culture.
- Accessing resources available to the organization, including consultants and vendors.

INDIVIDUAL

- Facilitating and enhancing the role of the nurse.
- Expert and decision support systems.
- Impact on patient or client care.

While there were necessarily some redundancies in the reports, each group treated the issues in its own way and in order to reflect the special character of the separate discussions all four papers are published in their entirety.

editors.

1 **Group leader: William L. Holzemer** (USA)
Penny Baxter (Australia), Barbara E. Carter (Australia),
Vernice Ferguson (USA), Ulla Gerdin (Sweden),
Evelyn J. S. Hovenga (Australia), Margaret P. Marion (UK),
Marcia Orsolits Stevic (USA), Roy L. Simpson (USA)
Scribe: Joan Donoghue (Australia)

2 **Group leader: Tricia Leeder** (Australia)
Rita L. Axford (Australia), Barry Barber (UK), Merle Cooke (Australia),
Carol F. Gaston (Australia), Carole A. Gassert (USA), Shirley Hughes (USA),
Kathleen A. McCormick (USA), Elly Pluyter-Wenting (The Netherlands)
Scribe: Bill McGuiness (Australia)

3 **Group leader: Susan J. Grobe** (USA)
Maisa Antti-Poika (Finland), Linda Edmunds (USA), John Hinterreiter (Australia),
Salah H. Mandil (Switzerland), Patsy B. Marr (USA), Diane J. Skiba (USA),
Denis Vandewal (Belgium), Rita D. Zielstorff (USA)
Scribe: Beverly C. Walker (Australia)

4 **Group leader: Wendy King** (UK)
Albert Bakker (The Netherlands), Albert J. Creevey (Australia),
Yolande Elsig (Switzerland), Edward J. Halloran (USA),
Susan K. Newbold (Australia), Roberta Rochman (USA),
Judith S. Ronald (USA), Sheila A. Ryan (USA)
Scribe: Joan Edgecumbe (Australia)

WORKING GROUP PAPER ONE

William L. Holzemer (Group Leader)

GROUP MEMBERS: Penny Baxter, Barbara E. Carter, Vernice Ferguson, Ulla Gerdin, Evelyn J. S. Hovenga, Margaret P. Marion, Marcia Orsolits Stevic, Roy L. Simpson, and Joan Donoghue (scribe)

SOCIETY

Work and Non-Work Cycles

Changes are occuring in people's life-cycle of work and non-work in cultures around the world. Individuals now define work and non-work in different and new ways and these re-definitions have resulted in a fundamental paradigm shift. Concepts like the "full-time working career mother" are out-dated in many cultures with the newly defined roles of fathers at home, fathers as care providers and mothers working at home for income. The traditional definitions of work and leisure are no longer relevant nor do they describe how people define themselves.

This shift in the conceptualization of the work--non-work paradigm has resulted in a corresponding change in learning. The concept of life-long learners who have different needs for information at different times and in diverse locations is changing the conceptualization of education. Information technology can provide new strategies to support learners in their time on task activities.

The increasing life-span and the growth of the aged population are also contributing to this paradigm shift. The aged population is experiencing more frequently occurring role changes which blur the separation of work and non-work.

The work--non-work shift is creating a re-conceptualization and re-valuing of caring as valued work. The work of caring is becoming valued in new and different ways, partially because of this shift as well. The hidden work of child rearing, parental care, as well as nursing care are moving from the hidden to the visible models. Information technology (IT) has the potential to enhance this shift by providing easy access to information, removing the boundaries about where work can occur, and defining new types of work.

Within the context of understanding IT and this life-cycle shift, is the value question of determining social goals and values. One participant suggested that societies conceptualize goals from one of four perspectives: survival, efficiency, comfort, or luxury. IT has the potential to enhance each of these social goals in different ways and it is necessary to have an understanding of the cultural goals prior to understanding how IT can enhance those goals. Values or social goals of society define the role that IT will play in that society.

Trust and Empowerment

Although social goals have a major role in defining the way in which IT will contribute to these goals, the degree of public trust and participation in IT activities is central to the effective use of IT capabilities. Technologies such as the smart card or electronic personalized patient chart have many advantages in that the patient becomes directly responsible for ownership of their medical record. However, the public has an inherent distrust of this type of IT because it has the ability to identify individual weaknesses and human frailties and to make them public.

If a society adopts Primary Health Care (PHC) as a philosophical position defining its values regarding health and health care, then certain assumptions about IT can be developed. The role of IT becomes that of supporting personal and community mobilization. The goal of such IT support systems would fit within the context of supporting the goals of PHC, not the needs of health care providers or health care institutions. The goal of empowerment as an objective of IT was warmly endorsed by the group.

A Vision for IT

Nursing has a significant contribution to make in the re-definition of data base systems that currently exist in health care. For example, most systems do not include items such as quality of life indicators, functional status measures, etc. These variables are important health outcome indicators that are affected by nursing care, yet rarely included in data base development in the health setting.

At the same time, it is recognized that many times in our political environments, decisions are not necessarily made based upon the data. However, data bases have the obligation to attempt to provide accurate and timely information to assist decision makers make informed decisions.

It is very difficult to develop an acceptable collective vision of the role of IT in health care in a pluralistic society. IT is required to enhance the development of quality indicators, provide access to resource management decisions, and provide the ability to evaluate the differential contribution of resources to hospital or tertiary care facilities as well as compared to community based care systems. Because of the difficulty of developing a unified vision beyond primary health care, it was suggested that a pluralistic vision that allows experimentation might be the most astute strategy for creating a future vision. Experimental strategies would allow the actual assessment of the usefulness of IT and its contribution to decision making and health.

Within the context of examining society and issues of life cycle changes, the aging population, and the shrinking work force, a concern arises about the bimodal distribution of talent developing in many parts of the world. Many applicants for positions within the workforce simply do not have sufficient literacy to participate as productive workers. One of the consequences of this is that industries, including the health care industry, are required to spend more and more resources on general schooling and training.

Within this dynamic situation, a vision of the future must also be conceptualized within the realities of the market place. It is not acceptable to develop a hypothetical view of IT that is

totally unrealistic from the financial or technical viewpoints. However, when developing a vision of the future it is also necessary to step outside and beyond current structures and limitations in order to create a new vision. When health care providers build a vision of the role of IT within a social context, one of the significant guiding forces utilized by these planners must be an advanced understanding of clinical practice. It is the expertise of clinical practice that provides both a reality and a vision for IT and its actual and potential contributions to health and health care.

ORGANIZATIONS

Communication Flow Patterns

IT systems have the potential to enhance or stifle the natural communication flow patterns of institutions. By studying communication flow patterns, IT personnel may develop a better understanding of the nature of the work within the organization. As a strategy to illustrate this, graphics that depicted different views of communication flow patterns have been shown to be useful in one organization (Gerdin & Peterson, these proceedings). This "organic chart" reflects blood flow patterns through the human body and illustratives the dynamic inter-relationships of various units within the Health Department and how their survival is linked to one another. Work in this organic communication flow pattern is dynamic and constantly changing.

A second model, depicting a bicycle tire to represent the particular health unit, shows the patient in the center and all aspects of service supports located around the unit (Gerdin & Peterson, these proceedings). The tire is represented as rolling over a series of rocks reflecting different aspects of a society that occasionally impact upon the rolling tire. This is in contrast to the structured, squared boxes of an administrative chart which traditional depict how IT professionals conceptualize communication flow patterns. The neat and orderly boxes of the classic IT depiction of reality are challenged by both the organic model and the bicycle tire model. The important lesson from these illustrations is that they assist one to become quickly aware of personal biases and their representations of their own world.

Quality of Care

IT support systems should have a central ability to support quality of care activities. The availability of information in such systems in fact can be judged adequate or inadequate to the extent that the data support the ability to make decisions about quality of care. Therefore, the first challenge in IT and quality assurance (QA) is to become intimately familiar with one's respective IT system so that one understands how to utilize existing data for decisions on quality of care. With this awareness, one will become aware of what is missing from the system as well.

IT support systems must link with admission and discharge policies allowing a better understanding of nurses workloads and another direct measure of quality of care. Decisions regarding IT systems can be conceptualized as strategic, operational, and tactical. Often,

systems lack the operationalization of variables that define nursing practice and that are directly related to patient outcomes.

Multiple methods are available to explore quality of care, including methodological and statistical strategies. Methodological strategies include retrospective, concurrent, and prospective audit strategies. Statistical procedures commonly used include analysis of variance, pattern analysis, and other descriptive and inferential statistical techniques. The level of research expertise required in this level of quality assurance program demands graduate level preparation.

A United States' model of patient outcomes that can be utilized to explore outcomes include the generic screens that are being operationalized by the US Government. These include six screens: adequacy of discharge planning, stability at discharge, nosocomial infection, unexpected death, unexpected return to the operating room, and trauma (which includes items like falls, decubiti, medication errors, etc.). Work is progressing to develop measurement strategies to operationalize these screens as well as research designed to link nursing interventions with these patient outcome indicators. The second screen, stability at discharge, is being documented to be highly predictive of morbidity and mortality and this is an area of current nursing research. When asked, many physicians are quick to agree that this functional status of the patient is a component of nursing practice.

Research and IT

Research, quality assurance, and IT are intimately linked. Research on nursing outcomes is not possible without the inclusion of patient outcomes related to nursing practice into IT systems. IT systems that include patient outcomes that relate to nursing practice are important because they provide a data base for the practitioner to validate patterns. IT systems must be sufficiently sophisticated to allow the control of demographic patient factors such as acuity; this data will allow for an accurate representation of outcomes that are related to interventions (medical, nursing, social work, etc). and not just the acuity of the patient. At the same time, the development of such systems are potentially problematic to providers because they allow for the identification of the individual practitioner who may be contributing to negative outcomes. In the US, physicians are protected from liability when such information is exposed during quality audit reviews. However, nurses currently do not have such protection.

Eventually, reimbursement will be linked to these outcome measures. Therefore, the development of valid and reliable patient outcome measures that are related to nursing practice have the potential to document that nursing makes a difference in patient outcomes, define an aspect of the legal scope of practice, and allow reimbursement for services. The stakes are high as nursing contributes to the development of patient outcomes that relate to nursing practice.

Organizational Climate

IT is neutral to discussions of organizational climate. If the administrative team has an open, organic model of administration, then effective IT systems have the potential to allow simultaneous local decision making and central review. An effective IT system can allow an administrator to move decisions to the level at which the most information is generated about the decision. However, if the organizational climate is controlling and autocratic, then IT systems will reflect such a philosophical position and keep control of information centrally. Such a philosophy is suggested to be poor management in these days of scarce personpower, and it results in an IT system open to potential sabotage by employees.

THE INDIVIDUAL

IT and Compliance

The issue of IT and compliance, may lead to negative comment relating to nursing care compliance. For example, as diversity is eliminated, personal freedom may be threatened. IT has the potential to allow individuals to be less personally responsible and less compliant. The research on behavior change documents that knowledge is not sufficient for behavior change. So knowledge about IT may not be sufficient to change nursing practice; rather it supplements and expands our ability to deliver and manage quality patient care. IT serves as a catalyst to compliance by providing prompts and alarms.

Environment and the Individual

The individual is inextricably linked with his or her environment and we do well to remind ourselves that many patients prefer the older style Nightingale wards where patients felt less isolated and had more access to nurses who were caring for other patients on the units. This awareness that new is not always better may serve as important background when considering the potential impact of placing terminals at the bedside. Placing terminals at the bedside will require that the providers develop new strategies for working with patients. At the same time, it is possible that such a system will have a negative impact on nurses. By removing their time away from patients where they have had opportunities for reflection and rest, we may be increasing their stress and dissatisfaction with their work. When IT systems no longer have the requirement of shift report or handing over, we may be removing an important social aspect of the nursing culture where time for thought, reflection, and dialogue occurs. These factors require further study.

Advanced Nursing Practice as Information Management

IT has the potential to assist nurses to work smarter and not harder. As a manager of information, the nurse has the potential to impact directly on quality of patient care. However, he or she may experience guilt about leaving the direct bedside and performing less direct "hands-on" care. The amount of information that must be processed is increasing at a rapid

pace and without IT, nurses are simply not able to attend to the degree of patterning that may exist within a data set.

Advanced nursing practice may be best captured by the concept of the information manager. Perhaps nurses will move to a new role within the health care setting of the information manager and hosts or hostesses will provide those direct patient care services that can be handled by less well prepared individuals. At the same time, it is conceivable that an interactive IT system might allow the information manager-nurse to respond directly to patient requests via the terminal in a new and innovative strategy. If a patient requests a glass of water and it takes 30 minutes for the nurse to physically respond, perhaps a system that allows the nurse to communicate via a terminal would allow a more instantaneous response to patient needs.

Finally, the view that focuses solely on the cost-benefit component is very limiting. Rather, IT should be viewed as essential and necessary to quality care systems. Table 1 presents a synopsis of potential pros and cons of IT and nursing for review and reflection. Table 2 reflects a summary of issues and ideas relating to the relationship of IT, society, organizations and the nurse.

In summary, societal values drive the development, implementation, and utilization of IT. Nurses, as information managers, will have increased opportunities to contribute to the common health goals of their communities through their enhanced expertise in IT and their expert clinical knowledge base.

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Table 1

Pros/Positive Aspects of IT	Cons/Negative Aspects of IT
*standardization of data elements	*potential blind compliance
*creates opportunities for new management strategies	*can intensify control and uniformity
*beside terminals bring the nurse to the bedside	*increases stress due to fewer breaks away from patients, limits socialization
*expands conceptualization of knowledge, can move to new levels	*danger of interpreting the beginning as an end
*excellent software as developed and developing; HIS as automated and automating	*failure to see IT as developing and automating
*efficient communication strategy	*It is only one means of communication
*creates alert systems, adds visibility to existing problems	*requires management solutions tendency to blame IT for problems
*requires use of standard language	*reduces personal freedom, demands communication at personal level
*sees patterns and allows variance within parameters	*providing patterns may weaken ability to detect patterns
*advanced nursing practice defined as information manager	*guilt of giving up hands-on care
*use of data for evaluation through practice	*requires manager to remain clinically relevant & demands changes in nursing education

Table 2

Summary of IT and Society, Organizations, and the Nurse

IT and Society

1. Understanding societal values is a key concept in IT development (we emphasized Primary Health Care and consumer power)
2. Life cycle changes in the Work and Non-work concepts have the potential to be greatly enhanced with IT
3. The relationship between data-bases and patient level data is critical. Who needs to know what information?

IT and Organizations

1. Environmental engineering-climate patterning-communication flow patterns are central to IT
2. IT must focus upon outcomes of care/quality of care
3. IT should be conceptualized as a resource, its benefits to an organization are much more than simply a cost-benefit analysis
4. IT provides opportunities for new management strategies

IT and the Individual Nurse

1. IT provides the expert clinical nurse with the ability to serve as an effective information manager; IT empowers nurses and may provide an enhanced vision of advanced clinical practice.
2. IT provides opportunities for individuals to exhibit new leadership styles, celebrate cultural diversity, respect emerging work cycle patterns, nurture environmental systems, and empower individuals, families, and communities.

WORKING GROUP PAPER TWO

Tricia Leeder (Group Leader)

GROUP MEMBERS: Rita L. Axford, Barry Barber, Merle Cooke, Carol E. Gaston, Carole A. Gassert, Shirley Hughes, Kathleen A. McCormick, Elly Pluyter-Wenting, and Bill McGuiness (scribe)

INTRODUCTION

The importance of information technologies (IT) to society at large is its all-pervasive nature. Individuals, organisations, and society, in general, have become accustomed to, and dependent on it, for use in all spheres of their daily activities.

INFORMATION TECHNOLOGY AND THE DELIVERY OF HEALTH CARE

Organisational operations have become increasingly dependent on IT for the mobilisation of data/information necessary for effective and efficient management. Hospitals, and other health care institutions are no exception to this rule. Large and complex databases have arisen in the health care sector as a consequence of pressures from both external and internal bodies for greater technological modalities for the delivery of health care, and greater accountability for resources used in that care.

Two pressing and recurring themes emerge:

1. The demand for massive health care databanks for the storage of information relating to all activities of health care delivery, and resource allocations for those activities.

   As a result of this increased demand, and subsequent development of information technology in the health care arena, it is imperative that the protection, security and safety of data at all levels of health care management is addressed and appropriate action taken. Database security and protection management activities have to be made by those expert in the field.

2. The demand for effectiveness of health care modalities to be addressed, as well as issues relating to the efficient use of health care resources.

   No longer is efficiency the sole criteria for good health care delivery. The effectiveness of care is of equal importance to clinicians who must balance the cost of care with quality of care. Quality of care must be recognised as an economic asset for society at large. To this end, outcomes of care, which can be quantified and qualified must be an objective for health care delivery services.

HEALTH CARE DATABANKS - IMPLICATIONS FOR HEALTH

The increasing demand for massive amounts of health related information for use and manipulation by a diversity of organisations, and individuals in organisations, has implications for the safety of both the patient and the organisation.

While health care modalities are being looked at in respect to its impact on the health and well being of the population in general, the security and safety of data generated as consequences of these modalities have not been afforded the same attention, yet the impact may be as great.

It is of concern that IT systems in health care are being "stretched to the limit" but what happens when the elastic snaps? The issue has become one of patient safety. Health practitioners, for example, are increasingly relying upon IT as part of their tools of trade. What happens then if the tools of trade malfunctions, or are not available?

Any discussion on the implications of IT for health care delivery must therefore include aspects of security of data, as well as the safety of data content. Not only will loss of data, or corruption of data, have the potential for adverse effects on the health and well being of individuals, it may well affect the formation of supportive information necessary for decision-making in critical areas, such as, health care resource allocations.

Although data security and counter-measures to protect that security is of paramount importance for existing IT systems, equally or more important, is the insurance of effective security within IT system designs. Serious consideration of security features of systems must be addressed at all stages of system procurement, installation, operation and maintenance IT security must be an integral part of systems when they are being evaluated, and must thus be included in the cost and benefit analysis of such systems.

In response to the dilemma of IT system protection, it is important that all managers of database systems put security and safety into the system which is commensurate to its specific purpose, and to the value attached to the data.

The current trend for addressing the issue of security and protection of health care databases in many countries is for national statements and policies, coupled with enforceable action, for the protection of these databanks. For many countries these mandates are translated into Governmental Statutory Laws. It is important that in organisations not governed by such laws, that similar statements and policies are made and mandated by the highest authority in that institution.

On the local level, it is important that all health care professionals secure and protect their data; that they be aware of security risks relating to the data contained in all documents stored in computer files.

Documentation and patient rights to that documentation includes issues relating to:

- patient access to their data at bedside terminals, and how this may influence the protection of data, and
- the right of consumers not only to access their data but also the right to update that data.

In summation, security must be an integral part of all IT systems. Therefore, IT budgets, planning and replacement costs must be based on the overall plan of IT for the operation and management of health care activities.

EFFECTIVENESS OF HEALTH CARE - IMPLICATIONS

With the spiralling cost of health care, and the need for micro-economic reform, attention to health care funding needs to be made with a clear perspective on the true cost/benefit of health care funding allocations and health care activities. Coupled with the demand for efficient health care delivery is the demand for effectiveness of health care modalities.

In the past, funding efficiencies in one health care setting (specifically in Australia) was rewarded with increased funding for that setting. Consequently, acute hospital activities in some areas of the country increased, but financial support for primary health care services, which increased as a consequence of hospital efficiencies, were in general not sufficiently funded to adequately address the impact of hospital efficiencies on its services. It makes good sense therefore, to capture and use database information from health care databanks on current activities in an effort to address this anomaly and perhaps to break inefficient service cycles.

Effectiveness of nursing services is in the forefront of nursing strategies aimed at addressing issues of the cost and quality of care. One strategy currently being implemented in seven hospitals over two states in Australia, is to address the issue of rostering efficiencies and effectiveness, and to computerise rostering. It was deemed important to roster according to patient demand rather than staff supply to balance staff mix and to optimise the cost. The system, however had to be flexible and allow creativity in rostering. Simulation models of differing shift lengths and starting times, using linear programming, were run so that unit needs and staffing numbers could be ascertained. Staff satisfaction and occupational health, as well as cost and balanced staffing mix, were addressed. There was also adherence to hospital and/or award requirements.

Data to date, suggests that as much as 20% of the salaries budget could be realised using this system. Nurse managers now make rostering decisions with the full knowledge of the impact of those decisions on the cost and staff mix.

A second development proposed by the Nursing Department of the South Australian Government, is to use database information to track the time spent on staff development. The aim of the project is to tailor staff development courses, and base these courses on a competency criteria, as opposed to a standard time criteria.

On the question of outcome-based data to measure quality of care rendered, the use of morbidity/mortality as measures of outcome, for example, is not appropriate nor acceptable as a measure of nursing effectiveness. Nurses should not be accountable for these so called patient outcomes. It was agreed that this is a medical model and must be recognised as such. There are many patient care models which measures differing aspects of quality of care delivered by nurses. Irrespective of the model used, it was agreed that nurses need to access

data about people in relation to their stability, improvement or decline. These elements must be measurable and able to be transformed into a discharge plan for the individual.

The overriding theme here is that information systems should be supportive mechanisms, which permit nurses to answer their own questions and be responsible for making their own changes, and that nursing research must stimulate enquiry for this to occur.

WHO MAKES THE DECISIONS ABOUT NURSING SYSTEMS?

While opinion varies as to who should make decisions about nursing systems, it is generally accepted that decisions relating to information systems in health care environments must be made by the senior executive of the organisation. The reason being, that the senior executive is responsible for the fulfilment of the mission of the organisation, and is aware of resources available for procurement and implementation of IT systems (which must be in tune with the mission statement). Further, health information systems may be too complex for end users to grapple with, and it is frequently too time consuming for reaching consensus among all users, if they are involved in decisions relating to system requirements and design.

The alternative view is that the success of IT systems, particularly in the implementation stage, is very much dependent on the commitment of the end user to the project. If the end user is not involved at the initiation of the project, there may well be strong resistance to the project, causing severe disruption to its use. The concern here is one of promotion of ownership for better acceptance of systems with education and timing of implementation being important elements.

In regards to implementation strategies per se, no one best way to manage and implement any IT system exists. What is critical for successful implementation of systems is that the management of change is accommodated. Employing the role of the professional implementors versus the vendor installers is one alternative strategy.

INFORMATION TECHNOLOGY AND NURSING iNFORMATICS?

Four roles are emerging for nursing informaticians. These roles can be found in the areas of:

- health care agencies,
- vendor representatives,
- consultancies, and
- academia.

With the increased use of computers and information technology in the health care environment, nurses must, participate in all arenas of health care informatics mentioned above if they are to determine their own requirements for information that supports their own practice. To be able to become a valuable and valued member of this fraternity they must be educational prepared and opportunities must be afforded to them for practice.

At the present time there are limited university programs for advancement of nurse computer competencies, particularly at the doctoral level. One alternative strategy for

addressing this issue is to bring about change to the legislation requirement for education. Universities might be required to follow legislation edicts if their program is to be accredited. The legislation could include a sunset clause, to the effect that by a certain date, nurse education must have specified elements of nursing informatics in their curriculum.

NURSING INFORMATICS DEFINED?

Given rapid developments in the field, it may be timely to review definitions of 'nursing informatics.' A more current definition for the field to consider is:

> Nursing informatics is the use of nursing science, computer science, and information science in nursing processes for patient/client care which provides data, information, and knowledge to the individual and the organisation in such a way as to change/influence society whilst protecting the individual and achieving health for all.

The goals of nursing informatics are to provide:

1. access to information
2. communication within health care
3. quality nursing practice, management, education and research.
4. cost benefit effectiveness and efficiency in health care.
5. improve the health of society.

WORKING GROUP PAPER THREE

Susan J. Grobe (Group Leader)

GROUP MEMBERS: Maisa Antii-Poika, Linda Edmunds, John Hinterreiter, Salah H. Mandil, Patsy B. Marr, Diane J. Skiba, Denis Vandewal, Rita D. Zielstorff, and Beverly C. Walker (scribe)

INTRODUCTION

The impact of information technology on society, organizations and the individual is described from three perspectives. Existing myths about information technology are presented first, followed by descriptions of applications of current technologies, and concluding with a discussion of desirable future developments.

SOCIETAL CHANGE

Myths about Information Technology (IT) and Society

A predominant myth that exists today is that involvement with information technology is both dehumanizing and de-professionalizing. Although the dehumanizing myth is gradually decreasing, it remains significant enough to be addressed here. Two key points are relevant in considering this myth: first, informatics support for nursing can free up nursing time for more human contact; second, system designers should increasingly emphasize the human aspects of the interface.

While information technology is indeed a profession in its own right, the use of IT by nurses, is and must remain an integral part of their professional practice. Part of the IT de-professionalization myth stems from the fact that many current systems have been designed for clerical and financial purposes, and not for primarily clinical purposes will be addressed. Nurses must continue to be involved in the design and development of systems so that they will serve clinical needs.

Information Technology Awareness

Hopefully, the more society becomes aware of the current uses of IT in rendering health care services, the less negative will be nurses reactions. Society's increasing exposure to IT functions in other service sectors is quite likely to increase both their awareness of IT's potential, and their expectations of IT uses in health care.

Well chosen examples of the uses of IT in health care should be widely publicized as far as practical and permissible. It is believed that positive reactions can be fostered by soliciting public opinion on both the existing and potential uses of IT for health care purposes. Recent

communication technological advancements lend themselves to broad dissemination and easy public access to health information (e.g., French MINITEL health databases).

Current State of Information Technology in Health Care

Once health care information systems are implemented, an adequate time interval must pass before requiring the systems' users to demonstrate whether they are cost effective. In the meantime the usage of such systems need not imply that they have full acceptance. Rather, users need to become involved in expressing suggestions for system modifications or complete alternatives. Overall the objectives against which these health care information systems, should be evaluated, are: the provision of the right information, in the right format, at the right time and to the right person.

Potential users of existing systems should be identified, made aware of the existing systems, taught how to use them, be allowed the time to become accustomed to their use, and at the same time, be made aware of their obligation to contribute to improving such systems, and be instructed and encourage on how to make these suggestions. These improvements take two forms; first, contributions (e.g.. data) to the content of such systems and, second, suggestions about the systems' technical characteristics (e.g.. user interface). At the same time, those who have originally conceived, designed and implemented the systems should be ready to accept and respond to the critique of their systems.

Desirable Future Information Technology in Health Care

The introduction and uses of IT in health care could bring about profound changes in the ways and economies of the various aspects of health care, including those relating to users of the systems and the clientele those systems are meant to serve.

These IT systems should contain information that enables analysis of the health care system with a view to capturing quality indicators and hints as to what actions may serve to bring about quality improvements. They should also enable the capture of productivity and effectiveness indicators that serve to optimize the utilization of all resources involved. Furthermore, IT systems should provide the tools that enable users to exert control over and influence the nature of the data and its presentation, system operations and their further development and improvement.

An important aspect needed for future systems is the networking of individuals, groups, and institutions with similar interests and activities. Such networking could, but may not necessarily be, computer supported; and could be at the local level (local area network or LAN) or at the wider level (wider area network or WAN). For example, communication among groups who would otherwise not have contact, can be accomplished using these networks. In addition, these networks can be the medium for providing communities with relevant information services, and for obtaining their input for improving these services and the networks themselves.

The introduction and operation of IT systems avails the best opportunities for making significant improvements to the health care system, per Se, including organizational changes and inputs from others outside the health care system.

Significant work remains to develop proposals for information system standards and to reach consensus on standards which address data, applications and systems software, and, communication and data exchange. However, full advantage should be taken of the IT technology itself to build on what currently exists while maintaining sufficient flexibility and avoiding major disruptions. Also, more work remains to be done with national and international legislation and regulations to protect both the consumer of health care services and its practicing professionals, and to cover the exchange of information and experience between individuals, institutions and nations.

A range of research needs and opportunities must be carried out on health care services and the IT systems that support them. For example:

a. bridging the gap between research findings and its practical applications and vice versa, and

b. fostering collaboration among researchers, clinicians and academicians.

ORGANIZATIONAL CHANGE

Myths about IT and Organizational Change

Organizations often believe that the implementation of IT will automatically resolve complex problems. In fact, the solution of organization's problems requires attention primarily to the people and the people interactions that form the organization with less to the technology itself. While the technology may be complex, it is usually people issues that prevent optimal use of the technology and not the limitations of hardware and software. Individuals' fear of: power shifts, depersonalization, changes in communication patterns, reorganization of responsibilities, and concern about de-professionalization that often interferes with effective use and the timely realization of system benefits.

Second, there is often apprehension that the introduction of information technology (IT) will eliminate communication within the team (since everyone will be accessing data from the computer). In reality, just the reverse occurs; professional communication and collaboration begins to address the appropriateness of care, and not just the details of what needs to be done to deliver the care. This shift in the nature of communication and the collaboration patterns support and enhance the interdisciplinary team approach to patient care.

A third myth exists about the nature of the disruption caused by technological innovation. It is often believed that the disruption to the organization is permanent. While it is true that implementing technology does cause a temporary disruption of the status quo, it is gradually resolved if the change process is managed carefully. Even when change is managed well, however, organizations can expect a period of turbulence while the new patterns of communication, new work responsibilities, new machines and new skills are being assimilated into the organization and its individuals are adapting to changes in their roles. The turbulence

is not permanent. After a period of time, the changes become part of the organizational status quo reflecting Lewin's perspective of the freezing, unfreezing and refreezing cycle that accompanies change.

During the implementation process, "dataflow diagrams" (Vandewal, these proceedings) and a "data dictionary" concerning the information flow and the primary system processes can be very useful for identification of problem areas and facilitation of communication between members of the organization, system designers and end-users. The diagrams are a useful tool for describing the organizational processes that are supported by IT and how information flows in achieving the organizational goals for care. Standardization and the use of basic theoretical concepts that form the basis of practice models for care can be useful to the functional analyst, the systems analyst and others concerned with designing the system for its operational functions.

Current State of IT with Respect to Organizations

While many information systems options are now available for the financial operations of hospitals, there are large gaps between what systems could do to facilitate patient care and what they are currently able to do. In general, systems do not yet support clinical nursing practice to its fullest extent. For example, current systems do not include quality and outcome measurement data manipulation possibilities, tools enabling the conduct of clinical research, decision support logic, access to relevant reference databases, support for patient instruction, or mechanisms that support continuing professional education .

As more departments within an organization begin to have access to greater amounts of data, the organization's power structure and interdepartmental relationships are altered. Departments whose power base was built by holding onto critical data required by others are most threatened and fearful for their future viability when IT disrupts their ability to sequester such information. In reality, as information becomes more available, the power base becomes broader and the organizational hierarchy becomes flatter. This in turn frees the organization to be more creative by working from a broader, richer database.

The Desirable Future

As we look towards the future, it is imperative that vendors, clinicians, academicians and professional groups work together to define and build applications for nursing so that these applications both extend the knowledge base of nursing and assist the individual nurse to care for the patient. Within a single institution, similar interdisciplinary collaboration is necessary to assure that shared applications provide direct and indirect payback for all who participate in their development, evolution and use.

While there is concurrence that the development of standards will facilitate the development of applications and data sets that can be used across organizations, there is also recognition that flexibility is as important a requirement to assure that sensitivity in communication is not lost. The work of lexicons, thesauri, and tables of correspondence promise to bridge the gap and provide a means by which diverse descriptions can be reduced

to common concepts. The use of modeling also provides an avenue for communicating the organization's practice and processs data.

Unbridled, technology can and will drive organizational change. Therefore, a re-evaluation of the organizational structure may not be counterproductive to the development of new approaches to patient care. However, a delicate balance must be achieved so that technology is a tool that is used effectively by those who understand how it can affect change. The tool must not become the primary driver of that change.

There needs to be research conducted by both system designers and nursing professionals to assure that data recorded at any one institution can be merged with data from other institutions. This would facilitate that quality assurance, research and data-based decision support development can be facilitated. Nursing professionals must be involved in developing and testing thesauri that link diverse terms with similar meanings, allowing the use of local vocabularies, while maintaining the ability to merge data.

Concentrated efforts must be devoted to defining international standards for nursing's minimum data set. While some countries have developed nursing minimum data sets (Werley & Lang, 1988; Sermeus, 1990), international standards still need to be agreed upon.

Collaborative work between researchers and developers must occur so that systems are developed that permit mapping of terms between data dictionaries, and the abstraction of data according to predefined rules. Additionally, standards of data exchange must be adopted so that differences in hardware and software platforms are not a barrier of data exchange.

It goes without saying that protection of individual privacy and confidentiality is of paramount concern when discussions about merging data into large scale data bases occur. However, the ability to merge clinical data on a large scale is essential for conducting quality assurance studies, and other research using a database approach (e.g.. knowledge bases for decision support systems).

Recognition must be given to the fact that nursing education is more than training. Nurses cannot take advantage of information technology until they learn the fundamentals of information technology, and at least some basic tenets of computer science. Standards are now in place in several countries that promote computer literacy in educational programs. Recommended informatics competencies have been proposed by an international group (Peterson & Gerdin Jelger, 1988). However, the very large number of practicing nurses who completed their education prior to the introduction of computer science need special attention. Continuing education courses that go beyond "training" in the use of a particular system are required (Ronald & Skiba, 1987).

EFFECTS OF IT ON INDIVIDUALS

IT, by providing information to individuals, causes role changes and increased personal accountability for both health care providers and consumers. Decision-making moves closer to the point of the individual affected by the decision, and individuals' roles subtly change to include information handling and decisions about alternatives.

Myths about IT's Effects on individuals

The myths that IT causes de-professionalization deserves special attention once again. Indeed, it is clear that IT affects an individual's role, but in a way that could be considered "re-professionalization." IT places more information and knowledge in the hands of the user, resulting in the potential for professionals and consumers to make more informed decisions. Thus, with IT, individuals can assume more responsibility and accountability for their decisions.

Current Practices

While current systems have been designed to support delivery of care from a financial and resource perspective, few have been constructed for clinical decision support. However, a gradual shift is occurring in our view of IT systems from a cost benefit realization focus to a clinical usefulness focus. Driven by societal and governmental changes in reimbursement and increased expectations for effectiveness, the health information of value is gradually becoming that information reflecting quality of care, effectiveness and better outcomes of care.

Desirable Future of IT in Health Care

Clinical decision support systems that include a knowledge base, and consultation, critique, reference and tutoring functions are becoming absolutely essential for health care professionals. For example, community health nurses in primary care who are faced with a birth to death health record containing all health care episodes, and who are practicing in remote and rural areas will need decision support to provide care for individuals and families. Likewise, their clients also need decision support to make choices about their various care alternatives. Only when individuals have adequate information for making decisions can we dispense with such terms as compliance and adherence to their regimens, and replace them with terms that reflect personal accountability for decisions about care.

A desperate need exists for research that addresses how the appropriate clinical data could be captured, represented and presented for use by individuals and organizations for such clinical decision support systems. Likewise, studies on how systems gradually evolve and develop to meet users needs are critical. The fact that systems must constantly change in response to users' suggestions must be acknowledged more fully.

SUMMARY

In summary, collaboration among clinicians, researchers, vendors and academicians is absolutely critical to move IT systems from their current state to a future desired state. Research is needed on clinical data sets and knowledge bases, decision support systems, case management strategies, nurse sensitive outcome indicators and methods and processes for accomplishing standardization, without serious disruption to local initiatives. Studies on system evaluation and the appropriate timing of such studies are needed, as well as on IT's effects on organizations and individuals.

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WORKING GROUP PAPER FOUR

Wendy King (Group Leader)

GROUP MEMBERS: Albert Bakker, Albert J. Creevey, Yolande Elsig, Edward J. Halloran, Susan K. Newbold, Roberta Rochman, Judith S. Ronald, Sheila A. Ryan, and Joan Edgecumbe (scribe)

EMERGING SOCIAL ISSUES

The changing balance of demand and supply within health care is a recurring theme in the analysis of the impact of information technology on society. Changes in demography such as the increasing elderly population, advances in medicine and technology and increased expectations of consumers as partners in their health care delivery systems all contribute to the ever widening gap between the needs and wants of individuals for health care and the level of service that can be delivered. Moreover, changes in the social structure of societies, for example, full time career mothers, have implications for the location, timing and environment of health care delivery.

RESOURCING HEALTH CARE

While increasing pressure is being placed upon providers of health care to do more and to do better, national economies are restricting the development and expansion of health services. This requires health personnel to account for resource use in terms of both efficiency - how well resources are being used regardless of the purpose for which they are being deployed, and effectiveness - the outcomes of resource use. Assuring efficiency and effectiveness then defines economy.

MANAGEMENT OF RESOURCES

Across nations, this improved efficiency and effectiveness, combined with the requirement to secure cost accounting and billing has led to the development and implementation of information systems. The rationale for this approach is that improved information will lead to informed, improved decision making, resources will be better allocated, and de facto services to patients will be improved.

Health care organisations have therefore designed systems for their own needs, and these are systems which distribute finance and report aggregate data to governments. They are not systems which support the care of the patient and the personnel directly providing that care. Yet resource decisions which directly influence patient care are being made on the basis of information collected for the servicing of the organisation.

NURSING SYSTEMS

During recent decades, remarkable progress has been made in the area of nurse informatics. Particularly, nurses are now directly involved in the specification, development, implementation and use of information systems which support the delivery of nursing care to the patient. Particular benefits of this trend which can be identified include:

* a time saving for the nurse by the computerisation of manual data collection;
* data readily available at ward level, and more recently, bedside terminals;
* added benefits such as the opportunity to review and query data; and
* the opportunity to conduct nursing research more easily;

However, a number of problems can also be highlighted. These include:

* the need to secure access to data and ensure confidentiality;
* concerns about the reliability of data;
* the need for exception reporting to control the volume of data;
* the use of data for additional, sometimes inappropriate purposes;
* limited choice of systems due to cost or technological constraints;
* ad hoc development of PC based systems; and
* artificial intelligence not progressing as quickly as professionals would wish.

Listing the identifiable advantages and disadvantages of nursing systems points immediately to an exploration of ways such problems could possibly be avoided and includes:

* ensuring a partnership when developing systems, between nurses, educators and vendors;
* not allowing the nursing vision of information technology and its uses to be constrained by existing technological or cost constraints;
* supporting the development of a patient-focused information strategies for health care organisations which detail the information requirements of each function within the organisation and the information flows between them, and includes the use and installation of information technology;
* providing patients with access to their own health information to support the partnership between patient and care provider;
* agreeing on minimum data definitions without over standardising data collection;
* improving output reporting;
* avoiding duplication of data; and, most importantly
* ensuring that the patient is the unit of analysis.

PATIENT CENTRED INFORMATION

The need to ensure that the patient is the unit of analysis is a central and over-riding concern. Not only would this result in information and information systems appropriate to nursing needs it would ensure that the needs of doctors and other health care professionals could be met, while at the same time, providing relevant and accurate information for managers and administrators in aggregate form.

Patient centred systems would ensure that information could be analysed across time and care settings, as well as across episodes of care. Moreover, patient centred data would facilitate the process of clinical decision making, management decision making and research.

Consideration of this issue leads one to review carefully what nurses should be trying to achieve and what information is required to account for the delivery of nursing care. Henderson (1978, p. 34) described the unique function of the nurse as being to, "help people sick or well in the performance of those activities contributing to health, its recovery (or to a peaceful death) that they would perform unaided if they had the necessary strength, will, or knowledge. It is likewise the function of nurses to help people be independent as rapidly as possible."

When nurses deliver care to patients it is within the context of an overall nursing objective such as rehabilitation or terminal care. Care is delivered and nurses then assess their own practice against the outcome related to that care objective as depicted in Figure 1.

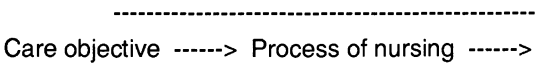

Figure 1

While care delivery is explicit, care objectives and outcomes may be implicit and are rarely recorded. For example, the care objective of nurses may be to deliver terminal care, but this will rarely be charted.

The significance of the care objective and outcome for nursing systems, is that these may be the valid measure of effectiveness. Yet nursing systems, even patient centred nursing systems, are primarily concerned with collecting data related to the actual process of care delivery. Specifically, they collect data relating to what care is actually delivered, rather than what care should be delivered to achieve the care objective.

This paper does not attempt to negate the benefits of collecting care delivery information in terms of saving time for nurses and providing accessible data, but it is of concern that data collection often focusses on activity that is readily visible and easily counted and recorded. For nursing purposes, this would not be too great a problem, but when this data is used by managers to inform resource decisions, the absence of objectives and outcomes becomes increasingly significant.

FUTURE DEVELOPMENTS

Embracing developments in information and information technology is now a key task for nurses, their managers, and their educators. As a profession, nursing needs to exert pressure to ensure that nursing systems develop in a relevant and appropriate way. This requires focus on two main areas:

* the development of patient centred systems; and
* the development of nursing care objectives and outcomes.

CONCLUSIONS

Of greatest importance is the need for nurses to retain their vision in the face of the financial and technological constraints that they will undoubtedly face. In the short term this may require nurses to accept proxy measures for data items such as outcomes while nursing research is conducted. Accepting proxy measures will acknowledge the importance of specific data items and their relevance to decisions relating to patient care, management decisions and resource allocation. It will also ensure that nursing systems develop in a way that benefits patients and supports nurses. For ultimately, if cost-benefit analysis is to be applied to information technology, it should include not only efficiency improvements but improved effectiveness and quality of nursing care delivery across all care settings.

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PART III

HEALTH CARE INFORMATION TECHNOLOGY IMPLICATIONS FOR CHANGE

Individual Papers

1 SYSTEMS DEVELOPMENT PLANNING ISSUES

This collection of papers addresses issues in planning for health care information technology. Accurate identification of information flow within the organisation and clear articulation of the organizations information needs are important predictors of successful implementation. Careful identification of the end user, and inclusion of same in the planning and implementation process, is equally vital.

The Identification of Communication Flow Patterns and Information Needs of an Organization

Merle Cooke

Information and Communication Flow Patterns: A Vital Part of the Process of Organizational Change

Ulla Gerdin and Hans Peterson

Planning Your Clinical Information System for the End User

Shirley Hughes

2 ISSUES OF VENDOR AND PROFESSIONAL DEVELOPMENT

The following papers suggest a number of issues related to the appropriate sources of expertise for systems development. Is this knowledge best sought from health care professionals, from vendors of health care information technology, or from the cooperative endeavors of both?

Software Development: Complexity and Professional Roles

Albert Bakker

The Pros and Cons of Customized Development Versus Software Package

Penny Baxter

Computer Application Development - User, Vendor or Profession?

Linda Edmunds

3 IMPLEMENTATION ISSUES AND ORGANIZATIONAL CHANGE

These three papers address a variety of issues related to managing the change process when implementing information technology. Understanding and managing organizational change is vital. The impact on the individual and the organization is highlighted in these discussions.

What's In It for Us? Information Technology Implementation -- A Process of Change

Albert J. Creevey

Managing the Change Process for a Smooth Implementation

John Hinterreiter

Managing Change for Smooth Implementation

Tricia Leeder

4 THE HUMAN - COMPUTER INTERFACE

Issues relating to the critical relationship of nursing with the computer are examined. Point of care technology and computer driven communication systems all point to benefits as yet unrealized.

Benefits of Bedside Terminals - Myth or Reality?

Evelyn J. S. Hovenga

Facilitating and Enhancing the Role of the Nurse: The Nurse and the Clinical Workstation

Roberta Rochman

The Electronic Community: Will Computer-Mediated Communication Have an Impact on Nursing Practice?

Diane J. Skiba

5 SELECTED CASE STUDIES

Four case studies are presented. One paper examines an implementation in Finland involving a new institution which provided a computerized information system across primary health care and acute hospital services. A study from the United Kingdom looks at implementation of an information system for preventative services. Papers from the Netherlands and Belgium each described an installation for a complex of acute care hospitals.

Organizational Changes as a Result of Computerization -- The Peijas-Rekola Case

Maisa Antti-Poika and Mikko Korpela

Information Technology and the Management of Preventive Services

Wendy King

Experiences with Selection and Implementation of an Integrated Hospital Information System

Elly Pluyter-Wenting

Managing the Change Process for a Smooth Implementation: The Case of Leuven

Denis Vandewal

6 USER EDUCATION AND TRAINING

Important curriculum decisions that nurse educators make across various education and training settings and levels of expertise are addressed in this group of papers. The issues of participation, content, context, and change from a variety of perspectives are discussed.

Computer-Based Training for HIS: A User-Driven Contemporary Curriculum Model

Barbara E. Carter and Rita L. Axford

From Implementation to Maintenance: How To Keep Staff Motivated?

Yolande Elsig

The Computer as a Partner in Nursing Practice: Implications for Curriculum Change

Judith S. Ronald

Computer-Based Training for H.I.S. Orientation: Efficient, Effective and Friendly

Rita D. Zielstorff

7 DATA INTEGRITY AND STANDARDS

These two papers address issues focussing on the quality and integrity of data used by nursing in health care. Data security and standards are the mainstream issues.

Data Protection and a Secure Environment for Nursing: Information Technology Security

Barry Barber

Can Patient Care Documentation Be Standardized for Today's Computer?

Susan J. Grobe

8 PREPARATION OF NURSING INFORMATICIANS

Two papers focus on the educational needs of nurses entering the new subspecialty within nursing known as nursing informatics. Appropriate level requisites are addressed as are professional and workplace demands for this expertise.

Preparing for a Career in Nursing Informatics

Carole A. Gassert

Career Opportunities in Nursing Informatics

William L. Holzemer

9 INFORMATION TECHNOLOGY OUTCOMES

A means of classifying patient care, determining quality outcome measurements, containing spiralling health care costs and inequality in accessing health care are topics explored in these papers.

Spiralling Costs of Health Care -- Can Computers Help to Contain Costs

Carol F. Gaston

Patient Classification and Computers: Tools for Patient Care Management in the Nursing Service

Edward J. Halloran

Guidelines for Measuring Quality Health Care or What to Do Until We Have a Large Database

Marcia Orsolits Stevic

Access to Care: Realities of the American Marketplace

Roy L. Simpson

THE IDENTIFICATION OF COMMUNICATION FLOW PATTERNS AND INFORMATION NEEDS OF AN ORGANIZATION

Merle Cooke

INTRODUCTION

In hospitals in the 'good old days,' the Matron was the centre of communication. All staff reported to her and provided her with information. The downward flow of information was edicts and rules. There has been a change with the payment of medical staff by the hospital and the growth of general administration services. There are now at least three streams of communication upward to the heads of services, and conversely downward. The Matron has been replaced by the Chief Executive Officer as 'head of the hospital.'

A second major change has been the technology explosion of electric typewriters, and computers. This has created paper warfare, with a mass of reports being produced, often with little useful information. Some managers have been overwhelmed by the amount of data available and are unable to glean the information required.

HOW TO IDENTIFY THE COMMUNICATION FLOW PATTERNS

There are various methods of systems analysis used to identify communication flow patterns. These include interviews, observations of work patterns, and tracking the information through the organization from where the data is collected to who uses it, and for what purpose, or is it just collected because some one may need it sometime.

WHAT CONTROLS THE COMMUNICATION FLOW PATTERNS?

Professional groups within the hospital often dictate flow patterns, keeping information within their group, as they recognize that information is power. The structure of the organisation also determines flow patterns; is it hierarchical or has there been a devolution of responsibility and accountability to unit level.

Patient related information is communicated between clinicians i.e. all staff involved in direct patient care, while management information is communicated between non clinical staff. There is often little interaction between these two information flows.

With the availability of Personal Computers there has been an increase in fragmentation of data collection, with different people often collecting the same data for use. The information collected remains on isolated Personal Computers, with other members of the organisation often unaware of the information being available at that location.

GENERAL REQUIREMENTS FOR INFORMATION WITHIN AN ORGANIZATION

Before defining the specific information needs of the organization, one should define the general requirements for information. The following requisites need to be met:

Proactive	-	Information can be quickly and readily adapted to meet changing needs.
Relevant	-	Information is presented in a form that focuses on the issue in question and does not carry extraneous data.
Accessible	-	Access to the information is readily available on a `need to know' basis.
Timely	-	Information is provided when it is needed and can be analysed as it is collected.
Reliable	-	The information can be trusted to be accurate, consistent and complete.
Secure	-	The information is not vulnerable to physical loss or to access by unauthorized users.
Cost Effective	-	The information provided can demonstrate a tangible value that can be measured against the cost to provide (i.e. the benefits accruing from the information exceed the cost of providing it).

IDENTIFYING THE INFORMATION NEEDS OF THE ORGANIZATION

The most successful way to identify information needs is not by asking people what do they need to know, as they usually do not know what information they need, but to begin with a systematic top down approach which begins from the Executive Group.

A Hierarchical Business Model (HBM) provides a useful approach to identify the information systems needs for an organisation (Figure 1). To begin, the Executive Group must define a mission statement for the organization and from this the information needs are defined. What information is required to support the mission statement and to measure the organization's performance against it.

From the mission statement a hierarchical business model is developed. Each factor in the mission statement forms the top of a hierarchical flow chart. For example, a factor may be 'to provide physical resources'. To do this it is necessary to 'identify the required physical resources,' 'acquire the physical resources,' 'maintain the physical resources' and 'quit the physical resources'. To 'identify the physical resources', one needs to 'review corporate strategy plans', `review historical resource requirements', 'project resource needs', 'review available resources versus the needs, define adjusted required sources'.

It is necessary to develop the model downwards till the source of the data needed to fulfill the mission statement is reached. A test of the validity of the model is that each statement must contribute to the statement above. Also each statement must contain only

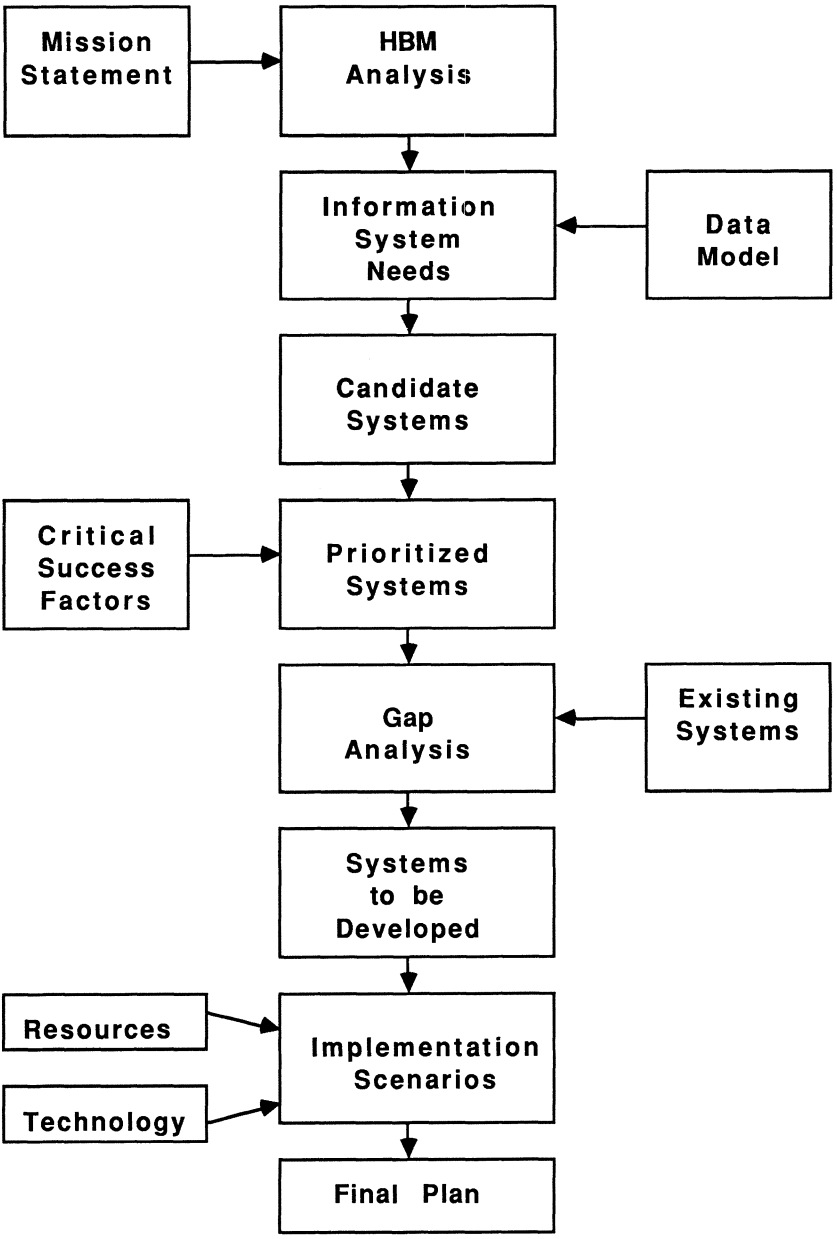

Figure 1

HIERARCHICAL BUSINESS MODEL

one action.

From the hierarchical business model, the information system needs are developed. Data modelling may be used. The candidate systems are defined and then prioritized using the critical success factors needed to measure performance against the organisation's mission statement.

A gap analysis is completed between the prioritized intended systems and current systems. These systems may not be computerized. From the gap analysis, systems are identified which require development or enhancement.

Resources and technology required must be defined and costed to implement the new or enhanced systems to complete the plan of identifying the information needs of an organization.

CONCLUSION

It must be remembered that organisations should be dynamic, that is, changing to meet current needs of society. Therefore communication flows will change with new structures and new people in the organization. It follows that information needs will change as the organization changes, and that systems developed must have the ability to be changed to meet new needs.

INFORMATION AND COMMUNICATION FLOW PATTERNS: A VITAL PART OF THE PROCESS OF ORGANIZATIONAL CHANGE

Ulla Gerdin and Hans Peterson

INTRODUCTION

Within the Stockholm County Council, Health Care Administration, changes in health care delivery, communication, and decision-making are having widespread impact on the organization. Changes in who purchases care and where it is provided are altering communication flow patterns. As decision makers were unsure about how to implement needed change and the consequences of different decisions, two studies about information flow were performed, one in relation to hospital care and one for primary care. We decided to perform both studies as an overview of the organization's communication patterns.

There are many groups interested in a study of information flow in an organization: nurses, physicians, administrators, and technicians of different kinds. People differ in how they conceptualize information flow. Some prefer text, others want pictures, and another group wants to have diagrams or charts with squares and lines between them. To be effective, the way of presenting the results of a study on communication flow patterns must satisfy all three groups. Figure 1 illustrates a typical flow diagram of organizational communication. Figure 2 demonstrates the clinicians' conceptualization of interdepartmental communication flow using quasi-organic schema. Figure 3 uses an alternative model (a bicycle wheel) to depict communication patterns.

Information and communication flow is knowledge that the organization has to learn in order to make progress. We asked professional consultants how to do the study and what method they recommended. As the cost would have been very high and the result perhaps no more than a bunch of paper, we decided to do the study with our own staff and a good deal of common sense. Four persons, one nurse administrator, a physician, an economist, and one systems nurse formed the working party.

The group decided to interview some fifty people in the organization both from the hospital and primary care sector. The target group was comprised of individuals who regularly exchanged information with these groups. Analysis of the results and a written report was circulated to all individuals interviewed in order for them to comment on the findings. This contributed to a high level of satisfaction with the results by both interviewees and working group members.

A consultant was hired to assist with educational preparation of the working group. The consultant also helped in providing alternative means to represent the data graphically and to assist with compiling a data dictionary.

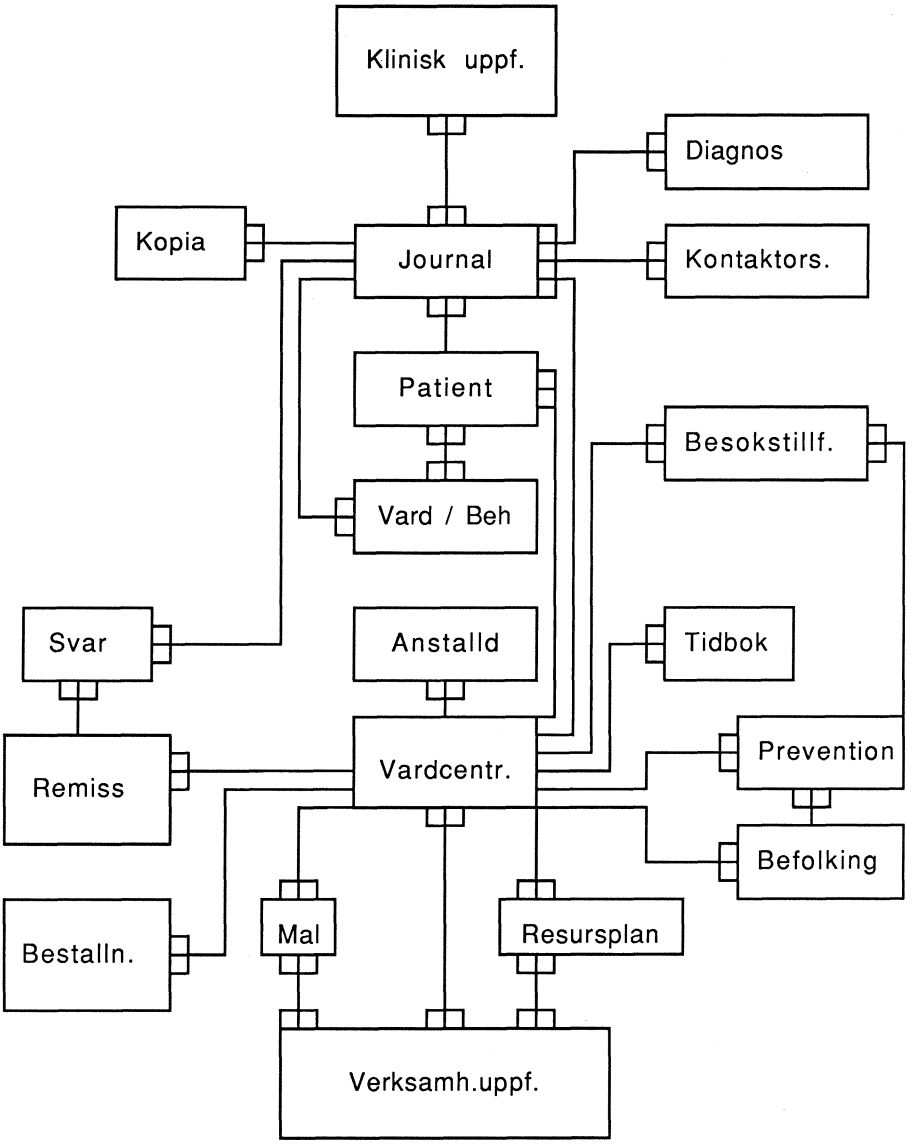

Figure 1

TRADITIONAL CHARACTERIZATION OF ORGANIZATION'S COMMUNICATION PATTERNS

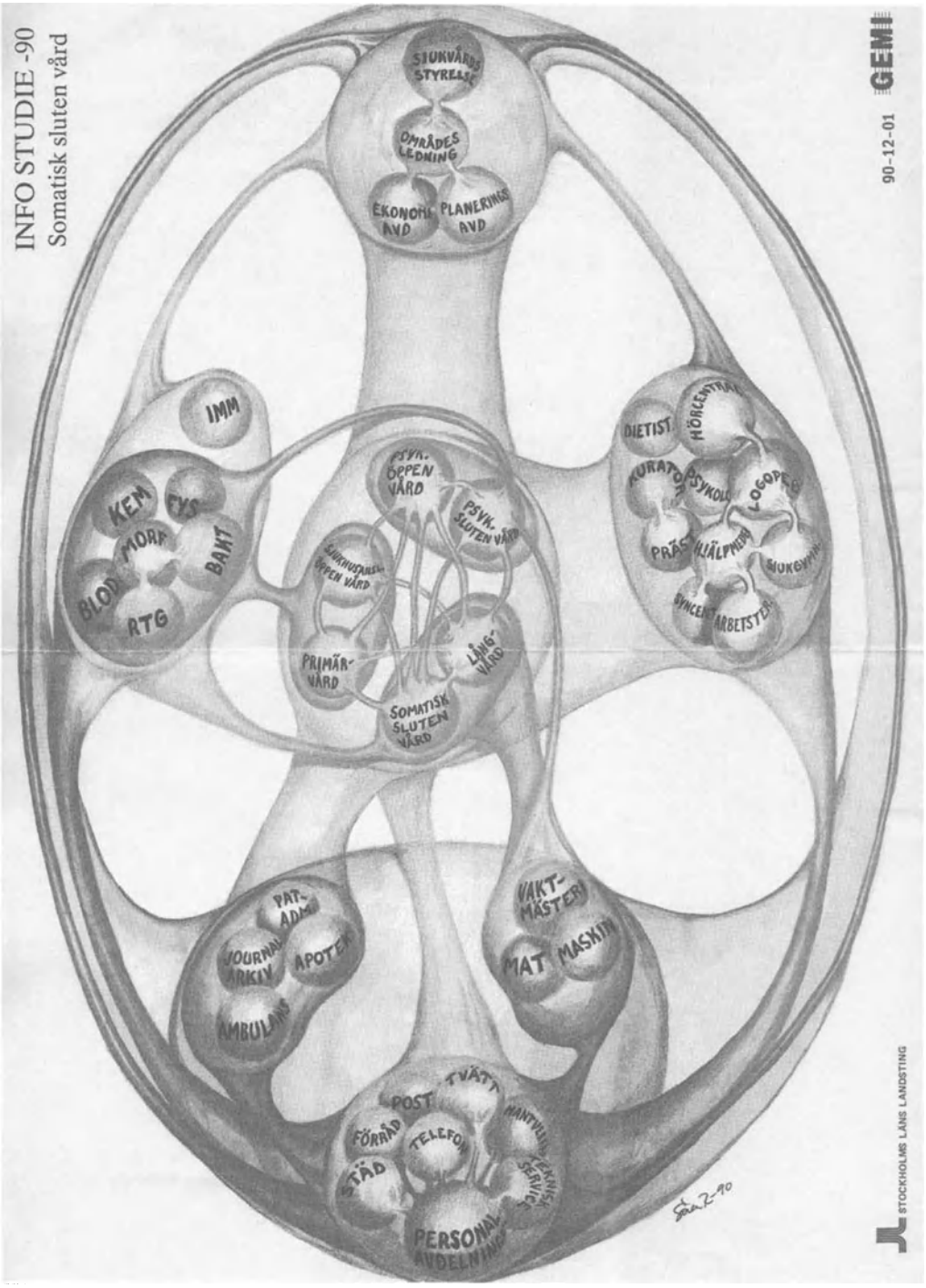

Figure 2

CLINICIANS' CONCEPTUALIZATION OF COMMUNICATION FLOW

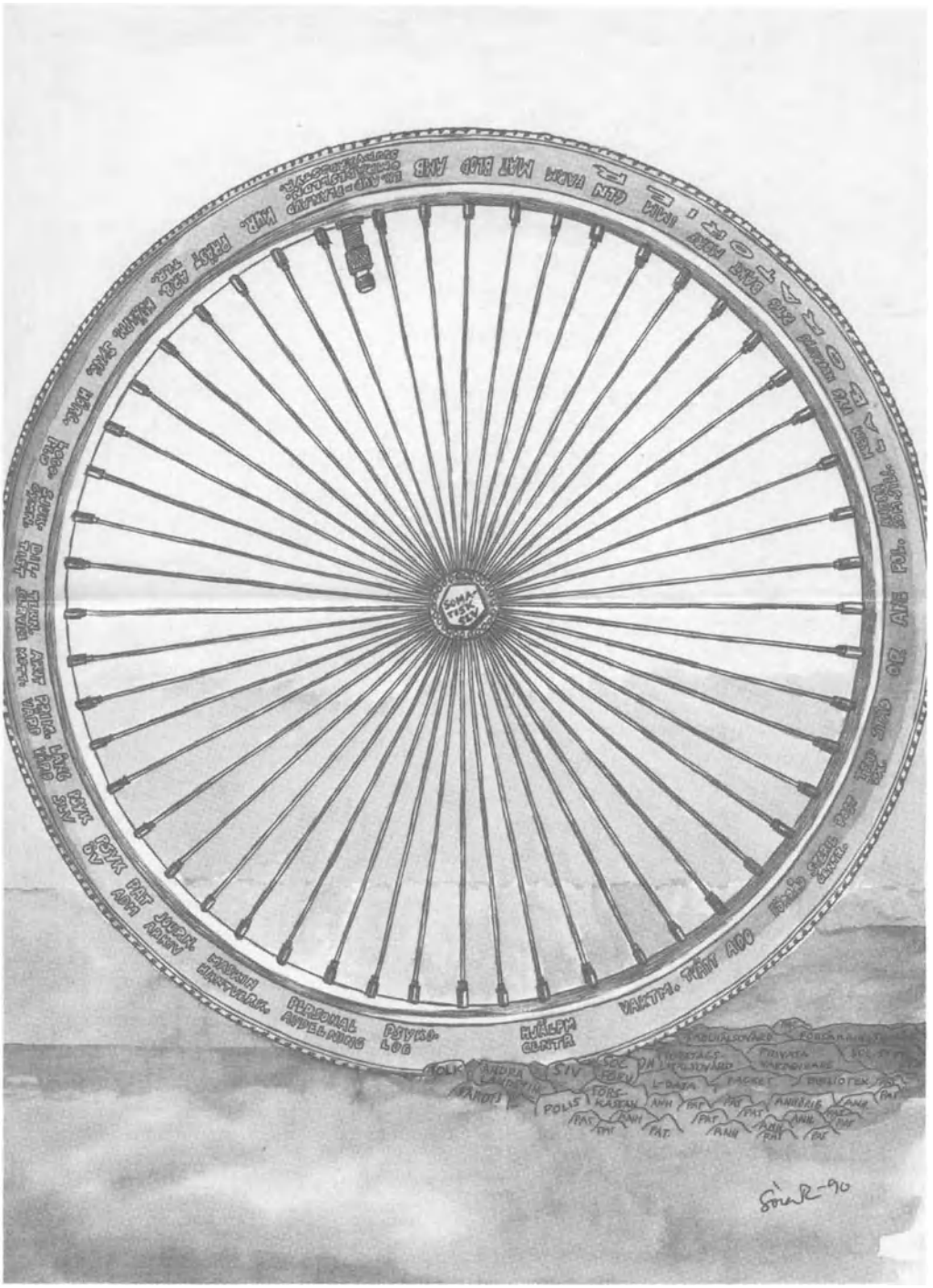

Figure 3
BICYCLE WHEEL MODEL OF COMMUNICATION PATTERNS

FINDINGS

The findings were more novel for the administrators in the group than to clinical health care professionals. The final report has been found to be useful in initial training programs for new employees, especially those who have had no previous experience in health care.

A summary of the findings follows. In the hospital, the dominant problem was one of locating the medical record. In-patient care consists of a lot of time spent waiting, primarily waiting for the physician. There is a gap between health care staff and hospital administrators in their understanding of organizational issues. In primary care, the biggest problem is the growing archive of data. Communication (and thus cooperation) does not flow well between the hospital and the primary care areas. There is limited ability to measure outcomes of care either in terms of health outcomes or in terms of costs for care in this area.

From these findings, the working group concluded that the needs for the two areas were quite different. The hospital needs computer support for day to day operations while primary care areas need computer support to find out which activities are most effective in promoting the health status of the population.

CONCLUSIONS

An information and communication study is designed to highlight all organizational, financial, staff, and access to information problems in the environment. As information needs are of very high importance for providing high quality health care, the easy access to information is of utmost importance. It is therefore necessary to have a very good understanding of the flow of information before implementing any decision which changes the communication, administration, or funding of an organization.

The large amount of information that is necessary to provide high quality health care today indicates the obvious need for computer support. This study indicated where computer systems would be best placed in order to support the organization. It indicated where other kinds of changes were more appropriate and allowed us to make the most cost effective use of our decisions to computerize.

PLANNING YOUR CLINICAL INFORMATION SYSTEM FOR THE END USER

Shirley Hughes

INTRODUCTION

Clinical Information Systems. Patient Care Systems. Nursing Information Systems. Bedside Systems. Point of Care Information Systems. No matter the name attached, all information systems used in the patient care environment present important new challenges when planning for effective use of these systems by the end users. The principle users of these systems are health care professionals whose primary focus is two fold; providing hands-on care to the patient and making sound clinical decisions related to the care of patients. The secondary focus is that of documenting the care provided and the resulting outcomes of treatments administered. Due to the uniqueness of this environment and the approach to the use of information by these end users, new challenges and new opportunities are presented to those involved in planning and designing information systems for use in health care.

In the past, health care information systems were focused on financial, management, requisition distribution, and test result applications. All of these provided functions which were largely clerical in nature, and therefore focused on the end user as a clerical person. Even though, in some cases, health care professionals used these systems, the fact that they were typically located at a central station and away from the patient, made the clerical focus acceptable, if not always user friendly. The new generation clinical systems, however, are moving more and more to the point of care and must, therefore, be planned for and directed at the health care professionals whose primary concern is patient care, not data input. Data input must be viewed as a support activity, not the primary function of the user. Data review capabilities must be planned for with optimization of clinical decision making in mind.

Even though there have been clinical information systems developed and in use to some extent since the early '70s, there is still only a small percentage of the total health care market actually using these systems in support of patient care information (Tribulski, 1989). We can point to many reasons for this seemingly slow adaptation of automation to the clinical setting; other automation priorities, shortages of funding for development of these systems, no real push by health care professionals for automation in the patient care environment, some early failures in Clinical Information Systems (CIS) attempts, and difficulties in measuring quantitative and qualitative benefits of the CIS. We are now at a point in time, however, where more and more interest is being expressed by clinicians for automated tools to support their information management needs, where health care administrators are searching for tools to improve productivity, as well as quality of care, where governing bodies are mandating requirements to measure quality and patient outcomes, and where the demands by health

care professionals for ease of access to clinical information for research studies is growing. Now is the time to look back at what has been learned from our limited experiences to date and to look forward to using new technologies in planning for new systems with the end user as the clinician, not the clerk.

This paper approaches the various considerations for planning and designing of these systems with an end user focus from four different aspects. These four aspects are: identification of the end user, definition of required functionality from the end user perspective, presenting information effectively (user interface), and considerations for a successful implementation.

IDENTIFICATION OF THE END USER

This would seem to be obvious. If the system is intended to be a nursing information system, the end user is, of course, the nurse. It is important, however, to look beyond the obvious primary user and to identify all possible users of the system and of the information generated by the system. This is especially true in the clinical environment where numerous members of the health care team may participate in the care of the patient. All need access to patient information, observations, and plans in order to optimize the patient's care. Additional end users who are easily overlooked are those who use the data generated from documentation of care for clinical research and quality assurance review. If any one end user group or clinical area is ignored in the planning process, the result will be dissatisfaction with the system: dissatisfaction on the part of the ignored end user because they can not find or use data in a fashion that supports them in their work, and dissatisfaction on the part of the primary user because they are caught in the position of having to retrieve data for (or listen to the complaints of) the ignored user group.

It is also especially important to identify all users at the start of the planning process so that appropriate consideration can be given to factors such as accessibility, security, ease of data input, and flexibility of data review for multiple clinical needs. Planning for system use by all clinicians and then focusing the planning efforts on understanding how each clinical area uses data for clinical decision making will insure a solid basis on which to build the detailed functionality of the system.

DEFINITION OF FUNCTIONALITY FROM THE END USER PERSPECTIVE

Planning for the functional design of a successful CIS requires multi-disciplinary participation. Representatives from each of the identified end user groups, clinical informatics specialists, and software and hardware engineers must all be involved.

The end user representatives should be actively practicing in the clinical environment so that optimal consideration of actual practice can be included in the planning efforts. Real-life situations and actual practices can be used to plan, rather than text book idealism. Opportunities for desired changes in practice which may be appropriate to make in conjunction with the system implementation may also be identified and/or discussed with this group. Involvement of the end users in the planning process also allows them to gain early

knowledge of and buy-in to the project so that changes can occur more smoothly when the system is actually implemented.

The majority of clinicians, however, have very little informatics knowledge. This makes it difficult, if not impossible, for a complete analysis of needs and assessment of appropriate technology solutions to be achieved. Clinical informatics specialists working with the end users will facilitate the comprehensive analysis of the processes of care, resulting documentation, and utilization of information in the clinical setting. This is an essential first step in planning a CIS as it helps to focus the design around the processes used by clinicians first, and then the resulting tasks. This approach will result in a more intuitive system design and functionality for the clinical user, and therefore much easier for them to use.

Software engineers with a knowledge of the clinical environment and experience in design of clinical applications can contribute immensely to the successful outcome of the CIS planning process. The role of the software engineer is to suggest appropriate technical solutions and to help the user and others to understand how new technologies could be applied in the clinical setting.

Various approaches to optimize end user input into the system design and planning may be used. Focus group sessions, workflow analysis and clinical observations with documentation of patient care processes, and formalized prototype software evaluations are some of the methods which have been used successfully. No one approach is guaranteed to deliver fool-proof results, but a combination of several will certainly lay the foundation for success. The key, however, is to involve the users throughout the development process. Schedule specific check points into the project plan to allow for periodic user reviews of system progress. Be sure to also plan enough flexibility into your project schedule to accommodate any alterations in the system design which may be identified as critical during these review periods.

PRESENTING INFORMATION EFFECTIVELY

One must assume that the health care professional will prefer to spend as little time as possible using the system (patient care is their primary concern), as little time as possible learning to use it (after all, they did not require more than a few minutes to familiarize themselves with the manual system), that many will be temporary or casual users (e.g., residents on short rotations, students, registry nurses), and that many will be computer illiterate. For these reasons it is extremely important that the CIS be designed with a user interface which is as intuitive as possible. New technologies based on graphical user interfaces offer important advancements in information presentations to meet these needs. Health care professionals need very quick and easy access to information and as much automated acquisition of data as possible to minimize the distractions of data management from patient care. Capabilities currently exist from a technical stand point to address these requirements. It is extremely important, however, to work with health care professionals to plan how these will be used in their specific applications.

In time, it is hoped that user interface standards for clinical information systems will be developed. These standards will serve to simplify end user training, facilitate ease of use in the patient environment, and establish a frame of reference for the user who must move between health care facilities and use more than one CIS. At the same time, these standards must offer the flexibility for various health care facilities, services within those facilities, and user groups to accommodate their varying uniqueness of practice.

A pit-fall that CIS designers sometimes encounter is that of looking at a complex task and designing the system to support this task with a complex user interface. Complex tasks must be accomplished by the end user as simply as possible. End user input and prototype testing can provide valuable guidance in this area.

CONSIDERATIONS FOR SUCCESSFUL IMPLEMENTATION

An effective implementation approach will, at a minimum, include extensive planning with end user involvement, procedural modifications or changes planned and documented ahead of time, effective user training and documentation manuals available, change management planned for and facilitated, ample end user support from administration to the unit resource person, minimization or elimination of dual systems, and a formalized and timely problem resolution process (Warnock-Matheron, 1988). No matter how well designed the system may be, it will fail if the implementation process is not carried out effectively. Change management must be a well defined and integral part of the implementation to insure that automation is optimized and made a part of the patient care information process (Perlman, 1990).

As with any worthwhile effort, an evaluation of the effectiveness of the implementation process and the system itself should follow at pre-defined intervals after the implementation of each phase. These quality assurance evaluations should be conducted from an end user perspective on the basis of perceptions as well as actual measurements of quantitative and qualitative effects. Results of the evaluations should be discussed with the users and modifications to procedures or systems functionality planned and implemented where appropriate.

CONCLUSIONS

Development of a successful clinical information system requires that the system design be focused around the needs of the clinicians. Involvement of the end users in the planning and design process along with informatics specialists, and systems engineers can provide a very powerful development team when all approach the challenges at hand with open minds and eager imaginations. It is wise to look at previous experiences and alternative approaches used with earlier efforts in this area. Old mistakes need not be repeated, there is too much new ground to cover. Multiple reiterations of software design should, however, be assumed and planned for. CIS development represents new territory. Plan on learning from experience, involving the end users on a continuing basis, and expanding the CIS to keep pace with the needs of the clinicians as they continue to enhance and refine their uses of clinical information.

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SOFTWARE DEVELOPMENT: COMPLEXITY AND PROFESSIONAL ROLES

Albert Bakker

INTRODUCTION

This paper was prepared as input to the Working Conference that followed the NURSING '91 Congress in Melbourne, April 1991. In this conference, many themes were discussed relating to furthering the introduction of information technology in nursing. An essential element in furthering the technology is the application software. In this paper software development is considered and some risks are identified. Next, the roles of the disciplines involved are discussed and it is concluded that professional input from both the nursing and the informatics profession is needed. Moreover, professional support and maintenance is required for products to be applied in the daily routine of health care. To feed the discussion some statements are produced at the end of the paper.

Before discussing the role of vendors or health care professionals, computer software and its role in health care will be considered. This will lead to a number of observations that are of importance for the discussion later in this paper.

BACKGROUND INFORMATION ON COMPUTER PROGRAMMING

Computers cannot perform useful functions in health care without the programs (software) that allow them to do required tasks. Beginning in 1954 computers have worked on the stored programme concept by getting a list of instructions that are loaded in its memory. Based on the situation encountered, special branches in the program can be selected. The programmes consist of sets of instructions that map the various logical steps required to perform a specific task.

Very early it became quite clear that the process of programming is far from easy. The difficulty is related both to translating the task to be performed into a defined logical scheme and in handling the idiosyncrasies of the computer (the actual coding). The primary problem was the complex, cumbersome 'coding language' that was being used to write the instructions for the computer, and as a result much effort has been placed on the development of programming languages that are easier to handle.

Programming has gone through several stages of evolution. Initially, the programs had to be formulated explicitly in the instructions to be carried out by the computer, including the absolute addresses of memory locations to be addressed. The next stage was the assembler language where numeric codes and symbolic addresses could be used. The higher level languages, like COBOL and Fortran, allowed for the formulation of the program in a way that more nearly resembled the way the processes were described normally. These languages

themselves went through an evolution process resulting in what are called 'third generation programming languages', with PASCAL as an example. Since the use of these languages was still restricted to 'the happy few' a new class of programming tools, the so-called fourth generation languages, was developed. These languages are intended to be much easier to use, leading to higher programming efficiency. As opposed to the third generation languages, these languages are not standardized and each manufacturer has its own unique variation.

COMPLEXITY OF PROGRAMMING

The complexity of the software construction process depends on the size of the problem, which is one of the reasons software development efforts are often underestimated. In courses and textbooks only simple problems are dealt with giving a misleading level of the difficulty in programming. In professional software development, the problem is reduced by using a modular structure, where the problem is split into a number of subproblems, that together can perform the task. The rapidly increasing requirements of the user again make the programming task more difficult. An example of this is the straight-forward payroll application that has grown over the years to become a very complex piece of software.

The improvement in software development tools is overshadowed by the increasing complexity of programs required by the users. Fourth generation languages unfortunately show their advantages in dealing with mainly small and medium scale programs. Health care problems in general require large programmes, so it is not surprising that professional software for health care is almost completely developed in third generation languages.

SUPPORT AND MAINTENANCE

As mentioned before, the construction of software is far from easy and as a consequence, the resulting products in general contain many errors which can only be partly detected during the testing phase and the acceptance procedure. This is mainly caused by the almost unlimited number of combinations of input that can be handled by the software. Accordingly, it is essential that a reliable support organisation is available to handle the problems that will arise when these programmes become operational within a health care facility.

In addition to this, the application requirements themselves are not stable. They are influenced by both developments inside the health care institutions and by outside regulations.

FUNCTIONAL SPECIFICATIONS - WHAT SHOULD THE SOFTWARE DO?

The previous statements might be considered a plea to leave the software development completely in the hands of informatics specialists. That is not the message of this paper! Informaticians might be best qualified to build software but they are, in general, not qualified to decide how software could best support activities in health care. So one might advocate that health care professionals should define what they need, write this down in functional requirements and leave the construction to informatics specialists. This is what American radiologists did when the RISC consortium specified the requirements for a radiology

information system. In my view such an approach implies serious risks since the health care professionals are not fully aware of the technical possibilities and limitations. The preferred approach would be that the functional requirements are defined in multidisciplinary teams where the profession directly concerned is involved with professional informatics people. It will often be beneficial if adjacent disciplines are also involved. For nursing applications, in addition to nurses and informaticians a hospital administrator and a doctor might take part in the process of conceptualisation of an application to consider various links and integration to other systems.

If we look again at the activities of the RISC consortium we should realise that several radiology departments had their own professional data processing groups so input from that discipline was guaranteed. Nevertheless, they did not pay sufficient attention to the position of a radiology information system in the total information handling process within the institution.

THE ROLE OF PROFESSIONAL HEALTH CARE ORGANISATIONS

The preceding discussion clearly indicated that one should not leave the development of software completely in the hands of informatics specialists. The professional health care organisations should stimulate the formulation of the requirements. This is especially true of global issues requiring international cooperation. The International Medical Informatics Association Working Group 8 (IMIA WG8) could play a role here. On the national level, the professional organisations could organise themselves to evaluate the products offered in the marketplace and give a certification to products that conform to standards of practice.

THE BAZIS APPROACH IN THE NETHERLANDS

In this paragraph a short description will be given of the way application software is developed within the BAZIS organisation in The Netherlands. BAZIS is a non-profit systems house serving hospitals in the country with over 20,000 acute beds. The board of the foundation is elected by the participating hospitals with an independent chairman. The board appoints the management of the BAZIS organisation. BAZIS has a large development activity directed to the development of an integrated Hospital Information System, covering a broad range of functions of the hospital. Additional services offered to the participating hospitals are training, implementation support, consultancy and facilities management.

To guide the development of software built by BAZIS there are three levels. At the bottom level Product Specification Groups, consisting of potential users from the hospitals, together with BAZIS professionals, specify the application software subsystems in detail. At the next level we find Sector Advisory Groups, consisting of representatives of the hospitals at the management levels that discuss the priorities to be set for the development of application software in a specific sector of the hospital activities. There are sector advisory groups for nursing, finance and administration, medicine and logistics. These Sector Advisory Groups advise the BAZIS management. At the top level we find the activity plan for the next year

where resources are allocated to the various development activities. This activity plan is approved by the board of the foundation.

SUMMARY

Software used in the delivery of health care must be appropriate, accurate and reliable. To achieve this, the joint involvement of health care professionals and informatic specialists is required. Because of the increased user requirements (triggered by increasing technical possibilities) the complexity is only increasing despite the introduction of additional development tools. In order for system developers to design systems that meet professional standards it would be ideal for the various national and international professional organisations to serve as standard setting and system certification organisations.

STATEMENTS FOR FURTHER DISCUSSION

Statement 1: There is still too much optimism about the progress in tools to develop computer software. The increasing requirements of the users, triggered by the increasing possibilities of the hardware, outbalance the progress made in programming tools. The effort needed to develop software that satisfies the user is still increasing.

Statement 2: Despite the availability of fourth generation languages that may be of help in rapid prototyping, the construction of software to be used in the care process will be done by professional informatics people. Quality assurance requirements will reinforce this situation.

Statement 3: For software used in health care it is essential that support and maintenance is guaranteed.

Statement 4: Requirement specifications should be produced by multidisciplinary teams. For nursing these teams should consist at least of nurses and some informaticians, probably assisted by professionals of some other disciplines (depending on the application concerned).

Statement 5: Organisations of health care professionals should participate in the description of functional requirements at an international level (a task for IMIA WG8 ?). At the national level they should play a role in the (functional) certification of software.

THE PROS AND CONS OF CUSTOMIZED DEVELOPMENT VERSUS SOFTWARE PACKAGE

Penny Baxter

INTRODUCTION

The use of computers in a major teaching hospital environment has changed immensely over the last five years. It is no longer restricted to financial and accounting functions. Current use of computers has extended beyond automation of repetitive tasks and 'number crunching' to integrated information systems servicing a diverse user base. Application software must now be able meet the needs of professional users to enhance clinical practice and decision making.

The shaping of application software is being driven by more and better informed users. This creates an increased demand to maintain and enhance existing applications and a marked increase in requests for application development. A greater number of departments using personal computers to solve their own information needs creates another problem. This leads to increasing difficulty in supporting and integrating stand-alone applications developed on personal computers and ensuring data protection and data security.

When a mature organisation is confronted by change in which information technology is a major component, it must carefully decide on the approach to application development in order to provide the most efficient and effective solution.

FACTORS AFFECTING COMPUTER APPLICATION DEVELOPMENT

When considering the development of application software it is helpful to ask three questions:

1. Can it be done? One needs to know if the hardware required is available. One needs to know if the users have the time to maintain the application.
2. Is it worth it? It is important that the cost benefit issue is analysed. The tangible and intangible benefits of the development should outweigh the 'once only' and recurrent cost during the expected life-span of the application.
3. Will the computer application be used? The computer application will only be used if it is kept simple. This means a 'user friendly' interface.

The development of application software requires two basic steps. Firstly, a logical model must be set up that defines the scope and nature of the problem. This means the problem needs to be analysed, the desired outcomes stated and the constraints defined. The complexity of the problem and the skill and experience of the users in defining the problem will determine whether there is a need for a professional to assist in this phase.

Secondly, when the desired requirements of a computer application have been established, the application software can either be purchased from a vendor as a package or the computer application can be written by computer professionals to provide a customized solution. This can be done as an in-house development project if this facility is available to the organisation. On occasion, some users may still prefer a customized solution but developed by computer professionals external to the organisation. So the choice is really between a package and a customized solution.

PROBLEM SPECIFICATION

Problems encountered prior to the conception of a computer application, if clearly defined, will facilitate the specifications and requirements of a proposed computer application.

The report containing the specifications and requirements of a proposed application should state the objectives of the application software and the expected benefits of the application. It should also state the financial constraints that will affect the management of the application and the 'must have' features and the 'desirable' features of the application.

If the users do not have experience in expressing their problem or are unable to make the necessary commitment to spend time to define the problem then any solution developed is unlikely to be satisfactory. An alternative here would be to employ a professional to assist the users to define the problem and clearly state and plan their requirements. This person must have the ability to interact and communicate with the potential users of the application and understand the tasks, working methods and the organisation of the environment where the application is to be used.

The more complex the desired computer outcome and the more specific to a particular organisation, the less likely a package solution will satisfy the organisation's needs. Therefore it is vital that the main goals and objectives are stated clearly.

USER ATTITUDE TO THE NEW SYSTEM

People are generally uncomfortable about change, even change of a minor nature. If minor change causes uneasiness, major changes may cause considerable stress. To many people information systems represents major change. The more rigid the user's requirements, the more difficult it is for a package solution to satisfy the requirements. If the users are prepared to make changes to practises and procedures (sometimes for the better but sometimes not) to adapt to a package then the package will be of benefit. However if the user is resistant to any change and not prepared to take a 'fresh look' at existing practises and procedures then neither a package nor a customised solution will provide the best solution. Organisational development involving computerisation should be an opportunity and not a threat.

FEASIBILITY REVIEW

It is important that time and effort is spent to estimate the costs and identify the benefits of the proposed application. It is helpful to express the benefits in dollar terms. Eventually one

would want to compare dollar benefits with dollar costs over a 5 year period (expected life of a application) to determine the economic feasibility of the application - whether purchased from a vendor or developed by a software engineer. It is important to remember that a computer application only provides people with information that they can use to achieve tangible benefits; these benefits do not occur magically.

QUALITY OF THE POTENTIAL DEVELOPERS AND DEVELOPING ENVIRONMENT

It is easier to assess the quality of a package solution in advance. If professional consultants and developers are not available then even if the decision dictates a customized solution, this may not be a sensible decision. If the decision is take advantage of the in-house department then the information systems department's track record needs to be analysed, i.e. are deadlines met, are users satisfied and does the department have a good environment for computer application development. A good computer developing environment consists of experienced and professional staff with a good track record, using state of the art techniques. It also consists of reliable hardware with sufficient storage and power plus good software tools such as a database package with screen generators, editors, report generators and fourth generation language. If the developing environment is not adequate, even the best and well qualified developer would have difficulty in producing a timely solution within the proposed budget.

PACKAGE FROM VENDOR APPROACH

When discussing the requirements of a computer application with vendors, it is always helpful to provide a report of the requirements prior to the discussion. This helps the vendors to understand what is wanted. It is also helpful to provide a brief outline of the reports or outputs required, types and volume of the input, and type and size of the records.

A package solution from a vendor appears to have several advantages. Packages provide a quicker solution, are cheaper, have better documentation and are maintained and enhanced regularly.

For an application such as a quality assurance system, a package is certainly a quicker solution. If the buyer of a package spent time to review packages from different vendors and matched it against the specification report of the proposed application then it is just as time consuming as the initial system development activities for a customized solution.

When evaluating cost, one must include the time spent by employees to select the package to the cost before comparing it with the cost of a customized solution. If a professional was consulted to evaluate the proposed system, it would incur a greater cost. More costs may be incurred if the package is not the right solution. And if it requires modification, more expense will be required, otherwise if it is abandoned the organisation suffers.

It is the general belief that packages have better documentation than customized solution. Packages are rarely rejected because of poor documentation and there are a lot of poorly documented packages around. Often deficiencies in documentation are not apparent

until the system is installed and it behaves in a unexpected manner with an error message appearing in the middle of a critical report process.

Not all packages are maintained over their life time. The developers may go broke or sell more packages than they can support. If the package is from overseas, Australian users may find it harder to get prompt fixes to problems or push for enhancements to better suit the local environment. Generally the user has little or no dialogue with the developers, which is a problem if the system needs to grow and change to meet the changing needs of the users. Therefore a customized system has a better chance of evolving then a package.

The process of developing a package involves not only developing a system but also turning it into a product and marketed. This may take as long as 2 years. Thus a well established and widely used package may be up to 5 years old using out-dated development techniques which makes it harder for the developers to maintain and enhance.

The quality of packages is extremely variable as is the quality of custom tailored applications. If the package is widely used, this may be an indication of quality or a good marketing strategy. It is important to check the documentation of the package and the user support available. It is generally harder to fix a package with 'bugs' than to fix a 'bug' filled customized software. Generally the price of the packages does not necessarily reflect differences in quality.

The disadvantages of using a packaged solution extend beyond the problem of not closely fitting the requirements of the users. Buying a package from a vendor may not be as cheap and quick and low risk as it may originally appear.

The extent of imperfections is likely to be realised after the purchase and installation of the package unless the evaluation is performed by a professional with considerable skill and experience in the exercise. If the cost of an experienced professional is added to the cost of the package then the cost of a custom tailored system may not be so prohibitive. A package from the vendor does provide a standard solution.

CUSTOM TAILORED DEVELOPMENT APPROACH

This approach may be taken because the package from the vendor is not suitable for solving the information requirements of the users. This task should not be taken lightly. It involves analyzing exactly what is required, designing a computer solution and writing and testing the programs. The best advantage of this is that it is designed to tailor fit the requirements of the application.

The main disadvantage of this approach is the time taken initially is much greater than using the package approach. Specialized knowledge or a team with analysis and programming knowledge will be needed. It will result in a higher one-time development cost for the application. This may be offset by its benefits. Problems occur with application development because of a communication gap between the user and the developer. Prototypes can be built and used to demonstrate the application to the user prior to its implementation.

DECIDING ON THE RIGHT SOLUTION

The task of selecting an information system is not simple. Time spent on specifying the objectives of the organisation, examining problems from the current system, defining the requirements of the new system and considering the options available to meet these requirements would facilitate the task.

Application software available from vendors should be reviewed and checked against the specification report of the proposed application software. It is a painstaking task to find a package that will closely meet the requirements of the users. If good ideas are present in the vendor software then steal these good ideas and incorporate them into the specification report, just in case the decision is to have customized application.

The process is long and slow but there are also a lot of current systems that are not meeting the needs of the users as originally envisaged. A solution developed by a professional would provide a better solution but would incur extra expense. A package from a vendor may be a cheaper solution but the result would not be perfect.

THE FUTURE

More and more good quality packages are now available from vendors. Also the quality of custom tailored programs is also improving and development time is decreasing with better development tools such as fourth generation languages. This would lead to faster and cheaper implementation. Perhaps eventually the wheel need not be reinvented.

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COMPUTER APPLICATION DEVELOPMENT - USER, VENDOR OR PROFESSION ?

Linda Edmunds

INTRODUCTION

A collaborative effort between users, vendors and professional groups is necessary to produce computer applications that assist both in the provision of patient care and the expansion of nursing knowledge. The application development process is described and the contributions each group can make to prioritization, design, and marketing are discussed.

Collaboration is the most fruitful approach to the development of useful computer applications for nursing. Applications which are the product of a collaborative interaction between users, professional groups, and vendors will have the most potential benefit for the nurse and for the profession. This paper describes how applications are developed and discusses the contributions each group can make to the development process.

THE DEVELOPMENT PROCESS

Software development generally follows a step-by-step process. First, projects under consideration are prioritized. Then requirements for approved projects are described. Next, the design specification is written and critiqued by potential users and technicians. The application is programmed, tested and documented. To shake out any remaining problems, it may be piloted at one or two facilities. Finally, the product is packaged, marketed and distributed.

In the vendor environment, the development process is formalized. Separate administrative groups may take responsibility for different components of the process or a core project team may proceed from one step to the next with assistance as needed from specialized personnel, such as technical writers. When applications are developed by a healthcare facility, some of the steps may be minimized, but in essence the process is the same. For example, marketing is a major vendor focus, but marketing is also important in a hospital where clinicians must be sold on the benefits of new software before they will incorporate it into practice.

In looking at the development process, there are three stages in which collaboration between the user, the profession and the vendor is most critical. These are 1) prioritization, 2) design, and 3) marketing.

PRIORITIZATION

The demand for computer applications almost always exceeds the resources available to

develop them. Therefore, the first step in any development process, in any environment, is determining what to build.

When a hospital or clinic builds or buys software, its focus is centered on issues and inefficiencies specific to the institution. The decision about what to expend resources on may be a political one, or follow an objective cost/benefit analysis, or it may be in response to externally imposed practice requirements. The priority, however, is to resolve internal operational problems.

The perspective of the software vendor is forced to be broader than that of the individual institution. Software development is expensive. If a vendor is to realize a profit on an application, it must be marketable to many healthcare facilities. A vendor's priorities, while never free of internal politics, generally reflect the collective priorities of multiple facilities of various sizes, locations and missions, as well as the major professional trends as it reads them. A vendor's decision about what to build is based on an analysis of what the marketplace is looking to buy, what the competition is offering and what it can predict about the future.

The role of the profession in assisting facilities and vendors to set priorities is indirect but quite significant. Because hospitals look primarily for software solutions to pressing operational needs, vendors are biased toward the manufacture of software that is operationally focused. Professional goals go beyond the operational to the evaluation and improvement of practice. By changing the expectations of users so that the nurse who participates in buying decisions will look for applications which meet professional as well as operational goals, the profession can influence what the hospital requires and thus what vendors will build.

For example, most systems collect clinical data to facilitate patient care during the patient visit. But different systems collect different subsets of clinical data in different formats. Often, this data is not extractable across patients or over time. Professional groups can influence buyers to look for systems which provide data bases that can be used for research and evaluation as well as for patient care.

In summary, if the user expects applications to serve professional as well as operational needs, vendors will build applications that meet both sets of requirements. What the user expects, the vendor will deliver and professional organizations can help manage these expectations.

DESIGN

Once the decision is made about what to build, the next step in the development process is to define the application in detail. This usually begins with a "requirements document" to outline what the application will do. It is followed by the "detailed functional specification" which is the blueprint for the user interface. A detailed functional specification provides an exact picture of what a system will look like and how it will work. It includes precise layout drawings of every screen, screen flow, print and report. It defines every data element, every edit rule, and the logic for processing each piece of information. It also describes what actions the user will take

to use the application and how the application will interface with related software.

In the vendor environment where large systems are developed and where it is critical to evaluate the design before additional money is invested in coding, the functional design process may be very formalized. There will be multiple validation steps during which potential users critique the proposed design for friendliness and applicability to practice. At the same time, programmers evaluate the design for technical feasibility.

Because the goal of the vendor is an application which will be used in multiple sites, experienced vendor designers learn to build flexibility into applications. Flexibility is a major benefit to the individual hospital as well as to the vendor. Flexible systems can be installed with a minimum of customization which is important because customizing software is expensive for any facility. In addition, institutions seldom remain static. Software with built in flexibility can evolve along with an organization.

But designers who work for vendors are usually removed from the daily operations of a hospital or clinical area so input from users is critical. When design takes place in a corporate tower, it is easy for designers to forget the procedural details and subtleties of day-to-day practice. An application that does not address these practical issues will fail at implementation. The benefit of a user-vendor collaborative development process is that the user can quickly spot inconsistencies between the vendor's concept of a practice situation and what actually occurs. When the vendor designer works with users from multiple institutions, differences in their policies, procedures and customs, facilitate the identification of areas in which application flexibility is necessary.

The contribution of the profession in the functional design phase is, again, critical but indirect. It relates to the role of nursing organizations in establishing standards. No vendor would ignore the NANDA (North American Nursing Diagnosis Association) list of Nursing Diagnoses if they were going into the design of a care planning application. This is because NANDA is a widely accepted standard. It is also unlikely that vendors will omit the data defined in Werley's Minimum Data Set (Werley, 1988) as they expand or modify their documentation applications. And vendors will certainly pay close attention to the guidelines published by ANA (American Nurses Association) (Zielstorff, 1988), NCNIP (National Commission on Nursing Implementation Project) (Simpson, 1989), and the recommendations to be made by the ANA Steering Committee on Data Bases to Support Clinical Nursing Practice (Stenvig, 1991).

Designing is straightforward when standards are available - it is complex when there are none because the application must be designed to accommodate so many possibilities. For example, it is relatively easy to design a flexible medical history because the organization and content of a medical history is similar from facility to facility. On the other hand, designing a flexible nursing admission history is complex because content and organization, while overlapping, vary significantly from nursing service to nursing service (Rowland 1984).

The single most important contribution that professional organizations can make to the design of computer applications, therefore, is to work toward the establishment of standards in as many areas of practice as possible. When standards are available, it is possible to create

applications that are operationally appropriate to many institutions. If similar data can be collected in a similar format, the ability of the profession to pull data for evaluation and research across institutions will be facilitated.

In summary then, the contribution of the vendor to the functional design process is experience in providing flexible applications that can be used in multiple facilities. The role of the profession is to establish standards so different systems can collect the same type of data and it can be compared. And the role of the user is to keep the design process reality-based so that the computer truly improves the efficiency of overworked staff.

MARKETING

Thinking of the profession or the user as adjuncts to the software marketing effort will surely cause purists to gasp. But both groups make an important contribution to marketing. Furthermore, the role they play is not ethically or philosophically contradictory to their own objectives.

Although vendors spend a good deal of time and money marketing their software products, the most effective marketer of an application is the enthusiastic user. Potential customers almost always insist on site visits to see proposed software being used in a clinical setting. A hospital or clinic that welcomes a vendor's customers can serve not only the vendor and the customer but also itself. They serve the vendor by demonstrating that the software works. They serve the customer by providing them with a realistic view of the benefits and practical issues related to the implementation of that vendor's offering. And they serve their own institution because of the increased attention the vendor will pay to their requirements. Because bad site visits almost invariably eliminate a vendor from the bidding process, vendors will improve software to keep clients who assist with marketing satisfied.

Professional organizations become involved with marketing efforts in two ways. While JCAHO (Joint Commission on Accreditation of Healthcare Organizations) or ANA or similar groups do not recommend software products, vendors will often take standards and guidelines communicated by these groups and build marketing presentations around them. These presentations are directed at describing how the software will assist the hospital in conforming to professional requirements. When the fit between a product and professional directives is arguable, marketing organizations will put pressure on the vendor's development group to modify the product.

In a more direct fashion, the profession supports vendors who build applications that engender enthusiasm among users or have positive professional implications by inviting them to present at nursing conferences and to publish in professional journals. Certainly the vendor who tries to market a product when participating at a professional meeting will not be invited back but the vendor who focuses on professional issues and the role of the computer in supporting practice will be a welcomed participant.

In summary, the profession and user can assist or impede the distribution and use of a software product by their support or lack thereof of a vendor's efforts to demonstrate, present and write about its offering.

FACILITATING THE COLLABORATIVE PROCESS

Users want software that will assist them in daily practice. Professional nursing requires databases to support evaluation and research. Vendors try to build applications that many institutions will install. The objectives of the three groups are not in conflict.

The collaborative effort often breaks down, however, in the communication process. The profession has not defined precisely, or the user does not explain specifically, or the vendor does not comprehend clearly what is required. The more concrete nurses are in explicating what they want nursing applications to do, the greater the likelihood that vendors will build what is needed.

The key words to remember are standards, pragmatics, detail, and validation. For the collaborative process to be successful, the Profession must encourage the detailed definition of standards. Users must clearly detail the pragmatics of day-to-day practice. And the vendor must write detailed functional specifications that clinicians can understand so that validation is possible. When professional groups, end users and software vendors collaborate in the development process, the result will be computer applications and data bases that assist nurses in both providing and improving patient care.

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WHAT'S IN IT FOR US? INFORMATION TECHNOLOGY IMPLEMENTATION -- A PROCESS OF CHANGE

Albert J. Creevey

INTRODUCTION

How many times, when a new information system is introduced, have you heard the words "what's in it for us?" or "no one consulted us about this?" More often than not, planned Information Technology (IT) change in hospitals is obstructed because of senior management's failure to predict significant environmental factors; allow for the "human element" of change, that is, the impact on each individual's work practices; demonstrate management's commitment to change; or to allow staff of all levels to adopt the role of facilitator. It is believed that if management paid more attention to these key elements there would be a significant increase in the success of any planned change situation.

NEED FOR CHANGE

Most change is necessary because the external environment has been altered. Within the Australian public hospital system it is primarily government pressure that accounts for alterations to the external environment. Such issues as the need for resource rationalisation, increased patient through-put and reduced lengths of stay, related to a reduction in health funding or reimbursement are common precursors for organisational change.

Pressures for change may arise from sources within the organisation. These occur particularly as a response to strategic planning, new technologies and employee attitudes/ behaviour.

External and internal forces for change in the hospital setting are often linked. A major impetus in this area is the desire to increase efficiency (internal) which is consistent with political pressure to contain costs (external).

The introduction of automation to perform tasks previously completed manually calls for a change to work routines, training programs and compensatory arrangements for users. From this perspective, changes in management policies are also required to reduce worker dissatisfaction which may, in Australia, be manifested as high turnover rates or industrial unrest.

Frequently, more than one area of an organisation sees a need for change, but not all areas see the need for the same change. In determining the need for change it is useful to collect information from various areas of the organisation so that the strength of the perceived needs are established. A vital part of introducing planned change is to identify which departments are primarily related to the particular change and to rank-order the various types

of change believed necessary.

Identification of those departments which primarily affect, or are affected by the particular change reduces the number of departments to be considered in the planning process and clarifies directions for early intervention. Rank-ordering the various types of change helps to determine the appropriate change management strategies.

READINESS OF AN ORGANISATION TO CHANGE

In determining the readiness of hospitals to embrace IT change, it is important that those involved identify possible areas of resistance. The general principles for reducing such resistance usually fall under three headings: who brings the change, what kind of change, and how is it best done (McLennan, 1989). Based on McLennan's concepts, the following points are relevant.

WHO BRINGS THE CHANGE?

Organisations find that resistance will be less:

- if managers, supervisors, union leaders, and other key people involved in the organisation feel that the programme of planned change is their own, not one devised and operated by outsiders
- if the change is introduced in a way appropriate to the task and
- if any programme started has the whole-hearted support of the top people within the groups concerned.

WHAT KIND OF CHANGE?

Resistance will be less:

- if participants in any project see the change as reducing rather than increasing their current work loads
- if the project accords with values and ideals which have long been acknowledged by the participants
- if the programme offers the kind of new experience that interests participants and
- if participants feel that their autonomy and security is not threatened.

PROCEDURES IN INSTITUTING CHANGE

Resistance will be reduced:

- if participants have joined in diagnostic efforts leading them to agree on what the basic problem is and to feel its importance
- if the project is adopted by consensus following group discussion
- if the parties involved can see both sides of the question and recognise valid

objections and take steps to relieve unnecessary fears

- if it is recognised that innovations are likely to be misunderstood or misinterpreted, and if provision is made for feed-back and further clarification
- if participants can begin to develop acceptance of each other and so experience support, trust and confidence in their relations with one another and
- if the project is kept open to revision, and reconsideration of experience indicates that a change in direction or emphasis would be desirable.

By taking all these possible procedures into account, resistance to change can be lowered markedly.

IMPLEMENTING CHANGE

To successfully introduce change, management must acknowledge the employees' anxieties and fears related to the change. Resistance can be reduced through the development of trust between the manager and employees.

The success of change requires that a number of positive aspects be present. Conditions leading to, and strategies for the change must have clear evidence of management approval and participation. Employees must be aware of the current situation and the proposed need for change. Permanent change can only be effected when the employees are convinced that the change is in their own and the organisation's best interest.

While many staff indicate that they want to be up-to-date, they will generally resist change that alters the status quo. Resistance is usually stronger when the involved change affects their work role. The steps in implementing change are easily described but, they are very difficult to implement for this reason. According to Lewin (Stoner et al., 1985) there are three fundamental stages associated with change:

- **Unfreezing** "the status quo"
- **Moving** "to a new level"
- **Refreezing** "the new status quo"

UNFREEZING "THE STATUS QUO"

If individuals are to accept and adopt change, their present attitudes and current beliefs must be altered or unfrozen. Once the factors causing the resistance are lowered, management is then in a position to implement the desired change.

Unfreezing in the change process generates self-doubt but allows a means of remedying the current situation. If organisation members are to be receptive to change, they must feel that they can change.

MOVING "TO A NEW LEVEL" (CHANGING)

The initiation of change can come from an order, recommendation, or self-directed impetus.

A manager with authority can command that a change be made and enforce its implementation by threats, punishments and close supervision. If this path is taken, the manager will find that the change must be constantly monitored. Change is more permanent and substantial if a person truly wants and feels a need to change. The most effective way to initiate change is to have a two-way relationship between the change agent (the person who is helping to implement the change) and the changee (the person who is affected by change). This should form a collaborative decision approach.

Any technological change proposal being prepared and/or considered by departments and instrumentalities (e.g. hospitals) under the control of the Victorian Government, Australia, must adhere to the Victorian Public Sector Technological Change Agreement (TCA) of 1985. This agreement requires that appropriate consultation occurs between unions / associations and their members, and the institution proposing the change before any new technology is introduced.

Factors taken into consideration in this process include the organisational effects of change, particularly with regard to cost, resultant efficiency and change to the organisation's structure. With regard to staff members, the TCA requires that adequate research into staffing numbers, possible redeployment and work practice change is undertaken. This is necessary to ensure that neither staff nor the organisation are disadvantaged. Similarly, considerations for training/retraining, additional skill levels and qualifications, plus promotional opportunities must receive in-depth consideration. At all times those involved in the consultative process must be cognisant of hygiene and ethical issues involved in the change process. Such issues include occupational safety and health aspects, privacy of the system, and civil liberties. The former considerations are not exhaustive, and each situation may require additional factor deliberation.

REFREEZING "THE NEW STATUS QUO"

Refreezing refers to maintaining the change once it has been made. When a staff member utilises a new work method eg. a nurse who documents at the time of data collection, and then reverts to the former practice of charting at the end of a shift, the change has not been effective. If change is to be permanent, the changees must be convinced that it is in their own and the organisation's best interest. One of the best ways to accomplish this is to systematically collect objective evidence of the success of the change.

However, the change will only be accepted if the reward system of the organisation is geared to the new form of behaviour. An employee's job may be substantially enriched in terms of content and self-supervision, provided that it is accompanied by properly enriched classifications/gradings and status symbols. People tend to repeat behaviour that they find rewarding.

A further important step in negotiating a successful change plan is to include key personnel to act as facilitators. Due to the cost, complexity and size of most information systems projects, this role is more often adopted by a senior manager possessing the necessary decision-making authority. A by-product of having a top manager act as a

facilitator is that it demonstrates the commitment level shown by senior hierarchy to the process.

CONCLUSION

The need for hospital management to further introduce information systems to improve efficiency and effectiveness while containing costs is unquestioned. However, the success of any implementation requires that organisations fully consider all aspects of the change process. From external and internal environmental factors to the "human element" role, all must be comprehensively addressed, to produce the desired positive change outcome. Because staff have been consulted and involved in the change process, the desired change outcome in relation to IT implementation will also be recognised when staff say "we know what's in it for us."

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MANAGING THE CHANGE PROCESS FOR A SMOOTH IMPLEMENTATION

John Hinterreiter

INTRODUCTION

"Most people hate any change that doesn't jingle in their pocket."

Anonymous

All organizations exist in an uncertain environment of change. The health industry is subject to various change factors such as government regulation, funding cuts, competition, consumer expectations and technology. The proliferation of Information Technology (IT) in the health industry necessitates planned and managed processes to successfully implement IT systems. The issue is not whether to face change, for it is always there, rather, it is one of degree and effect. The ability to adapt new measures is the ability to survive.

The process of planning and managing change is part of ongoing organizational development. Change does not take place in isolation, as change involving organizational structure, technology and individuals is interactive. Planned change should aim to produce more adaptive structures, technology and individuals, and it needs to consider humanistic-democratic aspects of health care settings. Change may result from a self-defined need or be imposed by external forces affecting the operation of the organization. The phases of planned change include creating an awareness of the nature and need for change, implementing (actioning) the change, sustaining the new "status quo" and evaluation.

CREATING AN AWARENESS OF THE NATURE AND NEED FOR CHANGE:

This important aspect of planned change will determine the degree of acceptance and commitment of future users. Some resistance to change can be expected, but minimized by careful attention to the individual concerns of staff. Individuals at work are generally motivated by a self-serving desire (Robbins, 1979) or need. A common question (although not always directly stated) is "What's in it for me?" or, commonly in the case of nursing staff whose self-interest may well be a desire or need to help others, "What's in it for the patient ?" There must be anticipated benefits for staff (less but more comprehensive documentation, more time with the patient, better information, computer literacy skills) and patients (improved quality of care and service).

A participative approach requires staff to be aware and involved from the onset of any discussions or ideas and before "rumors" get to the grapevine. Staff at all levels can recognize the need for change and be involved in the design and development of solutions. In

the case of an already available system, exposure to an on-site demonstration version will generate valuable formal and informal feedback, discussion and criticism. Regular updates on progress through formal and informal communication channels will promote the reality of the project and a feeling of being involved. Pre-implementation questionnaires are a valuable means to assess staff attitudes towards IT and to determine educational needs.

A change of this magnitude cannot be introduced as a means of "shaking things up" but rather as a result of careful analysis, planning and participation. The defined need and anticipated benefits should be conveyed to the future users of the system. Consultation with staff groups both internally and externally (unions, professional bodies, etc.) should begin early and be ongoing.

The current state of the organization must also be carefully considered. One reason for passive resistance or delayed acceptance is often the scenario of wards or beds currently closed due to lack of operating funds, while the purchase of new computers is proposed or underway. Staff need to be enlightened on budget allocation procedures and reassured that any gains from the use of information systems will be translated to an improved ability to provide quality care to more patients.

IMPLEMENTING (ACTIONING) THE CHANGE

The implementation of ward-based IT systems will affect all nursing division staff from top to bottom. In addition the implications of such a system will affect other disciplines and existing structures or procedures. A collaborative environment is essential to smooth implementation. An effective information system should result in a reduction of repetitive tasks, data duplication and the availability of information, and will change existing systems or procedures. Individuals affected by these changes need reassurance about job security and changed responsibilities.

The nature and extent of user education programmes should be carefully designed and supported with appropriate allocation of human and material resources. Technical support must be readily available to ensure the functionality of systems used by staff working 24 hours per day, 7 days per week.

Whilst implementation should not be hurried, clear direction and goals are required for the implementation phase. Target dates should be established for complete change-over to the new system. Running parallel systems for too long is not only frustrating and time consuming, but affects the quality of information in both systems. This negates the main reason for a parallel run, invalidating data across the old and new systems.

A project co-ordinator with a sound clinical background and experience or keen interest in computers is necessary as a facilitator and catalyst for change. The scope of the position should be flexible, enabling interaction not only with defined users, but others affected by the implementation of the system.

SUSTAINING THE NEW "STATUS QUO" AND EVALUATION

The implementation of ward-based IT systems pass through various phases.

* **The Novelty Phase** (1 to 2 weeks). As computers are installed and user education begins, initial high motivation and enthusiasm can be encouraged by the availability of computer games. Staff are drawn to the computer and can "play" without fear of breaking something. This non-threatening environment will see the most anxious individuals drawn to the system.

* **The Reality Phase** (2 to 4 weeks). Users undergo further education and begin use of the system proper, usually in parallel run mode. The inherent learning curve begins and this, coupled with usual work demands and effects on existing procedures can become a burden. Local and considerate support during this time is essential. A temporary review of resource management policies may be required.

* **The Acceptance Phase** (4 to 6 weeks plus). New systems are in daily use, old manual systems have been replaced and the computer is no big deal anymore. A degree of reliance on the system develops and is evident in the urgency and number of calls to the responsible person when the system "goes down". Individual users begin to recognize the capabilities and power of the computer and request additions or enhancements. A prompt response to these requests helps maintain positive attitudes.

Formal post-evaluation is a worthwhile exercise, particularly if data is available to compare with the pre-implementation situation. Staff quickly adapt to new systems when introduced properly, but sometimes need a means to reflect on what was done before and the improvements that have been achieved. Post-evaluation data that demonstrates deficiencies in the system should be acted on promptly.

CONCLUSION

Pro-active management of the change process will result in smooth implementation. A project of such magnitude incurs high initial costs associated with the purchase of a system and high overheads associated with the education and support of a large group of professional users. Full and sustained commitment by senior management must be real and visible, both through policy review and resource availability. The value of an informed and participative approach from the outset cannot be understated. The appointment of a project co-ordinator with broad and flexible responsibility will ensure the success of planned change. Formalization within nursing industrial awards of nursing information systems positions is long overdue.

Whilst continued support of the new "status quo" is required, it is also inevitable that the next change will be just around the corner, given the unprecedented advances in IT and demands for information. An adaptive staff, recognized for their acceptance of deliberate and planned change, will secure co-operation for future organizational development.

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MANAGING CHANGE FOR SMOOTH IMPLEMENTATION

Tricia Leeder

INTRODUCTION

The major emphasis of this paper is effective implementation of systems through the management of change which is outcome focused. Managing is the key word in the title. Managing change means taking control of the change process, shaping its direction, then influencing the outcomes. Only then will implementation run smoothly.

The introduction and implementation of new information systems to any organisation usually represents major organisational changes. To effectively manage these changes, an understanding of the way the specific organisation is instituted is imperative. It has been recognised in the literature that information systems can affect future organisational structure designs, and conversely, that existing organisational structures can influence information systems designs, and whether they are implemented successfully, or how they are used (Heap, 1989). There is no magic that can guarantee successful implementation of systems. Only effective management within an organisational structure which is conducive to, and receptive of, technological/informational innovations, can assure success. In sum, effective change management is management where an outcome orientation is valued, embraced and used.

OUTCOME-ORIENTED MANAGEMENT PRINCIPLE

The precise principles on which outcome-oriented management is based include outcomes, measurement and authority (Reddin, 1989). This implies, that to effectively implement any information system, and to manage the subsequent organisational change or changes, there must be clarity about the outcomes of the process, precise measurement areas for all outcome points, and a clear match of management authority to outcome expectations.

There are basically six key outcomes which must be achieved if management of the change process is to be effective, and implementation of information systems is to proceed smoothly. These are:

- change boundaries which have been set with consideration for the nature, rate and magnitude of expected change;
- organisational environment, culture and infrastructure which have evolved to accommodate change;
- focused change agents (managers) who have been charged with the overall responsibility and authority for issues and activities pertaining to the change process;

- levels of resources which have been determined as sufficient to effect change;
- outcome plans which have been realistically set and include focused timetables for each element of change; and
- monitoring and control mechanisms in place to ensure regular and valid progress measurements of change adaptions (Hickman and Silva, 1984).

EFFECTIVENESS AREAS FOR ACHIEVING STATED OUTCOMES

There is only one realistic and unambiguous definition of effectiveness within the context of this paper. Effectiveness is the extent to which a process achieves the outcome requirement of its function. Seen this way, the concept of effectiveness becomes the central issue in the achievement of any process, be it the implementation of an information system or the corresponding organisational change. Effectiveness areas, therefore are operational requirements which must be accomplished if a desired result is to be realised. Once these two definitions (effectiveness and effectiveness areas) are accepted and understood it can lead directly to changes in management practices and techniques, and in the philosophy leading to outcome orientations. Importantly, it lends itself to measurement areas to assure effectiveness.

Effectiveness area - setting the boundaries of change and evolving the infra-structure and culture to accommodate change.

Change needs to be underpinned by a clear vision about where the organisation is heading and the implications that may result from the pursuit of that vision. A careful identification and exploration of the potential outcomes of the new vision, including both positive and negative outcomes has to be made. Within the exploration and analysis the following factors have to be addressed:

- the type of organisation structure and systems best suited to deliver the desired results;
- the specific skills and resources needed to carry out the process; and
- the predominant organisation culture to promote the implementation of new approaches to work.

Most importantly, the overriding values of the organisation, in respect to the change process, must be ascertained. McKinsey (in Bowman, 1990) suggests that focused strategic thinking is the driving force that propels the three categories listed above (structure and systems, culture, style and values, and skills and resources) so that the organisation fits the strategic outcome. Vision, therefore helps to put the future in focus thus enabling organisations to create changes effectively. To create the conditions for bringing about effective change, and how people get committed to it, and involved in it, are important issues.

There has been a significant shift in values and attitudes towards organisations, managers and "changers" in recent years. Staff are no longer prepared to accept being

manipulated, influenced or pressured into changes which they do not understand or with which they do not agree. More fundamental is their willingness to articulate their feeling of dissent to a greater extent (Plant, 1987). In consequence, those bringing about organisational change have to be far more cognisant of the ways and means they use to do so than has ever been the case in the past. Therefore, to achieve the outcomes wanted, the goals and philosophy of the organisation must be articulated to staff prior to the initiation of change activities. This has to be achieved in a manner which is easy for all staff to grasp and which integrates strategic direction and cultural values. This management process is akin to the transformative leader process reported in the current literature. The vision of the future has to provide a reason for being for each staff member because it must relate the vision of meaning to individual concerns and work activities. The human aspect of change cannot be underestimated for its influence on the change process can be great.

A thorough evaluation of all factors involved in implementing the change process will provide key indicators that will ultimately determine the success or failure of the project. Detailed analysis of organisational structure, resources, and culture leads to a view of the reality of the organisation as it exists. The question becomes how to move the organisation from where it is now to where it is to be taken.

There is an old but well tried technique called "force-field analysis". This technique presents the current situation in the form of a line which is subject to pushing and resisting forces. The idea is that there are things which assist in reaching a vision (pushing forces) and ranged against them are resisting forces preventing movement in the right direction. If the pushing forces are stronger than the resisting forces, movement is in the right direction. If they are not, then this suggests the amount of change required to reach the goal is considerable. There are two positive ways to enhance forward movement; either strengthening existing pushing forces and adding new pushing forces or weakening resisting forces (Bowman, 1990).

To assist in moving forward, it is imperative that all major events in the implementation and change processes are identified, quantified and properly sequenced as to their impact on the organisation or subsequent implementation events. At this stage specific plans need to be designed to determine at which point changed conditions are likely to evolve which can be quantified. Boundaries of change are therefore set and manifestations of change are identified. The previewing step to implementation of change helps to anticipate the probable nature, rate, and magnitude of impending change.

Effectiveness area - empowering outcome-oriented change agents/managers

As previously stated, to exploit change and to create change, management must be focused on the outcomes to be achieved and eliminate extraneous activities. Managers who are focused in their responsibilities can translate visions of the future by concentrating on the keys to success. In other words, they maintain a positive forward direction to the accomplishment of their goal. The task is not easy, but it is a very necessary task to accomplish. Managers must be able to translate and articulate the goal or the outcome of the

project in a manner that it is understandable and acceptable to all levels and functions of the organisation. Focused or outcome-oriented managers can better achieve this than managers who are not. Intense focus generates competence and allows dramatic changes while keeping strategy and culture harnessed in the process The concern is that too much change too soon may have adverse effects on the organisation, the project and importantly the people.

Managers must be given responsibility and authority to complete the processes of implementation and change. Henri Fayol, a French manager and writer on management stated "responsibility must be commensurate with authority." This means that outputs and outcomes must match with authority. Responsibility for an outcome can only be accepted if authority is given to achieve it.

Effectiveness areas - evaluation checkpoints and measurements

Control is a key management function. The central activity in control is measurement. Without measurement there is no clear statement on the advance or decline of a project. Outcome-focused managers want to have a sound method for measuring each effectiveness area. There are two reasons for this, for control and for motivation. Any project manager wants to measure the results of an objective. If an objective cannot be measured its attainment cannot be known. Checkpoint measurements at regular intervals will not only provide a control tool but will act as a motivator. Knowledge of performance, whether positive or negative, is a motivator for outcome-oriented managers.

CONCLUSION

The conceptual foundation of outcome-oriented management, which includes the principles of outcomes, measurements and authority is an approach to managing change for smooth implementation of information systems. It can be an effective method to manage and accomplish implementations by deliberate and reasoned change.

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BENEFITS OF BEDSIDE TERMINALS - MYTH OR REALITY?

Evelyn J. S. Hovenga

To completely realise their benefits, bedside terminals need to be part of a fully integrated hospital wide information system. Such a system is capable of consolidating all patient data from admission to discharge and beyond. Furthermore, an integrated system requires all data to be entered only once. The use of bedside terminals alone does not determine whether benefits become a myth or reality; the effectiveness of the system plus the organisational climate within which it is used, determine this. Bedside terminals provide the greatest benefits when they are used by all health care professionals delivering a patient service, to access the patient's computerised medical record and to document their observations and treatment/care provided at the point of care.

Packer (1987) reported a survey which found that two out of every three hospitals in the United States were interested in information systems that collect and retrieve data at the patient's bedside. As a result of this level of interest more vendors are directing their research and development activities into designing or expanding their systems to meet this demand. But what are the real benefits?

Mowry and Korpman (1987) list potential benefits of automated systems as: a significant reduction in nursing time spent on clerical activities; enhancement of the quality of documentation; elimination of error prone telephone communication between departments; elimination of costly errors of duplication and omission; incorporation of both physician orders and nursing orders within the patient care schedule; the ability to trace patient outcomes to interventions; the possibility of creating improved on-line quality assurance programs using extensive, system provided audit trails; extensive clinical and management research capabilities; automatic calculation of patient acuity and suggested staffing patterns; the ability to track labour and material costs by patient and DRG; and scheduled or ad hoc management reports derived by use of a query language. Zielstorff, McHugh, and Clinton (1988) add that automated systems can be used to help structure the care planning process; to support the nurse's clinical decision-making skills; to guide future nursing decisions; to help detect or prevent certain types of nursing errors; and to increase the body of nursing knowledge. Value-added projected benefits include reductions in length of stay through improved patient scheduling throughout the hospital stay and reduced complication rates due to improved data accuracy, timeliness of test results and documentation responsible for timely and appropriate responses. These improvements in the quality of care are likely to result in improved outcomes for individual patients. In addition it is anticipated that there will be more opportunities for health service consumers to become more informed and to assume a more active role in their care.

Bedside terminals, used in conjunction with fully integrated health care systems, (i.e., integration beyond the hospital), permit the consolidation of factual clinical and other data about the health and health care services of a nation, creating large databases. The use of these facilitates more accurate evaluation of government policies and should lead to the development of better targeted health and social policies determining government expenditure. The ultimate benefit of which should be a reduction in the nation's morbidity. Ideally this data is also used to assure equity in access to and quality of health services.

Potential benefits of fully integrated systems may be grouped into a number of categories. Some are considered cost benefits, others are perceived as service benefits. Notwithstanding, the bottom line usually is to be able to demonstrate savings to justify purchase and maintenance costs. Potential benefits are generally perceived to consist of improved productivity and an improvement in the quality of care delivered. Savings from the improvement in quality are realised by the elimination of costs resulting from complications or errors during care delivery.

Staggers (1988) organised direct benefits, as perceived by a number of authors, under the two main categories of accountability and efficiency. Each potential benefit mentioned, requires its own management strategy to ensure benefit realisation. Clearly, strategies need to be employed and incorporated as part of planning and implementation processes to ensure that anticipated benefits will ensue. The extent to which benefits are realized by the provider, the industry, the patient and the nation as a whole depends on how well automation is planned for and implemented within each organization; that is, benefits are not automatic (Barry & Gibbons, 1990).

ORGANIZATIONAL IMPACT

An important impact of automated systems and the use of bedside terminals is the amount and timeliness of available information. Information is power. Thus a group previously powerless due to a lack of timely information has the potential to redefine its power base. The benefits for some may be at a cost to others within an organisation.

There needs to be an understanding of what is preventing apparently logical changes to occur prior to the development of management strategies aimed at realizing anticipated benefits. There are a number of issues. Automating existing inefficient practices will not result in improved productivity. Good system design, data and data base structures, together with optimum use of technological advances, are necessary prerequisites to a potentially successful system. Successful implementation requires an understanding of the organizational climate, a good assessment of the likely impact of the system upon existing work practices, power bases and communication channels. Frequently the introduction of an efficient fully integrated system within an organization leads to major organizational changes (Warnock-Matheron & Plummer, 1988).

Not only do people have to become familiar with new technology, but their work practices and roles are redefined. Everyone has their own expectations about what the system will or will not do. In short it can be very traumatic. However, a system may be successfully

implemented in terms of its ability to automate functions and to provide timely information without realizing other anticipated benefits.

Peters (1987) predicted that a successful firm in the 1990's and beyond would have fewer layers within the organizational structure, have more autonomous units with more local authority, be oriented toward differentiation, be quality and service conscious, more responsive, faster at innovation and use highly trained, flexible people as the principal means of adding value. This is a major change for most nursing divisions and most hospitals.

Nothing is more threatening to individuals than uncertainty, coupled with role and organizational changes. In such circumstances human behaviour becomes unpredictable. Controlling the flow of information is a common strategy by individuals to maintain power. Some will go to extremes to safeguard their power base and the status quo. Peters talks about empowering people and advocates that all information be shared, thus diluting the power bases. Fully automated integrated systems make this readily achievable.

An additional benefit is therefore a better understanding of everyone's contribution to the process of care and outcomes. It also means that the activities of some individuals will be under greater scrutiny. The nursing profession needs to be aware that the control of nursing information by nurses is crucial to the control of nursing practice. Thus the issue here is who owns what information. This needs to be clearly identified and incorporated in the system's design and maintenance.

Staggers (1988) has conducted an extensive literature review to identify the documented benefits of computer usage in nursing. This led to the question of whether perceived benefits have in fact been demonstrated by empirical studies and whether the effects of computer systems on nurses' work activities support the statements and service benefits. More studies have been conducted, but it is difficult to access the findings.

An empirical measurement study by MacArthur (1988) of the expected benefits following the implementation of the Clinicom system demonstrated that all anticipated benefits had been realized. However, these results were made available to the system vendor and hospital client only, as the study was commissioned from a private consulting organisation. Such study results are usually considered confidential. Another anecdotal article regarding the benefits of bedside terminals was published by Yero (1988).

Noehr and Bernstein (1989) assert that one needs to understand the tasks, the working methods and the organizational environment in which the systems are to be used before selecting or designing an integrated system. These authors talk about the final product as being not just another technical system but an organisational change. They identify as the most significant obstacle to realisation of potential benefits "the lack of concepts for capturing the application oriented perspective, and models for capturing working routines and communication structures in a modern hospital". They argue that it is crucial to develop user knowledge about the technology to produce new conceptions. This can be achieved through user involvement in system development and implementation. Further, effective integration requires standardisation. Currently we have many systems which are department, or at best health agency specific.

Increasingly, efforts are being directed toward first interfacing and later integrating these existing systems. Data integration generally works only between application packages supplied by the same development team since it requires the use of a 'common language' not to be expected when attempting to combine software from different vendors (Bakker, Kouwenberg, & Ottes, 1989).

One of the American Nurses Association's criteria for automated systems is that "the system should be designed to permit nursing data to be transported electronically to other systems" (Zielstorff et al., 1988). They consider that this would eliminate the re-keying of data and provide a much broader database than any one agency could produce. Not only does this require application standardization but also data element standardization. That is, all data elements used in databases need to have a standard meaning to permit the creation of a regional, national or even international nursing database. These authors state that "systems that can promise transportability of data across hardware environments will, in the future, have a distinct advantage." Standard data meanings are emerging from work done in various countries aimed at establishing nursing minimum data sets. The lack of a comprehensive uniform coding format to describe clinical nursing data renders current and future technological capabilities useless (Simpson & Waite, 1989). A priority for the nursing profession is to adopt a national, and possibly an international, taxonomy describing nursing (i.e., clinical indicators, interventions and outcomes).

Are benefits of bedside terminals just myths or can they become reality? To answer this question we also need to examine how staff time saved is actually used. Can nurses handle spending more of their time interacting directly with patients? This may require a re-orientation to nursing.

Hovenga's studies (1988, 1989, 1990a, 1990b, 1990c), conducted in eighteen hospitals between 1981 and 1989, indicate that nurses spend between 20% (nursing home type patients) and 40% (acute general medical/surgical type patients) of their time on activities which would benefit from the use of bedside terminals. These studies also showed that the introduction of additional non-nursing staff to perform non-nursing duties in ward areas did not result in a change in the amount of time nurses spent in direct patient interaction.

A common finding from five empirical studies (Staggers, 1988) addressing work activity changes and actual service benefits, was that extra nursing time available after computerization was not usually spent in direct patient care as the authors had originally hypothesized, but was channelled into other areas. A later study conducted in an intensive care unit (Kalbach & Kalbach, 1988) supports these findings. Yet the potential to help nurses improve their productivity has been reported by several authors (Cook, Fleming, & Buchanan, 1981; Edmunds, 1984; McHugh 1986; & Hughes, 1988).

CONCLUSION

In theory, there are significant savings to be achieved. To realize these potential benefits will require new management styles, considerable effort by all concerned and union co-operation. Saving nursing time is only one side of the equation, the other question to be answered is,

what will nurses do with this extra time? Unless the time saved is equivalent to one nurse on any shift, this saving will not translate into a cost saving unless sicker patients are cared for with the same staff thus reducing the cost of treating specific patient types. Savings are greatest where the information processing needs are greatest, i.e., in acute care settings with a high patient turnover where most patients require complex care.

Another projected saving is through improved patient scheduling throughout the length of stay, improved data accuracy, timeliness of test results and documentation leading to timely and appropriate responses, resulting in a reduction in complications, reduction in average length of stay and improved outcomes for individual patients.

More studies are required, both pre and post implementation of any integrated system, to conclusively determine the extent of the benefits of bedside terminals.

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FACILITATING AND ENHANCING THE ROLE OF THE NURSE: THE NURSE AND THE CLINICAL WORKSTATION

Roberta Rochman

INTRODUCTION

In a television commercial frequently aired in the United States, two managers stand behind a glass partition watching employees queue to use one terminal while dozens of computer terminals sit idle. The first manager asks, "Which personal computer is the best?" The second manager answers, "The one with the most memory, MIPS or megahertz." The first replies, "I don't think so, the best PC is the one that people use." I agree with this sentiment: the important thing is to give people what they need.

Unfortunately, too many hospitals install information systems without remembering who their users are and what they need to capably perform their function. The business of health care is patient care and the caregiver, in particular the nurse, plays a critical role in both gathering and using information. Systems which are evaluated and selected only for their financial applications, for example, while ignoring the needs and wants of other end users are doomed in their quest for widespread utilization.

NURSES' INFORMATION SYSTEM NEEDS

Nowhere should Chief Executive Officers be more anxious to bring computerization than to its nursing department. In its 1988 report, the U.S. Department of Health and Human Services Commission on Nursing stated, "With the nursing shortage, employers must consider all options for maximizing the time that RN's spend in patient care. Reductions in time spent in recording, tracking, retrieving and communicating information can reduce the unnecessary demands on nurses' time."

In order for any nurse to use a new tool, that tool must provide increased benefits. The nurse has a limited amount of time with each patient and needs the right information to make the right decision at the right moment in time. The computer should be the tool that optimizes that moment in time for the nurse and the patient (see Figure 1). For example, the nurse practitioner needs to review previous nurse charting activities while noting new observations. If the nurse is unfamiliar with the patient, the computer should alert him or her to the fact that a patient's blood pressure has increased from the last recording and the dependent edema evident today is a new development.

The clinical nurse needs to be able to use the computer tool to save time and/or money while improving quality. A key use of the computer is to improve continuity in monitoring patient data or improving the accuracy and compliance in charting which can save time. More

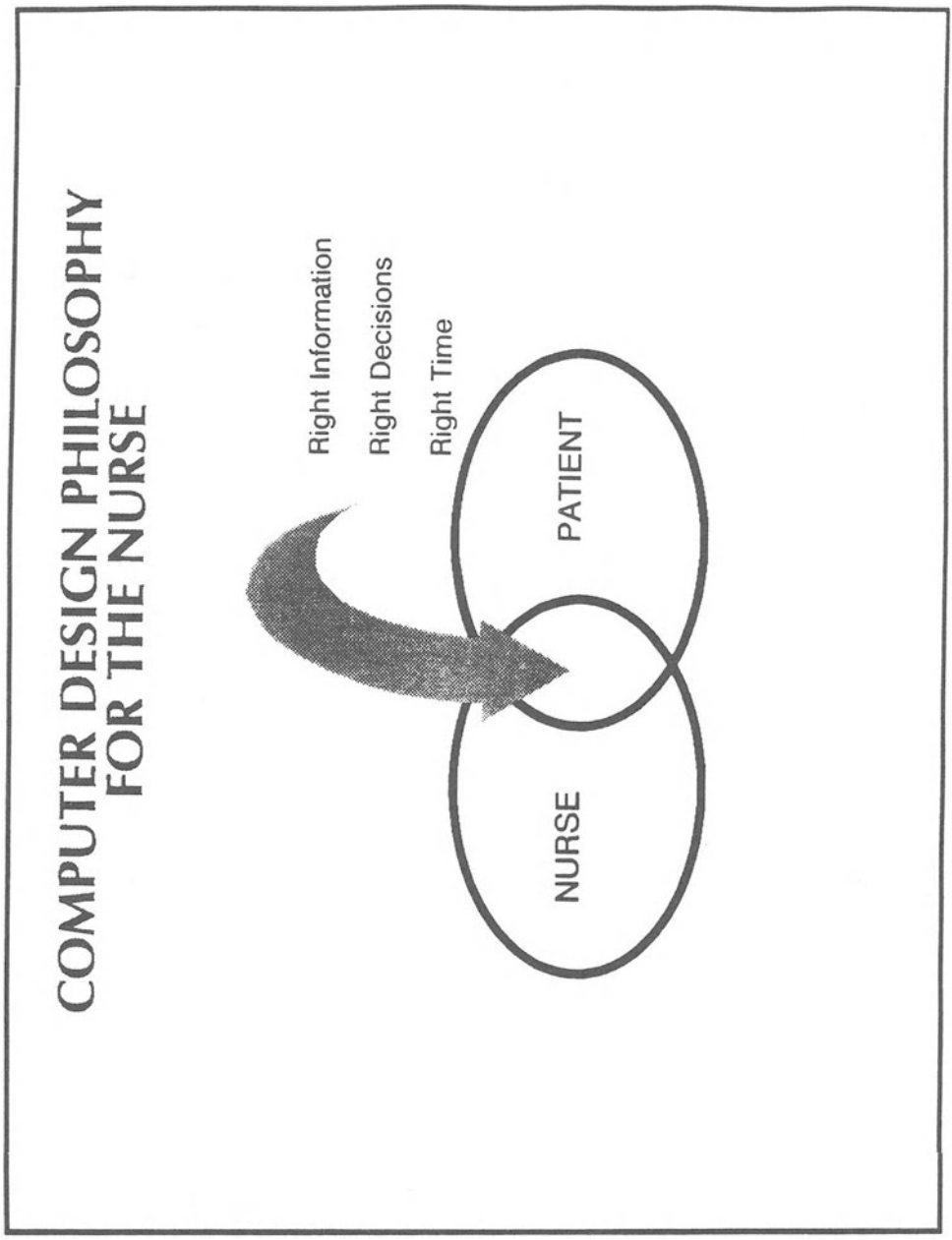

Figure 1
COMPUTER DESIGN PHILOSOPHY
FOR THE NURSE

importantly, the nurse can scan the on-line chart in one area, such as the nursing plan of care or nursing progress notes, spanning over many years. For the first time, nursing can track and be accountable for their professional actions over an extended period of time. The nurse administrator can retrieve summary information from the computer without asking the bedside nurse to spend more time documenting on multiple forms. The nurse educator can save time by using computer-based training tools that allow direct screen-capture in designing course curriculum and automatically grade the students' performance. The information systems nursing professional will be able to save time and money by utilizing software packages that have all of the nursing models pre-coded. It will also be challenging to learn the newest techniques in connectivity to multiple databases and environments to help automate his/her colleagues.

WHAT THE CLINICIAN NEEDS TO REDUCE TIME

The nurse should be assisted by the computer through the nursing process just as the surgeon is assisted by a skilled operating room assistant. The computer can drive many functions in the background that are invisible to the clinical nurse. By simply performing the nursing process of assessing, planning, intervening and evaluating, the computer can spin-off many other data elements for other nursing computer-users such as the nursing administrator (comparisons of prospective and retrospective acuity); researcher (number of the new critical pathways used on the Surgical Units in the past six months; the pathways that yielded the best patient outcomes); or Quality Assurance/Risk Management personnel (patients returned to the Operating Room after a previous surgery; nursing assessments done on every patient within the first twenty-four hours of admission). The computer should take away burdensome, repetitive or menial tasks from the nursing professional.

For example, when documenting a baseline assessment and noting a potential problem with toileting, the computer should present the nurse with the established potential nursing diagnoses or nursing problems that may apply to this patient to meet international, national or institution-specific standards. While entering the multi-disciplinary plan of care, each selected intervention should automatically include a time schedule for future charting and a prospective acuity value for the nursing specialty and shift. When the nurse evaluates (charts) each intervention and goal as "done" (with the clinical assessment, if necessary), "progressing as planned" or "not done" (with the reason why) the charging, cost accounting, retrospective acuity and nurse staffing variances are simply a by-product. The nurse should be prompted to document all necessary interventions, medications or intravenous fluids and then alerted to any items not charted for all patients under his or her care.

THE NURSE AND THE WORKSTATION

Let us first define the clinical workstation. Richard Peterson has described it this way:

> a computer terminal that is *powerful* enough to provide the practitioner with access to data from *multiple hospital computer systems*. Because of its speed and power, it allows hospitals to tie

> together cutting-edge technologies such as voice recognition, digital imaging, graphical user interfaces, video and artificial intelligence into a *single device.*

I have placed the italics to denote some key words and phrases. The terminal device must have the speed and capability to tie all of nursing's needs together in one tight package.

APPLICATIONS AND TOPOLOGY

Workstations are unique in the clinical environment because they can provide applications never before dreamed of by the nurse. For example, the nursing workstation can have applications on the personal computer itself, such as word processing, clinical graphics applications or a nurse scheduling package while still accessing other databases via a network (see Figure 2). Application ideas can be stretched as far as the mind can reach; information resources, nursing expert systems, artificial intelligence, research data bases, alerts and reminders, specialty clinical packages such as psychiatric nursing or home care, the clinically oriented electronic medical record, etc. (see Figure 3).

DESIGN GOALS

In the past twenty years, pioneers of nursing computing had key design goals which are still basic to creating the clinical systems of today. These goals include, but are not limited to:

- Extremely fast response times
- Ease of use
- Flexibility
- Accessibility
- Comprehensive functionality
- Room for system growth and expansion and
- Cost effectiveness.

However, in studying the nurses of the 1990's, a few more design goals have emerged in the clinical environment:

- Entire health care history on-line:
  - -Instantaneous access
  - -Previous data available for comparison: in- and outpatient
  - -Data input gathered directly from monitoring equipment
  - -Treatment noted from clinic, institution, office or home care
- Easy input mechanisms such as pointer devices and voice
- Patient's clinical status represented by trends
  - -No missing paper documents

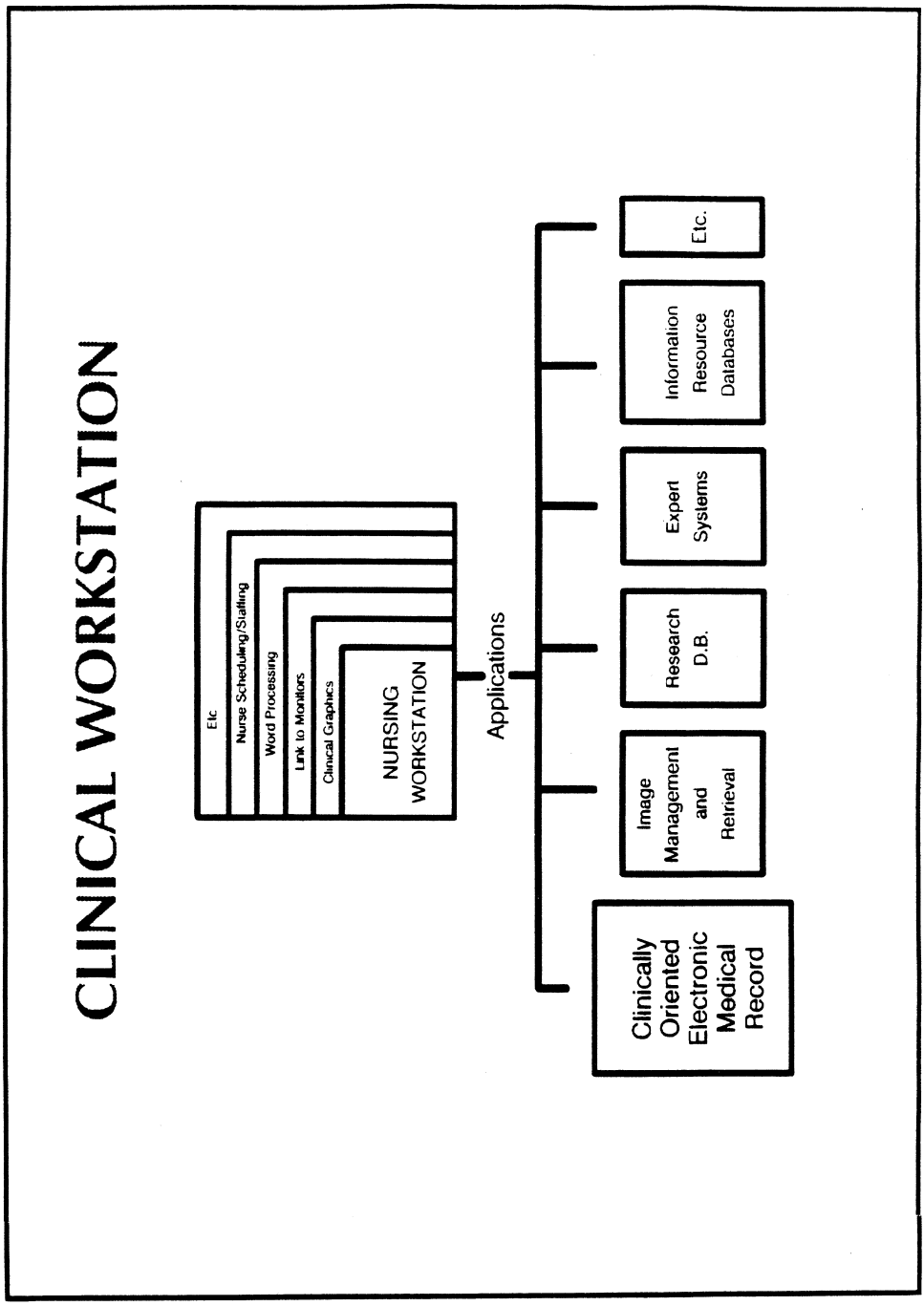

Figure 2
CLINICAL WORKSTATION

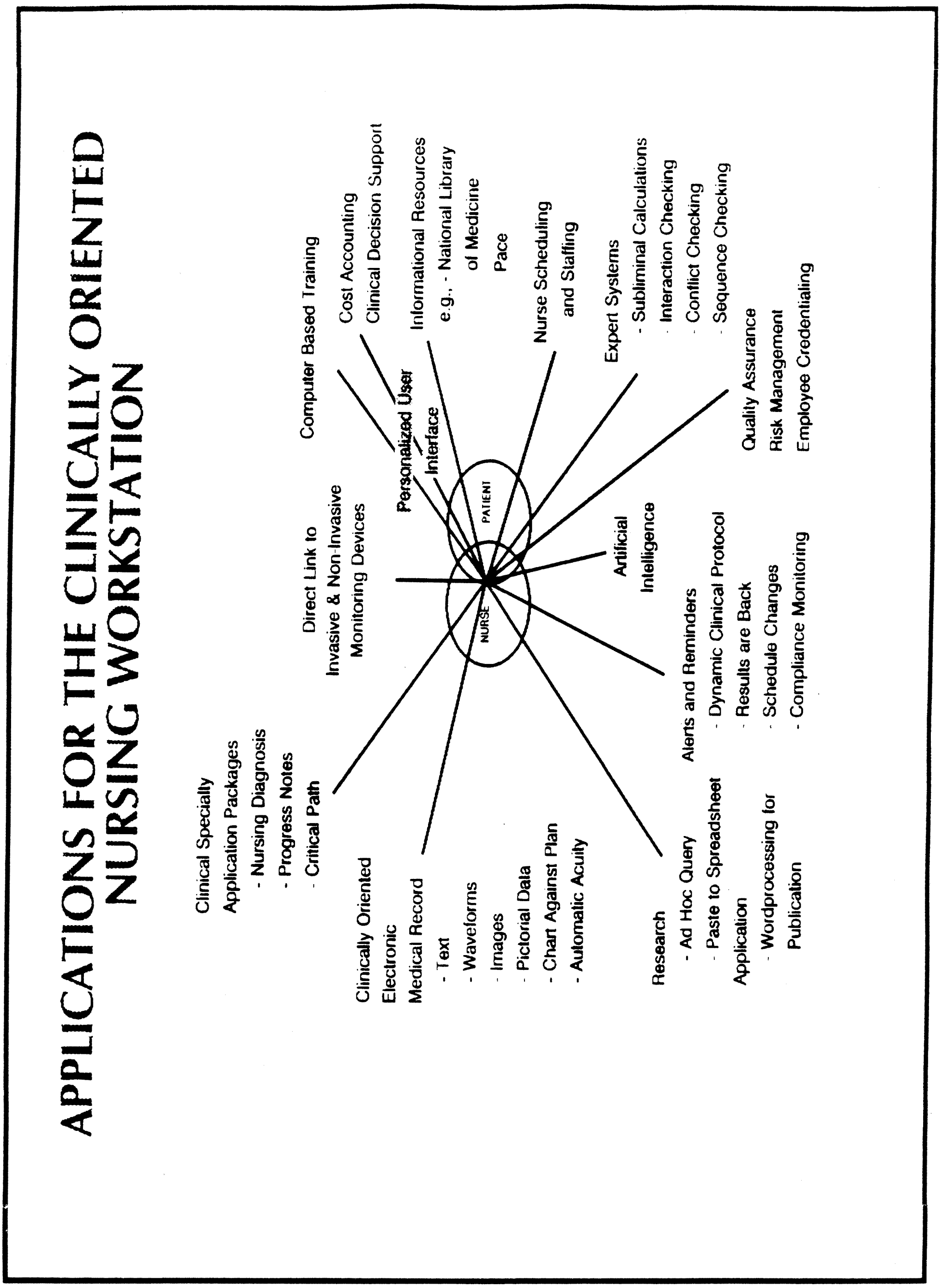

Figure 3
APPLICATIONS FOR THE CLINICALLY ORIENTED NURSING WORKSTATION

-Access to imaging, impressions, waveforms, pictorial, text and sound

BENEFITS

The benefits to the clinician are enormous and include:

- o Convenient and timely access to information
- o Accuracy and consistency of data
- o Data integrity and confidentiality
- o 24-hour review from various locations
- o Facilitates compliance of institutional, national or international standards
- o Longitudinal tracking of clinical data and trends
- o Continuity of patient records
- o Enhanced follow-up care
- o Improved statistical reporting
- o Improved patient relations: increased confidence/loyalty.

CONCLUSION

The nurse's role can be greatly enhanced by using the clinical workstation as a tool in the daily work environment by helping him or her work smarter, not harder. The first rule is that it must be a tool that he or she will use; it must help the nurse organize his or her time, assist in the nursing process, save the institution time and/or money and ultimately provide the information needed by other health care professionals without burdening the bedside clinician. In this way the clinical nurse can improve his or her own role by having more time to be with the patient as the caregiver/patient-educator or leader of the clinical health care team. The computer can and will continue to be designed for the nurse as long as it is a tool that the nurse will use because it is exactly what he or she needs to reduce time spent in recording and communicating information.

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THE ELECTRONIC COMMUNITY: WILL COMPUTER - MEDIATED COMMUNICATION HAVE AN IMPACT ON NURSING PRACTICE?

Diane J. Skiba

Society acquires much of its character from the ways in which people interact (Ellis, Gibbs & Rein, 1991). Over the last decade, computers have become commonplace in our offices, schools, and homes. In the next decade, computer-mediated communication systems, the technological marriage of computers and telecommunication, will serve as a driving force for societal change (Naisbitt & Aburdene, 1990).

Computer-mediated communication systems, a key ingredient of computer networks (Kiesler, Siegel & McGuire, 1984), have the potential to alter social interactions of individuals, organizations, and society. Gurbaxani (1991) predicts that the rapid introduction and growth of computer network use is revolutionizing the nature of communication. Thus, one outcome of this technological marriage will be the creation of a new communication paradigm.

This paper examines the area of computer-mediated communication and its implications for nursing. First, computer-mediated communication systems are defined and their use by nursing and health care professionals reviewed. Two projects, ComputerLink and NurseLink, have created electronic communities in nursing and are explored. Suggestions for research to examine the social psychological impact of this communication paradigm are presented.

Computer-mediated communication systems use computers and telecommunication networks to compose, store, deliver, and process communication (Hiltz & Turnoff, 1985). They support people's abilities to exchange, store, edit, broadcast, and copy any written document, to send data and messages instantaneously, and to consult electronically (Kiesler, Siegel & McGuire, 1984). Among the types of systems under this rubric are electronic mail, computerized conferencing, long distance blackboards, and bulletin board systems. Computer-mediated communication systems can enhance speed and volume of communication flow within and between groups and organizations.

Networks, i.e., computer-mediated communication systems, are proliferating at tremendous rates and have moved out of research and development, technical and scientific environments to academic institutions, and more recently, to the home environment (e.g., Prodigy and CompuServe). Computer-mediated communication, once confined to technical users, is now available and used by all segments of the population (e.g., school age children, home users, and elderly). This trend should inform health care professionals about creative uses of this form of communication.

An examination of nursing literature demonstrates that articles about telecommunications classify into two categories. The first category includes articles on the basics of telecommunications (Maher, 1984; Armstrong, 1985; and DeVillier, 1988). The second type of article focuses on the use of electronic bulletin boards to facilitate communication among

nursing colleagues. Several schools of nursing (e.g. University of Texas at Austin, Louisiana State University) and other bodies (Computers in Nursing and Nightingale in San Francisco) have established bulletin boards for information dissemination and communication in nursing. Numerous articles in this category have extolled the virtues of electronic bulletin boards and encouraged nurses to get "on-line" (Morey, 1985; Rankin, 1988). In more recent years, a third category of article has emerged: use of computer-mediated systems to form electronic communities in nursing.

The use of computer-mediated communication systems as an alternative approach to community health education first emerged in health care literature in 1986. Grundner and Garnett (1986) described an electronic hospital, St. Silicon's Hospital and Information Dispensary, that allowed consumers to call in and anonymously ask medical questions. Board certified family practitioners responded to these questions. The response to this system was phenomenal--the initial system received an average of 233 calls per week on a single line system. The phenomenon, interactive medical telecomputing, quickly grew to include other health care arenas such as dentistry.

The success of the electronic hospital precipitated the development of the community computing concept. Grundner (1991) conceptualized community computing as a free, open access computer network operated by the community much the way national public radio and public television are community-supported. Grundner (1991) believes that community computing in the 21st Century is analogous to the development and growth of the public library in the 20th Century. The community computing concept was first witnessed in 1986 with the initiation of the Cleveland Free-Net. Since that time, several others (e.g., Youngstown, Peoria, Chicago) have instituted electronic communities. The "electronic communities" have expanded beyond the hospital and offer services in areas like government, education, legal, libraries, and a teleport (to connect to other electronic services).

The success and availability of Cleveland Free-Net have permitted the development of several health-related projects to build upon the community computing concept. Of particular interest to nursing are two ComputerLink projects. In one project, caregivers of Alzeheimer's patients are electronically provided three types of support via ComputerLink: electronic encyclopedia, decision support system, and a communication pathway. In their preliminary analysis of ComputerLink usage, Brennan, Moore, & Smythe (1991) found that the communication pathway primarily used by caregivers through extensive use of the public communication options (The Forum, a public bulletin board to initiate discussions; and Q & A, where caregivers could anonymously ask questions of project staff). To a lesser extent, caregivers made use of the encyclopedia and the private mail capacity. Brennan, Moore, and Smythe (1991) concluded that an electronic support was a realistic method to deliver services to caregivers. ComputerLink served as a vehicle for emotional support for caregivers, provided practical information, and increased access to resources. In another project, Brennan (1990) is studying the provision of electronic support for patients such as HIV positive patients.

Another form of an electronic community is being attempted by the University of Colorado Health Sciences Center. Since 1987, the Center for Nursing Research at the School of Nursing has operated an electronic bulletin board, NurseLink. The original purpose of NurseLink was to facilitate communication between the School of Nursing and four local collaborating hospitals and to promote the dissemination of research findings. Stember (1986) conceptualized NurseLink as housing an electronic research database into which nurses from local hospitals could dial for research findings or consultations from nurse researchers in the Center for Nursing Research. NurseLink was designed to be available 24 hours a day as a free service unless long distance charges were incurred by the user.

After some initial success, a critical mass of users was never established among the intended nursing community. An evaluative study (Skiba & Warren, 1991) was conducted and NurseLink was then redesigned to highlight the noteworthy characteristics of information access and communication. A commitment also was made to increase awareness of NurseLink and to promote the unique features of computer-mediated communication systems to various groups throughout the School of Nursing, the State of Colorado, and the nursing profession. In concert with these efforts, NurseLink was expanded to create an electronic Community of Scholars among the School of Nursing and four Area Health Education Centers (AHECs) located in rural communities; it eventually will extend to the five off-campus rural educational sites within Colorado. The Community of Scholar's expansion was designed to create an extended academic community to foster collegial relationships among faculty, students, and nursing colleagues; to provide continuous access to information; and to encourage a forum for the exchange of ideas across sites. This expansion was designed within the context of the Colorado Nursing Task Force's recommendations for statewide nursing education and in cooperation with the Statewide Education Activities for Rural Colorado's Health's (SEARCH) mission.

Simply put, the electronic Community of Scholars created an extended nursing community, not bound by geographic regions, that couples computing power with telecommunication and networking capabilities. The electronic Community of Scholars will empower nurses with access and retrieval of an ever increasing commodity, nursing information and knowledge. For example, health care professionals are able to use NurseLink to access information about the School of Nursing (student and registration information, continuing education courses) and AHEC activities, communicate with faculty members about student rural health care placements (ask questions, initiate dialogues), communicate with members of the nursing community for exchange of ideas and discussions of health care issues, retrieve and send files (database information, newsletters, student papers), and have access to a myriad of information related to the University of Colorado community and the nursing profession. Thus, the electronic Community of Scholars will provide a supportive network for students, faculty, and nursing colleagues throughout Colorado.

Electronic communities in health care are just beginning to evolve. What impact will these electronic communities have on the delivery of health care and on the dissemination of information and knowledge? Will communication patterns be altered? Will there be a more

democratic relationship between clients and health care professionals as a result of the electronic communication paradigm? Kiesler and Sproull (1987) found that once an electronic community was forged, it affected the social and intellectual fabric of a university. Electronic communication is a vehicle for social interaction and is relevant to the goal of promoting community. The preliminary findings of the ComputerLink and NurseLink projects are indicative of a change within the community. "Clearly, the dynamic social and psychological components of computer-mediated communication can not be ignored" (Matheson & Zanna, 1990). Nursing research in this arena must continue.

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ORGANIZATIONAL CHANGES AS A RESULT OF COMPUTERIZATION -- THE PEIJAS-REKOLA CASE

Maisa Antti-Poika and Mikko Korpela

INTRODUCTION

Computer-supported communication takes place in the form of appointment scheduling, storing information in the patient's Medical Record and retrieving information from it, ordering laboratory tests and responding with test results. Peijas-Rekola hospital in the city of Vantaa, southern Finland, started to operate the Summer of 1990. As a new institution it had the opportunity to overcome old and rigid procedures and to develop innovative new ones. It was a major objective throughout the planning period to utilize computer technology to help cooperation and communication, both within the hospital and between different health care units in the region.

In Finland, municipalities are obliged by law to arrange for their entire populations' public services which promote health and prevent disease, as well as to take care of the health care and rehabilitation of the people. Primary care services incorporate general practitioner clinics, mother and child health centers, school health care, non-specialist hospitals, and other facilities. Together with the specialist hospitals (secondary care) and central hospitals (tertiary care) a comprehensive system is formed. In practice a problem has been insufficient information both on the primary level and in hospitals.

The main source of patient information is the Continuous Health Record, which is uniform throughout the country. Both in the primary level health centers and in the hospitals, all the information generated during consultation visits and hospitalization periods of a patient are stored in the Health Record, identified by the unique Social Security Code. The Health Record includes a cumulative medical, nursing, laboratory, operations, radiological, and other information. Contacts between the primary care units and hospital. The referral is stored in the patient's Health Record in the hospital. It is designed to contain the relevant information to the physician taking charge of the care. Usually it is the only information which is available when health care professionals start studying a new patient's case for the first time.

THE COMPUTERIZED INFORMATION SYSTEMS AT PEIJAS-REKOLA

The Peijas-Rekola complex incorporates a hospital and a health center in the same building. The specialist units serve the ten health centers of the municipalities of Vantaa and Kerava. There are 670 members of staff in the Peijas-Rekola hospitals and 140 terminals and 180 personal computer workstations connected to the network. On average there is one workstation per two members of staff (one workstation per one nurse in duty), which is the

highest figure in Finland. There is a high speed gateway connecting the Peijas-Rekola complex to the networks of the Vantaa health centers, which makes it possible to fast access to the health centers' data bases.

The Vantaa health centers have for five years already used a comprehensive ambulatory records program called FINSTAR (Jokinen & Hosia, 1987, Engeström et al., 1988). It is a heavily modified descendant of the U.S. COSTAR program. FINSTAR is aimed at paperless health records which means that all the medical and administrative information is accumulated in it. The program incorporates functions for planning of appointments,scheduling, laboratory tests, and so on.

Peijas-Rekola hospital makes use of a hospital information system called MUSTI, which is very widely used in Finland. It is an integrated system including subsystems for consultant outpatient clinics, wards, laboratory departments, radiology departments, operations units, and so forth. Compared to FINSTAR, it has more focus on supporting different operational work activities (Korpela, 1988). A patient's case history is also on computer. This programme is called KERTOMUS (widely presented at The Fourth International Conference on Nursing Use of Computers and Information Science, 1991) Peijas-Rekola hospital is the first hospital in Finland where a patient's case history is saved and used by computer. When a patient is being treated in the hospital, the staff in charge has the right of accessing the information stored about the patient in the health centers as well. The staff can inquire on the information and use it in planning for the care and defining the problem. Therefore the knowledge base is larger than what is contained in the referral only.

The computers of the health centers and the hospital are networked together, so the FINSTAR and MUSTI programs can directly interact with each other. Laboratory orders and results, radiology examinations orders and reports are communicated between the two institutions by program-to-program interaction. Taking into account also the fact that the primary care health records are now directly accessible from the hospital, it is evident that the patient information available to the hospital staff is greatly increased.

ELECTRONIC MAIL: THE INFLUENCE OF COMPUTERIZATION

Every employee of the complex can use the personal electronic mail. This has greatly reduced the problems of distributing information, by making use of several mail groups. Especially the ease, swiftness, and reliability of the computerized communication have been noted. For more demanding users, there is a standard Office Automation application with external X.400 links. The influences are to be seen in better transfer of communication in a working unit and also on the administrative level as a tool of decision.

INTERNAL REFERRAL

Internal referral is a semi-structured function based on the electronic mail. It can be used, when consultation about a patient is needed with a specialist physician, psychologist, nurse, physiotherapist, or other colleagues. Internal referral promotes consultation both within the medical and nursing staff and between different professions. Every unit has its own electronic

mail box, where the in coming referrals are stored. All the requests for consultation examinations for these specialist professions are made by the internal referral. It can be just a consultation "on paper" or a request for treatment. The staff of the recipient unit has access to the whole health record of the patient, even to the health record accumulated at the health centers, besides the information on the referral. During the consultation, thus, the staff being consulted has temporary access rights to information concerning a patient whom they are not permanently in charge of. The recipient unit must always enter a feedback which is stored in the patient's health record. During the first six months of use there were 960 internal referrals made using the internal referral method on the computer. During the last three months the amount of internal referrals has markedly increased to 876.

Different professionals in Peijas-Rekola complex consult each other. The activities were started from scratch, and many support activities take time to form out. Computerized information systems in special cannot be simply implemented. Both the software and the work practices need to be adjusted and developed with time and experience.

Internal referral have not yet been fully utilized. It has an important educational function which is also related to professional identity. Writing down a composed description of the problem and addressing it to another specialist increases cooperation between different professions. Flexible consultation opportunity raises the quality of patient care, and also increases the other professions' knowledge about the contents and methods of nursing.

ELECTRONIC REFERRAL BETWEEN THE HEALTH CENTERS AND THE HOSPITAL

In the hospital the incoming referrals are directed to the physicians in charge of each of the specialties. It is up to the physician to decide on what action is needed for the referral. Some of the referrals are only for consultation, and some of them need to be forwarded to another health care institution. For these reasons, the requirements for the electronic referral included that it can be returned to the referring physician if needed, more information can be requested, the referral can be replied to by consultation only, or it can lead to the hospital taking charge of the patient's care, in the form of an appointment at a consultant clinic or a hospitalization period.

When a referral is entered into the computer at a health center, it is stored in the patient's health record, copied to the referring physician's electronic mail archive, and sent to the in-coming mail box of the specialty in question at the hospital. The consultant in charge reads the referrals and decides on the action needed. He or she can also request electronically additional information from the referring physician, and postpone the referral until the reply is received. Then the consultant can decide that an appointment will be scheduled and an invitation letter sent to the patient, or that the patient will be admitted to the ward. The information needed for these actions is carried over from the referral.

The computer-mediated referrals are currently in use between the eight health centers in Vantaa and the Peijas-Rekola hospital. They speed up considerably the communication related to the patients' care and examinations. A referral of even the most urgent category takes several days to reach the hospital's consultants by ordinary mail, in contrast to some

seconds by electronic mail.

The electronic orders and referrals have dramatically speeded up patient-related communication between different health care units in Vantaa. Moreover, the electronic requests for additional information and the internal referrals have enabled totally new forms of interaction between hospitals and health centers, and also between and within different professions in the hospital. The rapid development of the electronic communication facilities, together with the high degree of computerization in hospitals and health centers, enables even more flexible and efficient transfer of information between different health care units in the future. Peijas-Rekola hospital and the health centers in Vantaa are pioneers in using electronic referrals in public health, in Finland as well as in the world in general.

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INFORMATION TECHNOLOGY AND THE MANAGEMENT OF PREVENTIVE SERVICES

Wendy King

INTRODUCTION

Medical care costs. It is labour intensive, uses increasingly sophisticated techniques and equipment and is subject to seemingly insatiable demand from raised expectations of consumers and from demographic changes. As medical science progresses new techniques and possibilities are developed which creates tension between what is technically possible and what resources can sustain. This tension is further exacerbated by moral change: for example, recognition of the need to improve care for those with a mental handicap.

PREVENTION IN HEALTH CARE

Prevention is widely acknowledged as a solution to the ever increasing cost of curing. It is considered to be better than cure and is regarded as the key to healthier living and a higher quality of life. Increasing attention is therefore being paid to prevention in all health care settings and the preventive approach now permeates and informs all aspects of the health services. But while prevention is considered eminently desirable, is it affordable? Pressures on resources of money and manpower in the health services limits opportunities for new developments making it all the more essential that available resources are used to best effect.

Not all preventive measures necessarily require additional or massive resources. Much can be done by more effective deployment of existing staff and facilities and much will depend on encouraging members of the public to make better use of the preventive services already available. However, the redeployment of existing health care resources and the allocation of new resources requires appropriate planning and management. This requires health service managers to display a ready assessment of the effectiveness with which the service is meeting the needs and expectations of the people it serves. Specifically, they must develop real output measurement, against clearly stated management objectives.

In the last decade, changes to the way in which health services are managed in the United Kingdom (U.K.) have provided an improved administrative framework. It is now possible to look at priorities more comprehensively and to plan the allocation of resources more effectively. The main task of those who guide and manage the provision of health care is to ensure quality, contain costs and secure access to those who need it. This entails the making of choices.

DECISION MAKING AND CHOICE

Standard theories of choice view decision making as intentional, consequential action based on four issues:

* a knowledge of alternatives for action defined by the situation
* a knowledge of consequences of alternative actions
* a consistent preference ordering
* a decision rule by which to select a single alternative of action on the basis of its consequences for the preferences.

The Steering Group on Health Services Information (DHSS, 1984) said that, "Such choices and the decisions flowing from them are likely to be more consistent and more rational if they are taken in the light of correct and relevant statistical information. They will also be more easily explicable to the public, to professionals and others affected by them and thus often easier to implement. The result should be the provision of a good service for as many people as need it at least cost."

INFORMATION SYSTEMS

Harnessing the benefits of information technology to support the delivery of health care services was an obvious and evolutionary process for service managers. Not only would the capture of data enable them to define precisely what preventive services were, it would also enable them to monitor service delivery. Resource use could be assessed both in terms of efficiency, how well resources have been utilised irrespective of the purpose for which they were deployed, and effectiveness, whether the resources have been deployed in the best possible way.

In the U.K., the nursing providers of preventive services collect basic data to meet minimum national requirements and in the majority of cases, data collection is computer based.

The core of these information systems is activity data. Staff record details of the tasks that they have carried out including face-to-face client activity such as health promotion and screening, and client-related activity such as preparation for health teaching. This is supplemented by staff details and basic client biographical data. The aim is to produce output reports which can be used to inform decision-making and improve the management of services. The reality is a paper mountain of unused reports which are out-of-date, over-long or irrelevant to day-to-day management.

In the words of March (1982), "Decision makers and organisations gather information and do not use it; make decisions first, and look for the relevant information afterwards. In fact, organisations seem to gather a great deal of information that has little or no relevance to decisions." Further, Coddington and Moore (1987) observe that, "In general, the data available to health care managers are far more detailed and plentiful than those available in

other industries. Nevertheless, there is a continuing obsession with getting still more data, and with deferring action until they are available."

Health providers have been seduced by the decreasing cost and increasing availability and flexibility of information technology, but are not necessarily reaping the rewards. As unsophisticated users of information systems, they have failed to avoid a major hazard in designing information systems described by Kast and Rosenzweig (1985), "...that of attempting to develop as much data as possible for use in the system. Voluminous data of many types might be collected and stored in case they are needed at some point in time. It is easy to see that massive amounts of useless data might result." They recommend that management information-decision systems should be evaluated on the basis of a cost-benefit analysis maintaining a balance between the cost of the system and the value of the information generated.

Tricker (1982) has noted that the demand for management information continues to grow as organisations become more complex, as the environment becomes more uncertain and as the rate of change of key business influences, including technology itself, accelerates. However, the value of an information source depends upon three factors: the decisions to be made, the precision and reliability of the information and the availability of alternative sources. The allocation of resources to information technology should therefore depend on a clear idea of how potential information might affect decisions. For example, if activity data predominates, pressure will inevitably be brought to bear upon staff to increase activity levels and thus efficiency. But if staff are delivering inefficient services, doing more of the same will conversely increase inefficiency.

INFORMATION STRATEGY

In their rush to implement information technology, health care providers have taken an ad-hoc and piecemeal approach to systems development and implementation. They have failed to appreciate the major impact that information technology will have on their organisation because they lack an information strategy, a long-term, directional plan which will determine what information is to be gathered and how it will flow within an organisation. It has two major aspects: the requirements of each function and the installation and use of Information Technology.

Developing an information strategy requires a change in thinking and needs to be undertaken within the context of the way in which the environment influences the basic functions of the organisation. For each major area of service provision and related support services, service objectives and information flows around the business priorities and organisation must be analyzed. Information requirements relating to service objectives can then be established including the identification of information flows which will relate care activity to targets, outcomes and resource utilisation.

The result will be useful output reports. Activity is still likely to feature as an information requirement for preventive services, but in a much more limited way. For example, activity data is useful for services such as immunisation programmes where numbers of completed

courses need to be counted for comparison against a target population, but this is less appropriate for a domiciliary visit.

Current information systems fail to recognise that each domiciliary visit has an overhead which is a cost to every visit regardless of the complexity of tasks carried out. Travelling to a home, gaining entry and conversing with the client and their family is a fixed cost. Individual activities are a variable cost which may accrue concurrently, or consecutively. For example, health education may occur during, or following a screening procedure. Separating those activities and managing them is impossible for both nurse and manager. Of much greater relevance is the reason for the visit or service target, and the outcome of that visit.

SERVICE OBJECTIVES

The answer to effective and efficient management of preventive services therefore lies in detailing what it is the organisation is trying to achieve. In other words, by setting objectives at every level of preventive services. "The introduction of information technology,...does not challenge the...fundamental professional practice of the individual. The setting of workload objectives, however, does." (King,1990).

For preventive services, objectives may be related to areas, target populations or programmes of care. The crucial factor is that each objective must be capable of monitoring and managing by staff and that information systems collect appropriate data to support this process. Thus appropriate systems will only be procured with an information strategy built upon measurable service objectives.

CONCLUSION

In summary, it can be seen that despite the proliferation of information technology within the health care services, the failure of organisations to develop appropriate information strategies has diminished the potential return in terms of better client care.

Computers are about forty years old, information technology is much younger and the notion that information technology is strategic is newer still. Preventive services, more than any other health care area have emphasised the requirement for a comprehensive information strategy.

Preventive services are not delivered between the clearly defined parameters of hospital walls where patients in beds can be counted and diagnostic related groups identified. Preventive services are often opportunistic, less structured and less easy to define, a fact which has been highlighted by attempts to harness the benefits of information technology.

It is inconceivable that a nurse would deliver care to a patient without an assessment of their needs, a set of care objectives and a plan of care. Yet despite the pressure on health care resources we fail to adopt this simple process approach to considerable financial investments in information technology. While the move to preventive services has highlighted this deficiency, the lessons are applicable to all health care organisations. Treat information like a patient and the whole service will be healthier.

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EXPERIENCES WITH SELECTION AND IMPLEMENTATION OF AN INTEGRATED HOSPITAL INFORMATION SYSTEM

Elly Pluyter-Wenting

INTRODUCTION

This paper describes experiences with Hospital Information System (HIS) selection and implementation processes, to be discussed during the working conference following the Fourth International Conference Nursing Informatics '91, Melbourne, Australia. The experiences were gained within the BAZIS cooperative, The Netherlands (Bakker, 1982).

Three different subjects are dealt with:

1. HIS-selection and its impact on implementation success;
2. The experience that implementation requires a new profession. For this 'implementor' the task and role are described briefly, educational requirements are listed;
3. The organisational structure required for the use of an integrated HIS on nursing wards, to keep management informed about the use of the system and to keep the nursing wards aware of new developments in the HIS. A linking pin construction is recommended.

HIS SELECTION

Selection of a hospital information system is a most important, very difficult and time (=money) consuming process (Ball, Hannah, Gerdin Jelger, & Peterson 1988). In most cases the idea and first incentives to look for a (another) HIS comes from the hospital board and the hospital management group. The first action is the installation of a HIS selection committee. This committee first of all will have to define the goals to be reached with the new HIS. Based on this list, selection criteria are defined. This process will be followed by an agreement about the selection process itself. This process and the participation of hospital employees is of most importance for the acceptance grade when in a later stage implementation of applications is brought into practice. To support this statement two examples are given, in the first the approach was top-down, in the second it was bottom-up.

In one hospital, the board decides that selection of a HIS is a most complicated task and for that reason a small taskforce of management representatives is installed, mostly assisted by a HIS consultant. This group gathers information about existing hospital information systems and, taking account of hospital goals and money available, finally decides about the new HIS without involvement of future users of the system. Some of the arguments for this are:

1. Selection of a HIS is a too complex subject to be discussed with a large number of staff.
2. Anxiety about disagreement between departments/divisions with regard to goals and costs of a HIS.
3. Lack of knowledge about computers and hospital information systems in general by hospital personnel.

On the first sight, these arguments look realistic and, in hospitals with strong leadership the decision of the board will be accepted by the hospital staff. In other cases implementation personnel have to deal later on with the results (negative attitude of future users) of such a selection process.

In another hospital, the board decides that the decision/choice of a HIS will effect all departments and divisions and a committee is installed in which all disciplines and departments are represented. All committee members are asked to study the use and impact of computer systems in hospitals and are asked to define goals. In the beginning of the lifecycle of the committee a lot of information about possibilities and consequences of EDP is given and a process to raise awareness concerning the impact of an integrated HIS is started. The representatives are asked to inform their colleagues frequently and in detail about the progress of the committee. In such a process we see requests for demonstrations, detailed discussions and evaluation. This process finally is followed by advice from the committee to the board about which HIS meets hospitals goals best.

This type of selection process needs:

1. Strong leadership of the chairman of the committee,
2. Intensive participation of vendors, and
3. Serious involvement of hospital personnel.

The type of selection process of a HIS influences the implementation process. In case of autocratic leadership which is accepted by the hospital staff the implementation team will work with end-users who have very limited knowledge or awareness of the system. The more democratic type of HIS choice in general paves the road for cooperative teamwork between the professional implementation team and future users. Both types of selection processes might lead to successful implementation although there is a preference for the democratic approach. We have seen successes and problems in both ways.

ANALYSING IMPLEMENTATION

Sequence Of Introduction Of HIS Functions

As soon as the selection of the HIS has taken place and the installation of hardware is realised, plans are made for implementation. The first question to be answered: In what order has the system implementation to take place (e.g. the BAZIS HIS exists of more than 70

subsystems). This question will have to be answered by the hospital management taking into account the vendor's advice. The sequence of system implementation in an integrated HIS is an important issue. It depends on the wish of the board on which department automation will have to start. It also depends on the interrelation between subsystems. In most hospitals the financial systems together with the patient registration system are so called "starters", followed by departmental systems such as outpatient clinics including an automated appointment system, a stock control system, a pharmacy system, a lab system, etc.

Components Of Implementation

Looking at the process of implementing a computer subsystem we can identify the following activities:

1. First of all the implementor will ask the hospital management to form an implementation team consisting of users and responsible employees of the department concerned. The committee often is chaired by the head of the department.
2. Definition of goals and analysis of the whole implementation process is done by this committee. In a step-by-step planning, the necessary activities are specified plus the responsible person, and a time schedule.
3. There follows intensive demonstration with use of documentation,
4. Construction of conversion timetable,
5. Specification of software adjustments needed (if any),
6. Agreement on testing period of the system, and
7. Choice of a production date.

Based on the documentation and demonstration the implementor makes the users acquainted with the broad functionality of the system. In case of the BAZIS HIS the subsystems are designed in a way that the system can be focussed in many ways to meet the special situation of the organisation.

TECHNICAL ASPECTS OF IMPLEMENTATION

The task of the professional implementation team is focussed on two classes of subjects related to the technical aspects and the organisational impact of the system

Technical Aspects

Installation of the central hardware, the display terminals and printers is done by technicians, the implementor has to install the software on the machine. In the BAZIS hardware situation a new program is implemented on the test machine and test disk. The professional systems implementor takes into account which thesauri, reference files and types

of database records are necessary and which connections will have to be made with other subsystems. In the BAZIS situation either load modules are installed, or sources can be compiled and linked by the implementor. In the latter situation it is not necessary in all situations that the implementor himself does this task, automation personnel of the computer department can do this as well. We prefer the situation where the implementor does it himself, since this puts him in a better position when he would have to deal with problems later on. Anyhow, a BAZIS implementor does never act as programmer, programming is considered to be a task of the development team.

Organisational Impact Of The System

Implementing a computer subsystem means in the first place the analysis of the running organisation of the department, e.g. what is done by whom, why, and when. Based on this orientation and based on the knowledge of the implementor of the functionality of the subsystem, he will define which impact the system has on the running organisation.

Together with the users and the head of the department decisions will have to be made about adjustment of the organisation. This stage of implementation is a time consuming one and critical with respect to implementation success. The reasons are:

1. Awareness of organisational consequences of the system needs cooperation of two professionals (implementor and hospital employee).
2. Adjustment of organisation mostly effects other departments. If these effects are not discussed in time, negative surprises will be generated by the time that the system is running.
3. In practice we often see that necessary decisions are not made in time or not made at all, forcing the implementor to take the decision. In general in such a situation the implementor feels most uncomfortable, unsure, and hoping for the best!

With regard to data protection, data integrity and privacy aspects it will be discussed which employee is authorised for which part of the program. The task of the implementor is to stimulate the discussion, to ask for decisions and in a technical way to authorize the employees for the different functions of the system. It is emphasized that authorisation is the responsibility of the head of the department and not the responsibility of the professional systems implementation team.

EDUCATIONAL REQUIREMENTS

Based on the content of the task of the implementor it will be clear that implementing computer systems is a specialised professional task needing training and education. As the BAZIS organisation is asked to implement a lot of (sub)systems in hospitals and institutions, a special taskforce of professional implementors was formed and special training has been developed.

This course is given once or twice a year for a group of about eight persons. Implementors enrolled for this course are supposed to have had already education concerning programming, system management and computer architecture in general. The course is strongly based on the organisational, technical and psycho-social tasks of the implementor. Theory takes eight full days, training on the job takes almost one year. A syllabus is made by the course leader, all contributions of the teachers are documented. Evaluations of the course have been very positive.

SUCCESS FACTORS AND PITFALLS

An implementation process is a very interesting and intensive process. A number of aspects to take into account during the process have been mentioned already. The following success factors or pitfalls can be mentioned in addition:

1. Trained and well educated implementor;
2. Well designed and up to date documentation;
3. Strong leadership of department;
4. Strong support of computer department;
5. Positive attitude of hospital employees;
6. Well defined planning and time schedule;
7. Knowledge of hospital organisation by implementor;
8. Educational/paedagogical skills of implementor;
9. Professional authority of implementor;
10. Enough time for users to get acquainted with the system;
11. Strong support of hospital board and management;
12. Decisions not only made and made in time but also documented and communicated to those involved; and
13. Knowledge of the implementor of functionality of other subsystems of the HIS.

By now, it will be clear that bringing computer systems into operation is a critical activity which needs strong support of a number of hospital employees at different levels in the hospital.

ORGANISATIONAL STRUCTURE RECOMMENDED

As soon as nurses on the different nursing wards get directly involved in the use of HIS-applications, nursing management feels the need to be kept informed about their use and results. On the other side nurses on the wards feel the need to be kept informed about new developments within the HIS and their implications for the nursing ward. There is also a need within the nursing service to discuss the results of the use of the HIS applications and to

inform each other on practical solutions/ideas. For that reason the Leiden University Hospital adopted a special structure based on the linking pin principle. This meant that from each nursing ward two nurses were asked to act as the 'ambassadors' of the nursing ward in a hospital group on one side, and to act as a HIS representative/liaison for the nursing ward on the other side.

Four times a year a meeting was arranged where new applications were presented and applications in use on the nursing wards were evaluated. The outcome of these meetings was reported to the central HIS steering committee of the hospital.

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MANAGING THE CHANGE PROCESS FOR A SMOOTH IMPLEMENTATION: THE CASE OF LEUVEN

Denis Vandewal

INTRODUCTION

Looking back upon the use of nursing informatics over the last three years, three aspects attract the attention:

1. Due to the specific organisation of the hospital it is impossible to find all-in software packages on the market. It has become necessary to develop a number of packages ourselves. A Strategic Information Systems Planning Study (SISP), which concentrated also on the dataflow concept of the primary process, was carried out in 1987, and has been shown to be very valuable and useful.
2. The registration of Nursing Minimal Data Set (NMDS) in Belgium has stimulated the demand for automation of the "primary process."
3. A pilot testing of "Data Entry Facilities" began in 1988. and uses barcodes and hand held terminals (HHT). These features seem to meet our expectations, particularly for the registration of parameters and other precise data.

ACTUAL SITUATION

The University Hospitals of the Catholic University of Leuven are a complex of four hospitals with a total capacity of 2055 beds. The nursing personnel staff amounts to about 2850 employees. Computer applications on nursing units, mainly for administrative usage, have existed since 1982. In 1987, a strategic plan that focused on the primary process was carried out (SISP study Figure 1). As a result of this study, a number of existing structures had to be reviewed. We had to realize the shift from "data processing" of the support services to the "point of care."

APPROACH

Successively, the following steps were taken :

1. Market research of the existing software;
2. Testing the utility of this software to be used at the "point of care;" and
3. Examining which software had to be bought and which we had to develop ourselves.

The market research clearly revealed that especially American-specific software could not be used in our context. Prokosch (1990) shares this experience. He says : "Our research

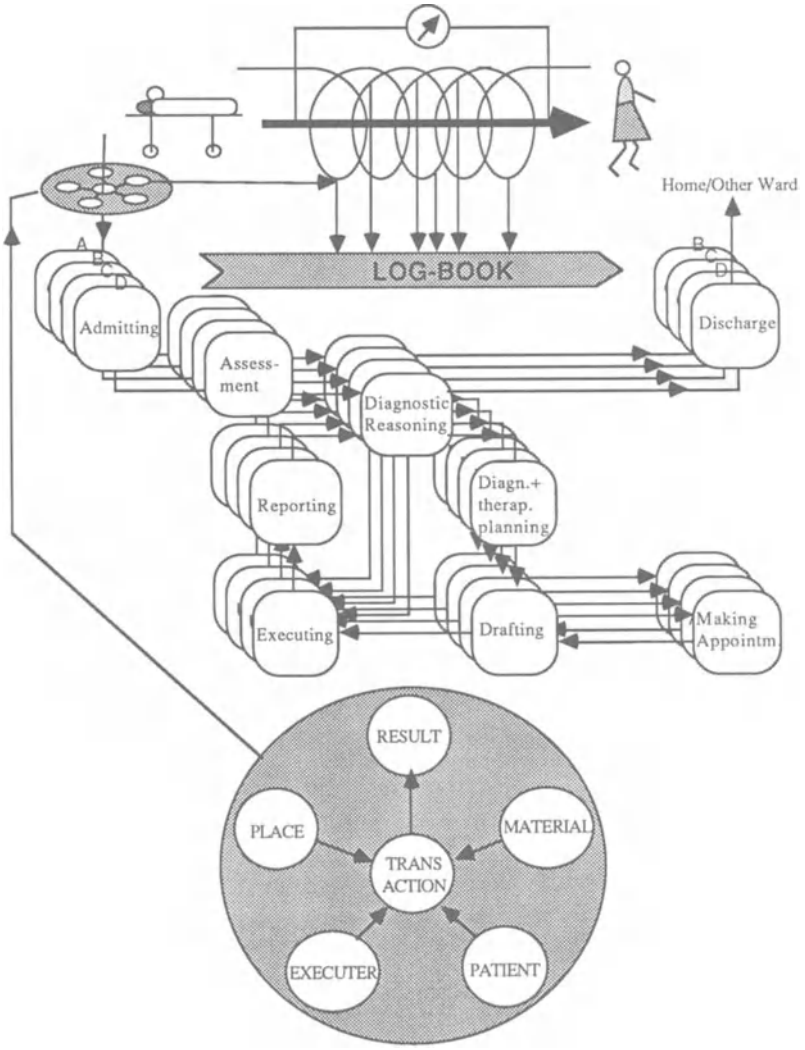

Figure 1
STRATEGIC INFORMATION SYSTEMS PLANNING
THE PRIMARY CARE PROCESS

showed that H.I.S. subsystems developed in the U.S. can not be directly transferred into a German hospital," e.g., the screen design did not satisfy their needs. He added, "We decided to apply the knowledge and experience we gained during our intense research with the system."

Steps were taken to introduce a relational database and software packages for patient oriented administrative applications (patient administration and billing) as these required most of the efforts of the Data Processing Department personnel. This liberated them in order to achieve a quicker realization of other applications.

During the preliminary phase, the use of some "dataflow diagrams" and a "data dictionary" concerning the primary process proved to be very useful (Figure 2). Standardization and the use of theoretical basic concepts constitute the basis of models which are of direct use to the functional analyst, the system analyst and others concerned. The need for an "international" data dictionary for nursing was clearly felt here. Meanwhile the first step was taken towards a nursing information system, integrated within a HIS. "Patient Tracking" and "Activity Management" got started.

NMD REGISTRATION REQUIRES AN AUTOMATED CARE PLANNING SYSTEM

The Nursing Minimal Dataset (NMD) has to be collected in every Belgian hospital four times a year during a fifteen day sampling period specified by the Minister of Public Health. These NMD items have to be collected daily for every patient hospitalized during this fifteen days period. Recently, in the Royal Decree of the 21st of June 1990, the Minister of Public Health ordered the hospitals to start collecting complementary Minimal Basic Data Set (MBDS) including medical diagnosis, therapy, patient characteristics and characteristics about their hospital stay. These two regulations make Belgium unique in the availability of health care information.

Collecting this information demands considerable effort. At this moment, each data element is registered after execution. The need and the call for these data have accelerated the demand for the automation of activity registration at the "point of care". Our hospital managers face these demands daily, especially because "nurses" are becoming scarce and the "administrative" tasks are amplifying.

An investigation carried out by our services revealed that more than 90% of the care and acts planned by physicians and nurses are executed. Automated care planning is still marginal. Yet it is a lot easier to confirm these 90% and to adapt the remaining 10% rather than transform this planning for a 100% into executed data and information. While we used to be "seen" only and "heard" sporadically, now we notice that a great deal of attention is paid to further planning of the automation process with "point of care" applications.

DATA ENTRY FACILITIES

Although the dream of bedside terminals is very actual, it is still unrealistic and unfeasible for us, especially from a financial point of view. The investigation into "data entry facilities", which took place in 1987, gave concrete form to a number of applications.

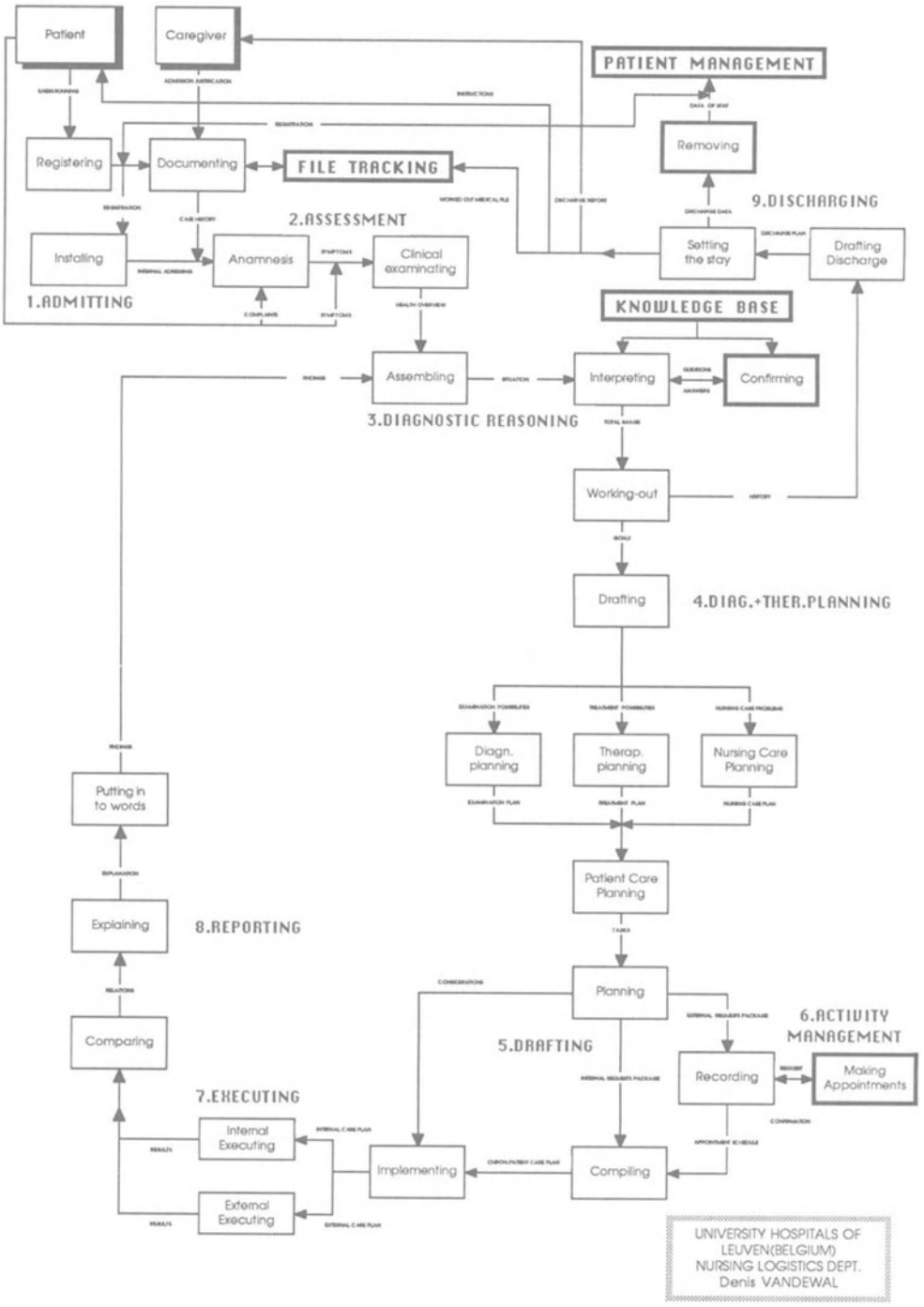

Figure 2

SECOND LEVEL DATA FLOW DIAGRAM OF THE PRIMARY CARE PROCESS

We introduced hand-held terminals and the use of barcodes for data registration close to the "point of care" and the "point of use. We experienced that the registration of parameters and of a number of other data goes on quickly, efficiently and faultlessly.

After six months, the barcode project for "material tracking" in the operating room yielded a one-off saving of US$150,000 in stock reduction, a weekly gain of time of 6 hours for the O.R. Nurse Material Manager and of 4 hours for the pharmacy department. These figures apply to a complex of 18 operating theatres and 15,000 surgeries a year. This success made further applications possible for the intensive care wards and other nursing units.

Three applications were tried as "point of care"-applications :

1. Registration of parameters with patients
2. Registration of NMD items on a nursing unit
3. Applications for request of laboratory tests by the physicians, so that they can to be directly integrated in the care planning.

These applications form the first phase of the elaboration of an automatic care planning system. Indeed, if the doctor can plan lab tests, if nurses can register parameters, nothing can obstruct the integration of an automatized "care planning system" by using this technology. The elaborated "data flow concepts" are always the guideline.

CONCLUSION

We notice that the interest for "point of care" applications has increased over the last years. The registration of certain data for the authorities accelerated this process. The general use of the same "data flow concept" as a basis for the elaboration of application is an advantage. Nurses and physicians are not only involved actively in the design of "point of care" applications but also in the related practical aspects.

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COMPUTER-BASED TRAINING FOR HIS: A USER-DRIVEN CONTEMPORARY CURRICULUM MODEL

Barbara E. Carter and Rita L. Axford

INTRODUCTION

Introducing Information Technology (IT) to clinical areas of hospitals requires appropriate educational preparation for nurse users. In the past two decades, many elements of the technology have changed dramatically, particularly the human- computer interface (Staggers, 1991). The development of computer training curricula for nurse end-users is thus difficult as the content to be taught is not static, but changing with the technology.

The major problem for Hospital Information System (HIS) trainers is how to shape computer curricula to be up to date so bedside practitioners (Registered Nurses) are able to use computers effectively and efficiently in their practice. Application of adult learning principles, in which learners are involved in the process of identifying their learning needs is a critical requirement for successful adult learning programs. Expertise in IT is also essential in developing appropriate computer content. This paper will describe a means by which all these sources of information are tapped in order to create a user-driven, contemporary curriculum.

THE NEED FOR USER-DRIVEN CURRICULUM

Curriculum needs for novice users have commonly been based upon the illusive concept of 'computer literacy.' Although computer literacy is considered by many to be a mandatory requirement for nursing practice (Andreoli & Musser, 1985; Heller, Romano, Damrosch & Parks, 1985; Arnold & Bauer, 1988; Palmer, 1990), there is no universally accepted definition for the term (Biscoe, 1985; Heller et Al., 1985; Tate, 1986). Because the concept is regarded as ambiguous (Roovers, 1984; Murphy, 1987; Hannah, 1988), and only vaguely defined (Mikan, 1984; Bradburn 1986; Thiele, 1988), sound curriculum decisions cannot be made upon such an abstraction.

According to Knowles (1986, p. 59), adults are orientated towards, and motivated by, learning which is relevant to their own purpose. From this view, when learners participate in identifying their learning needs, they reveal their existing knowledge gap. Curricula which focus upon the learner's perceived needs and provides content to meet those needs, will better motivate adult learners.

Currently there is a gap between the computer knowledge that practising nurses have and that which is required to take full advantage of computer technology (Happ, 1983; Heller et Al., 1985; Ball & Douglas, 1988). From this view if potential benefits of IT and HIS are to be

realised, bedside practitioners' perceptions of their computer learning needs must be thoroughly explored and addressed.

ROLE OF EXPERT OPINION

The computers in nursing literature reveals a predominance of studies exploring expert opinion on learner's attitudes to computers (Grobe, 1984; Krampf & Robinson, 1984; Thiele & Baldwin, 1985; Brodt & Strong, 1986; Lange, 1988; and Delaney, 1989). Curricula based on these findings can be used to reduce learner-apprehension but are limited in helping to determine cognitive and psychomotor content.

There is only limited expert consideration given to the computer content required by nurses currently practising in hospitals. The needs of educators and administrator/managers have been explored, either together (Arnold & Bauer, 1988; Delaney, 1989), or separately as administrators (Lange & Brownie, 1986), or educators (Ronald, 1983; O'Brien, 1985; Armstrong, 1986). Similarly nursing students' needs have been addressed in studies conducted by Armstrong (1983), Felton and Brown (1985), Soja and Letz (1987), Johnson-Hofer and Karasik (1988), and the content for post-graduate nursing students has been determined by Heller et Al., (1985) and Romano, Damrosch, Heller, & Parks (1989). These studies confirm that each facet of nursing practice requires its own specific program development and further supports the need for learner (user) inclusion in content selection.

JOINT INPUT IN CURRICULUM DEVELOPMENT

Ideally a user-driven contemporary curriculum would be based on user- identified needs as well as current expert advice. Carter and Axford (1991), examined computer content areas identified by experts and bedside practitioners (users) and found differences between the two groups for what was deemed necessary for an effective computer training curriculum. Whilst the actual findings of their study are setting and role specific, a model for determining computer curriculum content for other nursing groups applicable in other settings can be extracted from their methodology.

Carter et Al., (1991) used a two step process in their study. A Delphi technique was used to identify what content computer systems experts (nurse informaticians) believed necessary for bedside practitioners. These nurse informaticians were Registered Nurses currently involved with systems analysis, computer system development/management or computer programming. Second a sample survey of 150 bedside practitioners (computer novices) was conducted to identify the computer content they believed was necessary for themselves in order to effectively use computers in their practice.

Four groups of content could be derived from a matrix comparison of the experts' and the practitioners' (learners) opinions as described in Figure 1.

	Learner Essential	Learner Non-Essential
Expert Essential	**Group One** LEARNER and EXPERT **ESSENTIAL**	**Group Two** EXPERT **ESSENTIAL** LEARNER **NON-ESSENTIAL**
Expert Non-Essential	**Group Three** EXPERT **NON-ESSENTIAL** LEARNER **ESSENTIAL**	**Group Four** LEARNER and EXPERT **NON-ESSENTIAL**

Figure 1
CONTENT GROUPS IDENTIFIED BY EXPERTS AND LEARNERS

Group one content consisted of items that both experts and practitioners regarded as being essential to know. In their study, Carter and Axford (1991) found these items included topics dealing with practical knowledge needed for computer and printer operation, the ability to trouble-shoot, the understanding of security and confidentiality and the nurses' role in information management.

Examples of group one items:

Use a computer to enter and retrieve information

Use a printer to produce a hard copy report

Use a password

Assume responsibility for data security and confidentiality

Know procedure for destruction of paper reports

Know what error messages mean

Obtain help, on-line documentation, expert (MIS)

Complete a trouble-shooting check list

Ensure nursing membership on hospital computer committees.

Group two content were items considered essential by the experts and non- essential by the practitioners. In the study in question, these topics were drawn from industrial and

practice issues, computer applications in nursing and ergonomic considerations.
Examples of group two items:

Understand policies regarding computing, e.g. no need to be a programmer, use of keyboard the same as pen, etc.

No industrial implications ie. not a clerical function

Use computer applications to document the nursing process

Use a computer as a decision support tool

Identify computer programs currently used by nurses

Appreciate reasons for computer location

Use hardware in accordance with ergonomic recommendations.

In this study no items were found to be considered essential by the practitioners and non-essential by the experts. If this content group had been identified it would form **Group three.**

Group four content contained items considered non-essential by both practitioners and experts. The topics in the group four category were related to knowledge of computer technology, terminology and computer logic.
Examples of group four items:

Explain how data representation occurs in the computer

Explain how computers operate on input to produce output

Describe the characteristics of a computer

Define bit, byte, bus, RAM, ROM, MODEM etc.

Understand the concepts of field, record, file, database

Identify and describe the components of a computer and peripherals

Differentiate between types and sizes of hardware configurations

Know how a printer works.

Content identified according to the model can now be prioritised and ordered within the curriculum. According to adult learning principles, priorities for content inclusion needs to be consistent with the learner's request for knowledge. The following are basic assumptions regarding the adult learner (Knowles, 1986, pp. 55-61).

Adults must know why they need to learn something before learning it.

Adults have a resource of past experience which influences learning.

Adult's learning is focussed on the problems, concerns, tasks and needs, related to current life situations.

Adults want to learn useful things.

Adults are motivated to learn things that they perceive are relevant for their own

purpose.

Implications for content development arising from these principles are:

Content clarification is necessary if past experience cannot account for its relevance;

Content should be designed around the actual current needs of learners;

Content should be useful and applicable, for example, to work situations;

Content should focus on what the learner needs and wants to learn.

An integration of the expert opinion, the learner identified needs and the adult learning assumptions can now direct the curriculum content and sequence involved. The matrix of identified content groups indicates the origins of content identification and the order for content delivery (Figure 2).

	Learner Essential	Learner Non-Essential
Expert Essential	**Group One** TEACH FIRST	**Group Two** TEACH THE NEED TO KNOW THEN TEACH
Expert Non-Essential	**Group Three** TEACH WHY UNNECESSARY TO KNOW	**Group Four** DO NOT TEACH

Figure 2
USER-DRIVEN CONTEMPORARY CURRICULUM MODEL

Group one content should be taught first. This is practical computer knowledge which the learner recognises is needed in the work environment and the expert agrees is essential to "work" the computer. "Teach me this - I need to know it."

Group two content would require that the `need to know' be taught, then the content be presented. This is application knowledge which the expert has identified as essential, but the learner has not recognised as important because past experience has no to relevance it. "Teach me why I need to know this - then teach it."

Group three content, would require that the items be introduced and clarified so that it is understood why this content is unnecessary at this level. "Teach me why I do not need to know this yet."

Group four content should not be taught. Both expert and learner agree it is non-essential technological knowledge. "Do not teach me this - I do not need to know it."

FURTHER APPLICATIONS OF THE MODEL

This model can be used to develop a variety of curricula and applied to different settings by simple and cost effective means. The learner population is identified and asked what they believe they need to learn. The Delphi-generated expert opinion does not need to be as elaborate each time as trainers in the field have some level of expertise and can network and liaise informally with other experts. They need to identify independently what they perceive are the learning requirements of the target learner group. By collecting timely data from the specific setting and imposing the model onto it, a user-driven contemporary curriculum can be developed. In this way, learner and expert input directs content and the four elements of the matrix dictate sequence for delivery.

Curricula developed are assured of being contemporary despite rapid change, as the model provides a means of keeping pace with technological change through informatician expertise and learner-expressed needs.

TO THE FUTURE

The challenge of preparing bedside practitioners to use Information Technology to its full potential in their practice is a priority for the profession. Activities directed towards this challenge must include an awareness of the learners' needs, identification of expert knowledge in informatics, and a means of integrating both into computer training curricula. A user-driven curriculum model based on andragogical principles can assist in making curricula decisions that satisfactorily address this challenge.

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FROM IMPLEMENTATION TO MAINTENANCE: HOW TO KEEP STAFF MOTIVATED ?

Yolande Elsig

INTRODUCTION

This paper addresses the changing role of the nurse computer educator. Initially, the role was one of familiarizing nursing staff with the newly developed Hospital Information System (HIS) and training them to use it effectively. The task has changed over time to one in which effective liaison with the Informatics Centre Adviser regarding appropriate budgeting for new developments and vigilantly retains nurses policies which promote quality patient care through participation in multidisciplinary working groups are now the focus.

Thirteen years ago, when the Hospital Information System "DIOGENE" was introduced in the Geneva University Hospital, the staff in charge of installing informatics in the nursing units was confronted with problems which fortunately have practically disappeared these days. First of all, the nursing staff had to be convinced that a tool like informatics could be a real help in their daily tasks. At a time when nurses had only a vague idea of this technology, the first step was to familiarize them with the hardware by organizing demonstrations of the material and publishing information about the project long before the applications containing the HIS were installed. The next step was to attempt to "seduce" them. There was a psychological resistance to a change of such importance. However, most of the problems have been resolved, resulting in "well thought over" acceptation or "polite" acceptation. Over the years, especially due to the progressive introduction of different applications, the nursing staff has become more familiar with this kind of technology and has now acquired a certain "informatics culture."

HOW TO ENCOURAGE THE NURSING STAFF TO PARTICIPATE IN THE INFORMATION SYSTEM THEY ARE GOING TO USE

A nurse took part in the group that was responsible for the development phase of this HIS project. This was a very important factor in gaining acceptance of HIS by the nurses, because the system had the support of the Nursing Department Management and a guarantee that the care policy in force would be safe-guarded. Soon after, working groups composed of chief nursing officers participated in the study and the realization and testing of the applications to be used by nursing staff.

In 1978 when the HIS became operational, the first monitors were installed in the offices of the chief nursing officers. They were the first to use the "bed census" application and, very

soon they were training the nurses who were in charge of their units. This was the first step towards the transmittal of training and support for the users in their care services.

The intended objective was and still is to induce the nurses to fully adapt the informatic tool and not just to tolerate it. If you are dealing with personnel that have no experience in informatics, it is important to inform them of the objectives pursued by HIS and the means by which they may be attained.

Information meetings were organized in our hospital with the staff of our Informatics Centre, to ensure that all the nursing staff were informed of the project. These sessions were held at different times of the day, enabling the maximum number of persons to attend, i.e. day and night workers alike. This also provided an opportunity to answer questions the staff were asking themselves concerning this innovation. The main objective was to take the drama out of introducing an informatics tool into the care unit. Demonstrations were held for small groups in a specially equipped room enabling the participants to use test programmes of existing applications.

Later, a video tape was made available for the computer instructors. This video tape follows the case history of a patient in the hospital and demonstrates the various applications used. An important part of the training was to make the users aware of the importance of the security of their password. Strangely enough, although one reason for reticence towards the use of informatics by nursing staff was the fear of divulging confidential information, staff were actually permissive in the use and sharing of their password. We were therefore obliged to lay special emphasis on this important aspect during the training of staff.

The success of the application depends on the quality of the services rendered. The participation of the nurses in the project and the development and introduction of an information system is of no value, unless the service which is expected is not realised by the nurses themselves. If, as described in the objectives of our system, the applications do away with repeated administrative tasks as well as with the filling in of forms, the users will automatically notice the improvement during their daily work.

For applications concerning patient care such as requests for laboratory tests, it is necessary for the application to provide a range of supporting information related to the request, i.e. labels giving the name of the patient, the lab samples, etc. The nursing staff are thus able to appreciate the efficiency of the information given by the computer. Furthermore, rapid transmission of the results contributes to more efficient handling of patients' problems; the information obtained concerning the swabs will avoid errors and contribute to higher quality patient care. In brief, a good application is one that does not need to be enforced, but that is accepted enthusiastically because of its efficiency. Thus, it will be easy to motivate the personnel to use it.

ROLE OF THE STAFF CHARGED WITH SETTING UP THE SYSTEM AND MAINTAINING THE INTEREST OF THE USERS

It is important for the computer instructors to believe in the accomplishment of informatics when working with nurses for whom informatics is new. They should, however, keep a critical eye on the applications proposed and keep in mind the quality of HIS which, while facilitating the work of the different agents in the hospital, must assure high quality care for the patients to be treated.

WHAT IS THE SITUATION TODAY?

We are now confronted with problems of a totally different order. Informatics demands much more from the nursing staff than an Informatics Centre and the resources at its disposal is able to offer. Priorities must be established and future applications chosen so as not to demotivate the personnel if a particular request is not immediately satisfied.

The role of the instructors, who act as interfaces between the Informatics Centre and their respective services has also changed. They are expected to act as references not only concerning the HIS but also as regards all who use computers as an informatics tool. The explosion of the use of the personal computer in all the hospital services and the creation of high-performance information networks has enabled a greater number of people to access the information technology. We must now face the growing demand for training which can only partly be met by providing a continuous training programme.

As regards the nursing staff, a class was set up for the senior executives to allow them to become familiar with the use of the data banks installed in the various services, as well as working in "local mode" with text processing or spreadsheet software. To meet the specific needs of the nursing staff, the installation of a conference room equipped with terminals is a further means for training instructors for new applications that are introduced, the most recent being Integrated Personnel Management.

The increasing needs do not go hand in hand with the increase of budgets. It is imperative that users understand that informatics development does not only mean the initial use of the Informatics Centre, but also that they must account for the purchase of equipment and programmes in their budgets if they intend to develop applications for their own use.

Thus, the role of the instructor becomes a role of adviser. The persons designated to interface must be assisted efficiently by those who assure the conception, maintenance and support of the users for the applications developed within the context of HIS as well as for those developed more locally.

MEANS PROVIDED FOR THE NURSING STAFF

Special emphasis was given to the development of the following services:

- Conference rooms for organizing courses and workshops

- The creation of a support group to research projects for the Nursing Department providing technical and human resources through experts.
- The creation of a Nursing and Informatics Group consisting of nurses with special interests in the field.
- Distribution of information (newsletter).
- Calendar of informatic events in Switzerland and abroad.
- Publication of the realization of informatic projects in the nursing services.
- Encouragement of the publication of the results of work in the field and of their presentation in seminars or congresses.
- Providing the nurses with informatic resources in the hospital with the cooperation of instructors.
- Inciting creativity by encouraging projects which use informatic tools.

In our hospital the task is enormous and the Nursing Department is more and more required to work in multidisciplinary groups which are now preparing informatic applications in the care units and at the patient's bedside. It is our task through working in these groups, to retain the policy of the Nursing Department. The training of managers and nurses who are responsible for maintaining the use of high quality informatic resources in the care units helps guarantee the quality of care we wish to provide for our patients.

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THE COMPUTER AS A PARTNER IN NURSING PRACTICE: IMPLICATIONS FOR CURRICULUM CHANGE

Judith S. Ronald

INTRODUCTION

Nursing education literature is replete with suggestions for improving the curriculum. Changes in the curriculum development paradigm have been suggested (Bevis & Watson, 1989) as well as specific content changes in response to shifting demographics, changing health care systems and the evolving nursing role. In addition to curriculum issues related to content and process, using the computer for both teaching and testing has been described in the literature.

The most common use of the computer in the nursing curriculum has been as a teaching tool. Its primary purpose has been to modify patterns of access to knowledge by altering the place and time at which knowledge can be accessed. Computer assisted instruction and interactive video provide remediation, enrichment, practice in clinical decision-making using simulations, and can be used in place of, or in conjunction with selected classroom and clinical experiences. In addition, the computer is being used in some schools to provide students with experience in automated documentation of patient care using a simulated computerized hospital information system (Hodson, Hansen, & Brougham, 1988). These uses of the computer in education serve to enhance the curriculum as it currently exists as well as to provide students with hands-on experience in using the computer to support the current practice environment. However, such uses do not fully recognize the computer's ability to access, manage and process information in totally different ways not only in the educational environment, but more importantly in the practice environment (Ronald, 1985).

THE COMPUTER IN NURSING PRACTICE

Most nursing education curricula do not take into account the ubiquitous nature of the computer in the health care system and society. It is highly likely that by the year 2000, if not before, most practitioners and students will have their own computer or work station available to them. They will have point of care access to a multi-disciplinary electronic nursing knowledge base. Such a knowledge base has yet to be developed, but initial efforts have been described by Ozbolt and Swain (1990), Evans (1990) and Graves (1987). Students can access the same multi-disciplinary electronic knowledge base used by the practicing nurse, but in different ways and for different purposes. The availability and active use of such a database in the curriculum could dramatically change the current approach to nursing education.

Technology exists that allows nurses to organize, manage and retrieve information from the knowledge base in much the same way they do in their minds - by association. They can create individual pathways that are best suited to their own learning needs. Users can use intuitive approaches in the search for knowledge and choose from learning environments that include text, graphics, sound, video or animation (Skiba and Ronald, 1989).

In addition to using the computer to access a knowledge base, nurses will use it to retrieve patient information and record assessment, planning, implementation and evaluation activities. Decision support systems will assist in the analysis of patient data in relation to the knowledge base to help determine the most appropriate interventions. Nurses will select from a variety of possibilities or generate others not suggested. They will do this through their knowledge of the whole and their ability to integrate and synthesize information provided by the computer and their own knowledge of the patient and his family.

Not only will health care professionals have access to information, but patients too will be able to retrieve information about themselves and their condition using computers in health care facilities, individual homes, doctors offices, libraries, drug stores and other places. They will be informed, knowledgeable members of the health care system and will be full partners in decisions about their care.

CURRICULUM IMPLICATIONS

The changing practice of nursing in response to collaboration with the computer raises many questions for educators. What different skills will be required of the practicing nurse to function effectively in partnership with the computer? How will the computer influence the way in which people learn and think about it? How can the computer support the new educative-caring paradigm being set forth by Bevis and Watson (1989)? How can the goals of the new paradigm support the nurse's ability to work effectively with the computer?

Both Medicine and Dentistry have begun to examine some of these issues. Weed (1989) has explored changing medical practice in an information age and its related impact on medical education. It is his belief that the present premises and tools of medical education and medical care do not support or allow the evolution of health care. "Much of the frustration felt by so many hard-working people in the medical profession has its roots in flawed premises and inadequate tools" (p. 209). According to Weed, the primary flaws in the premises under which we now function are the current reliance on memory both in practice and education and the organization of knowledge into discrete academic packages or courses.

Eisner (1991) has also written of his concerns with the relevancy of the dental curriculum for current and future practice. He states "...in almost every North American dental school, today's professional degree curriculum reflects yesterdays realities...". He describes the curriculum as lecture-based using the traditional overhead and/or slide projector with evaluation of student knowledge being done primarily through multiple choice examinations. The curriculum, according to Eisner, can be characterized as fact-based and passive. In addition to methods used for teaching and testing, Eisner also comments on the students

perception of the lack of relevancy of prerequisite courses. He believes that learning should be problem-based using a multi-disciplinary dental database.

Both Weed's and Eisner's observations could equally well be made of most nursing curriculums. Nursing programs are, for the most part, teaching as they always have. They use the lecture method, rely heavily on memory and use multiple choice testing. The computer has been introduced primarily to provide computer literacy and as an alternative instructional method to support the traditional behaviorist model of education.

In an age of a rapidly expanding knowledge base, it is not possible for learners to remember the myriad of facts they are taught during their educational programs. In addition, knowledge is expanding so rapidly that whatever is learned is quickly outdated. With the advent of the computer and its almost universal availability, there is no reason to require students to memorize extensive amounts of information. The reality of nursing practice in the very near future is that there will be little need for students or practitioners to rely on their memories. It may actually be dangerous for them to do so.

Current and future nursing practice will use electronic extensions of both human memory and analytic ability of the mind. It is within this context that educators need to examine what it will mean to provide nursing care in partnership with the computer.

Nurses will have access to current knowledge and patient information wherever they are, at the bedside, in the home or at school. The skills needed will be to identify what information is needed and when and how to access that information. With the assistance of the computer, nurses will analyze the information and apply it to meet the unique needs of individual patients and their families.

Without the tyranny of teaching information to be recited back at a later time, the classroom can be as envisioned by Bevis and Watson (1991), an opportunity for interaction, with the teacher serving as the "metastrategist who establishes a climate of sorority and fraternity, of equality, of scholarly seeking; who raises questions and issues and dialogues with students so that they become partners in education, not objects of education" (p. 254)

The teacher and student will be partners in the learning process in the same way that the nurse and the patient are partners in health care. As patients become increasingly knowledgeable, nurses will no longer be information givers, but instead will have to assist patients in interpreting and applying their knowledge to their own lives. Such a role requires sophisticated educative and caring skills. Nurses are often uncomfortable caring for health care professionals. They are unsure what to teach, if anything, and exactly how to interact with them. In the information age, all patients will be closer to the professional in their knowledge level.

It is not the relatively few characteristics that patients with a given disease have in common that determine the best intervention for them, but rather the myriad of things they do not have in common (Weed, 1988). Human response to illness characterizes the practice of nursing. The individualization of care plans and interventions based on scores of patient and family factors is what requires professional knowledge and skill, not being able to write down the standard care plan for specific nursing diagnoses.

Computers provide information about care plans, drugs, treatments, selected patient data and so forth. Only the nurse looks at the whole and can provide an interpersonal caring relationship with the patient and family. Even in a setting in which computerized care plan are not available, students can be given standardized plans and focus on modification based on individual client needs. Testing techniques can be changed from multiple choice to open book. Most students do not like open book exams. Faculty don't give them very often. Why? Perhaps because an open book exam requires students to access information and apply it, rather than repeat what is already in the book. Perhaps because faculty are unsure how to devise tests within this context. Open book testing assesses very different skills from multiple choice examinations. It also gives a much different message to students, i.e memorizing information is not important; knowing what information to retrieve, how to retrieve it and using it to solve patient problems is important.

The challenges for nursing practice and nursing education are great. Computers provide us with the tools to develop a multi-disciplinary electronic knowledge base and to extend our memories and analytic skills. If we can use this tool appropriately, it will free us to focus on curriculum goals to help learners become critical thinkers, more responsive to societal needs, more caring and compassionate, and have increased insight into ethical and moral issues (Bevis & Watson, 1989, p. 348).

Nursing educators have to begin thinking about nursing education in totally different, if not revolutionary, ways. All of us need to consciously break habits of thinking about nursing practice and education as we know it. The field of nursing and the learning process in nursing need to be carefully examined and reconceptualized in light of the challenges and opportunities provided to us by the computer.

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COMPUTER-BASED TRAINING FOR H.I.S. ORIENTATION: EFFICIENT, EFFECTIVE AND FRIENDLY

Rita D. Zielstorff

ABSTRACT

Computer-based training developed with high-level software packages offers a cost-efficient means of orienting large numbers of personnel to a hospital information system. Equally important, a decentralized, self-administered, self-paced tutorial allows professional personnel to get training where and when they want it, with as little or as much reinforcement as they desire. This paper describes our experience with computer-based training to teach staff how to use the first clinical module of our system, laboratory results inquiry. An important note is that about 300 of our 2500 personnel elected to come to mentored group classes, where the same computer-based tutorial was used, but a trained "superuser" was available to answer questions and offer guidance.

INTRODUCTION

Training busy clinical personnel to use a hospital information system is always a challenging task. When the number of staff is 2500, when the time period for accomplishing the task is a few weeks, when staff's computer skills range from none to expert, and when system implementation occurs in the midst of a major move to a new building, the task is daunting.

We had experience with all the limitations of traditional training methods, including difficulties with scheduling busy clinicians, low staff motivation, and poor skill retention. One method that seemed to offer a solution was decentralized, self- administered computer-based training. We knew that this approach had been used successfully in industry for several years, and we were also encouraged by the fact that it was beginning to be used for H.I.S. orientation (Farrell, 1988; Perez & Willis, 1989). We visited one site where computer-based training was being used for ongoing H.I.S. orientation with very positive results.

Computer-based training has always been appealing, but until recently the cost of developing the tutorials, as well as the amount of lead time required, made the idea impractical. However, several high-level microcomputer-based packages are now available that permit rapid development of attractive and very easy-to-use tutorials. After comparing costs and benefits of centralized group training versus decentralized microcomputer-based training, we decided to use the latter approach.

The plan was to place a microcomputer on each care unit two weeks prior to implementation of the system, and leave it there for one to two weeks after implementation.

We also placed microcomputers in two physician lounges, a physician library, and the hospital's main library.

The intent was to place responsibility for training where it belonged: with the clinical professional. Each person would be responsible for getting training whenever and wherever it best suited him or her. No person would be given a password to use the live system unless he or she had completed training, and no one would be allowed to use the live system without a personal password.

DESIGN OF THE TUTORIAL

The tutorial consisted of an administrative segment and a training segment. The administrative segment captured registration data and tutorial usage information. For this segment, we used a high-level package, Fox Software's FoxPro, a DBase III Plus compiler.

For the training segment, we selected a program called Dan Bricklin's (tm) Demo II (tm). The training segment consisted of a total of nine modules. The first seven modules each taught a discrete task related to Results Inquiry, and were designed for the computer-naive user.

A Quick Review module covered all the material in the first seven modules. This enabled the computer-naive learner to reinforce and integrate material from the individual modules. However, for the computer-proficient user, the Quick Review was enough to learn the application.

The Proficiency Check was the final module. The Check provided a simulation of the real system, and asked the user to complete certain information retrieval tasks as they would in the real system. A minimum score (based on how many correct vs incorrect keystrokes were made to complete the tasks) was required in order to pass the Check. Passing the Check allowed users to get a password to use the live system.

GROUP CLASSES

Administrators anticipated that some personnel would not be comfortable with the self-administered tutorial. We equipped a nursing staff development classroom with ten microcomputers. The same computer-based tutorial was used, but trained mentors were available to answer questions and assist with problems in using the tutorial. Staff were informed of the availability of the classes, and were asked to call ahead to schedule themselves if they wanted to use this resource. About 300 of the 1900 nursing department personnel who were trained took advantage of this resource.

RESULTS

Between May 15 and August 22, 1990, approximately 2500 personnel completed the tutorial and passed the Proficiency Check. Among all those who registered, the average user spent 24 minutes total at the tutorial; the median was 17 minutes. Asked their opinion of whether they felt that computer-based training was a useful way to learn Results Inquiry, 68% of those

who completed the tutorial gave a positive response, and about 7% responded negatively (25% stated "no opinion", or did not respond). To the statement "Computer-Based Training should be used for future PCIS (Patient Care Information System) applications," 70% agreed, 5% disagreed, and 25% stated "no opinion", or gave no response.

The computer-based tutorial continues to be used for training incoming staff, and for orienting personnel as additional hospital departments receive access to Laboratory Results Inquiry. Twelve microcomputers are installed in various locations around the hospital. When a new ancillary department is brought on line to Results Inquiry, a training microcomputer is placed temporarily in an accessible area in that department, and staff are given the responsibility to take the tutorial. Since the initial orientation period, over 200 additional staff have been trained via the tutorial, with minimal expenditure of human resources.

EFFECTIVENESS OF THE TUTORIAL

Passing the Proficiency Check may be taken as one measure of the effectiveness of the tutorial (99.5% of those who took the check eventually passed it, with only 7% repeating the Check more than once). But a more objective measure is whether staff were able to use the live system without difficulty. The Information Systems Department maintains a 24-hour Help Desk where users can call for help in using the PCIS. The Help Desk reported that in the weeks following implementation of Results Inquiry, the number of calls increased by about 700 per week. Most of the calls had to do with keyboard problems (such as the Caps Lock key being on when it should be off), and with confusion that arose when the monitor's screen saver feature regularly caused the screen to go blank. The tutorial did not cover either of these types of issues.

CONCLUSIONS

We will be introducing many new clinical applications of the PCIS throughout the hospital over the coming three years. This experience has convinced us that for applications where several hundred users need to be trained, computer-based training is the method of choice. We would not, however, repeat the experience of using stand-alone microcomputers. Computer-based training via microcomputers networked to a central server, or even better, directly from the PCIS mainframe, would eliminate many of the problems associated with the decentralized microcomputers. We are currently in the process of evaluating mainframe-based tutorial development programs.

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DATA PROTECTION AND A SECURE ENVIRONMENT FOR NURSING: INFORMATION TECHNOLOGY SECURITY

Barry Barber

A SECURE ENVIRONMENT

Security is an issue that we have been familiar with for years but there are new issues to be dealt with as a result of developments in technology and developments in the practice of health care. Things have come a long way from the time when health care was a totally confidential matter between a patient and his or her Health Professional . Health care is a team effort with a multi-disciplinary group of specialists responsible for the differing aspects of care. Furthermore, as the possible range of health care has become more complex, and therefore more expensive, the methods of financing care has become more complex thus involving more people and organisations including governments which have additional "public health and public interest" responsibilities. These circumstances would produce problems of confidentiality in any case but the opportunities offered by computer processing and the widespread availability of micro-computers, computer networks and powerful multi-access centralised systems escalate both the risks to confidentiality and the opportunities for securing effective security at the same time. It is worth noting that the recent draft European Commission (EC) directive regarding data protection and information technology (IT) security [1990] will set much higher standards of data protection within the EC countries than is required by the current application of the Council of Europe Convention 108.

The crucial difference between secure systems and insecure systems lies in the people rather than the computers. Security requires a balanced combination of physical security, procedures based on sound policies, people who are properly motivated and technical security appropriate to the organisation and its policy requirements.

Security cannot be achieved by technology without people but the people may exploit the opportunities offered by any loopholes in the technical defences. The health services have not traditionally been heavily security-conscious in respect of its computing systems but the technical and organisational changes outlined above are forcing health professionals and health care organisations to look afresh at the issues of security in the current context and to implement measures which previously only the military services had found necessary. The issues of IT Security require the following steps to be taken.

DEVELOP AN IT SECURITY POLICY

The first step involves the development of a suitable IT security policy which sets out in simple terms what is desired regarding confidentiality of information; integrity; and availability of the

information systems.

The next step involves carrying out a risk analysis to examine threats to these systems and their vulnerability to these threats. In addition, one must examine the "likely worst case scenario" in respect to unauthorised disclosure of information to staff and to others, destruction or loss of these systems or data, denial of system access for shorter or longer periods, and finally, modification of systems or data either accidentally or maliciously. The totality of risk is revealed as the combination of the threats and the vulnerabilities of the systems under consideration. The purpose of this process is to locate the greatest risks and to ensure that the countermeasures are designed to provide cost-effective security.

VALUATION OF ASSETS

The first aspect of security is a thorough understanding of assets that must be protected. In the area of IT Security, it is important to assess all the assets including the physical equipment, the software required to enable it to function and, most importantly, the data assets residing in the system. This assessment involves estimating the replacement costs of the facilities as well as examining what would actually need to be done if any of the threats materialised. This involves examining with the users what problems would be encountered as a result of disclosure, denial of access, destruction or modification of the data or systems. Most people are clear about the "minor consequences" involved in the clerical costs of re-creating the database but they may well not have thought of the costs of any civil or criminal legal proceedings arising from gross negligence, a failure in the "duty of care" or any other suit that may arise partly or wholly as a result of the security failure. There are regular claims for damages in the health care area and these claims will begin to have computer components even when a computer failure may not be the sole or main factor. In addition to the legal dimension, there is a safety dimension that may acquire legal consequences. This dimension starts with minor damage to patients but goes on to serious harm to an individual, death and then to multiple deaths. Such safety issues are addressed by the current draft International Electo Technical Commission (IEC) standard (IEC, 1989).

The combination of the value of the assets and the totality of risk, comprising both the threats and the vulnerabilities, indicates the level of the counter-measures required to achieve the desired and necessary levels of security in the systems. The United Kingdom Central Computer and Telecommunications Agency (CCTA) Risk Analysis and Management Methodology [CRAMM] provides an approach to this difficult problem that is beginning to be applied within the United Kingdom. In addition, the EC is addressing the general issue of IT Security with a number of initiatives such as the Information Technology Security Evaluation Criteria (ITSEC, 1990) document which seeks to develop a set of criteria for assessing IT Security aspects of systems. This work takes up from the point at which the US Department of Defense (DOD) took the evaluation of systems in the so-called "Orange Book" [DOD, 1985]. The civil computing sector has a great deal to learn from the military sector as we seriously go into the use of open systems and networking of health records. The current issues relate to the determination of the profile of need for various aspects of IT Security so that appropriate

security can be incorporated within the health systems while rejecting unnecessary features as being either an unnecessary expense or an unnecessary overhead on systems activity.

CONCLUSION

Security cannot be brushed aside as irrelevant to the processes of health care. We all require security as health professionals, as patients and as members of the public. The new configuration of ways in which health care is delivered requires that we must take these issues seriously and incorporate them in our routine practice.

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CAN PATIENT CARE DOCUMENTATION BE STANDARDIZED FOR TODAY'S COMPUTER?

Susan J. Grobe

INTRODUCTION

The concept of standardization is pervasive in discussions about computer data and its exchange across networks for the purposes of abstraction, aggregation and summarization. Within the context of standardization, the most commonly discussed issues include standard formats for the electronic transfer of clinical data (McDonald & Hammond, 1989); standardized, uniformly coded minimum data sets (Gabrieli, 1985), including the nursing minimum data set (Werley & Lang, 1988); and uniform coding systems such as ICD-9, CPT-4, DRGs and SNOMED, that are currently in use. Respectively, these latter standardizing systems are used for the purposes of classifying causes of mortality, providing reimbursement, and summarizing pathology reports. Others have described standardizing data sets, that is, the information content and procedures for establishing a research oriented database (Thompson, Piland, Hoy, Watkins & Montgomery, 1990).

Together these examples provide the theme for this paper. First, that data are standardized for very particular purposes, and second, that databases should be research-oriented to serve empirically in helping to define nursing's data, and validate its usefulness for particular purposes.

Important aspects of standardization must be attended to in designing and implementing health care information systems. Data transfer and exchange, data abstraction, summarization, and aggregation must be accommodated. Likewise, standardization required by purposes external to care provision and its monitoring (such as reimbursement or policy determination) must also receive attention. Importantly, automated systems designs must facilitate appropriate data collection, data structuring and processing, and application of the best techniques for maintaining the standardized database over time.

STANDARDIZATION ISSUES

Generally, standardization issues exist at the database level of automated systems, an important distinction given current pressures to "standardize nursing's language." Notice that none of the previous examples implies standardization at the user's input level. Characteristically, narrow sublanguage domains are reflected in the existing uniform coding and minimum data set examples. However, none of the cited examples implies standardized or restricted language use on the part of health care providers. Several of the examples, however, do imply that coding procedures are used for record abstraction and summarization

subsequent to the health care provider's data entry.

Consideration of an automated system's data collection procedures is necessary, however, since the entered data form the basis for the later coding or abstraction. In cases where quantitative values are the data of interest, procedures for data capture and coding are relatively easy to define, and can be accomplished using automated system procedures. However, in cases where diagnostic terms are known and used by health care professionals, for example, ICD-9, some coding review by well trained individuals is often necessary using the relevant coding criteria and standards. In those cases where the sublanguage of a care domain has not been as clearly codified as ICD-9, such as occurs with generalized symptomatic complaints, then coding, abstraction and summarization becomes increasingly complex, difficult and unreliable (Grobe, 1990).

Does this difficulty with coding data from a broader and more general range of language imply that we should be restrictive with the terms that we allow health care professionals to use with automated systems? Does it imply that there be a set of " recognized and approved terms?" Should system interfaces be built around these agreed upon terms? Is this the answer to getting standardized data into systems so that it can be used for abstraction, aggregation and summarization?

The clear and simple response to these questions is no, definitely not. Linguists, philosophers and the dictionary developers have known for a long time that you can not and should not standardize the language used by individuals. Rather, it is more proficient to examine what terms they use and, then find ways to define the terms from the ways they are used. In this process very clear criteria and standards are applied for deriving the meaning of the term from the purposes it serves. Thus words and their definitions are derived from purpose driven standard setting. Each different purpose may imply a different innuendo.

The situation is not very different for defining and standardizing nursing's data. Data definitions may vary for different purposes. Data may be needed in different forms.for different transformations for varied purposes or for creation of new categorizations. However, the data should be such that it is amenable for examination using industry standard query and statistical analysis tools. For example, some purposes may use data from patient problem lists; some purposes may use indicators of progress or improved functional status from nurses notes, care plans, or discharge plans. Other purposes may need all the assessment data on selected parameters over time.

Therefore, instead of proposing standardization at the user level of input, it is more reasonable to approach it at the database level, and by specific purpose; that is, standardize database contents, structures, retrieval and characterizations of selected phenome na according to specified purpose. In this way, a specific purpose is defined, and the particular data for use are clearly delineat ed. The operations to be performed on the data can then be anticipated, or at least broadly defined, and the resulting analyses can provide the information needed. In this way, very pragmatic and empirical methods for nursing's data standardization can be accomplished, building on purpose after purpose.

Simultaneously, the purposes of specific nursing data will be refined. Some examples of

the purposes might include: quality assurance, functional status improvement, determination of level of care needed, general status monitoring, and evaluation of a patient and family's consultative needs. Although at first, we might have disparate data for a wide variety of purposes, an important step will have been made. A new vision of nursing's data will result.

This process of standardizing nursing's data, based on how it can be used for particular purposes will begin to develop gradually. Such an empirical approach to standardizing nursing's data now becomes one of defining and standardizing data according to how well they serve for specific purposes. Hopefully, this empirical approach will soon replace misguided attempts to standardize nursing's data based on what currently exists in nursing documentation. It also helps in that data serving no identifiable purpose might be culled from nursing record systems and thus disappear from automated systems.

In conclusion, the ideas posed here force a reconsideration of the topic provided for consideration. The question "Can patient care documentation be standardized for today's computer?" is incorrect in its basic assumption and direction. A better question is: How can nursing's data be standardized for very specific purposes for future computer systems?

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PREPARING FOR A CAREER IN NURSING INFORMATICS

Carole A. Gassert

INTRODUCTION

The use of computers in healthcare agencies has proliferated during recent years. Initially seen as a means to manage financial information within healthcare, information systems have expanded to include patient care systems that support nursing practice. As the focus shifted from cost recovery concerns to documentation and management of patient care, the need for including nurses on committees to design, develop and select systems was recognized. Including nurses in these processes have enhanced nurses' interest in pursuing careers that focus on computers and their use in health care. The result is the emergence of a new field, nursing informatics.

The definition of nursing informatics is currently evolving. It was first viewed as the use of computers in nursing practice, administration, education and research. In 1984 Ball and Hannah defined nursing informatics as the "discipline of applying computer science to nursing processes" (p 293). Later Graves and Corcoran (1989) defined nursing informatics as the combination of nursing science, computer science and information science in such a way as to enable us to study the management (organization) and processing (transformation) of nursing data, information and knowledge. Shifts in defining nursing informatics from computer applications to managing and transforming nursing data into meaningful information and knowledge mirror an expanding array of career opportunities nurses now have within the field.

CAREER OPPORTUNITIES

Nurses with informatics preparation are being sought to fill jobs in four different areas: healthcare agencies, vendor corporations, consulting businesses, and academia. In health care agencies nurses fill roles as middle and upper level managers of information systems. Middle management positions include coordinators of nursing information systems, liaisons between nursing departments and information system departments, and systems analysts. As upper level managers nurses fill positions as directors of nursing information systems or directors of hospital information systems departments. Job responsibilities may include analysis of information flow within the organization; selection, implementation, evaluation and maintenance of information systems; design and development of systems; and fiscal and personnel management.

Increasingly nurses will be employed in these positions. A 1990 survey of 25 nursing directors of hospitals accredited by the Joint Commission on Accreditation of Healthcare Organizations, in 19 states within the United States indicated that three-fourths of the

hospitals already allocate one or more budgeted positions for nurse managers of information systems. An additional 50% of survey respondents recognize a need to add such positions within the next 1-2 years (Gassert, Mills, & Heller, 1991). This is one example of the interest nursing directors have in hiring nurses for informatics positions.

A second area of employment for nurses prepared in informatics is vendor corporations. Vendors hire nurses to serve on installation teams and to demonstration systems. Management positions as product managers, project managers, and account managers are available. Product managers are specialists with a particular system and may be involved in designing and developing that system. Project managers are responsible for project planning, system testing, client training, configuration of customized systems, and activation of implementation projects. Account managers follow up with clients after systems have been installed to supply additional modules or upgrades.

Consulting businesses provide a third area of employment for nurses in informatics. Depending on the amount of informatics education and experience, firms hire nurses in either staff or manager positions. Levels or grades exist within each of the positions. Nurses also have the potential of becoming partners in the firm. Job responsibilities include analysis of organizational structure and information flow, identification of information needs and system requirements, and system selection, implementation and evaluation.

The final area of employment is nursing education. Schools of nursing have recruited informatics prepared nurses to direct student technology learning centers and to teach computer skills classes or courses. Other schools are interested in hiring faculty to teach in nursing informatics programs and to do research in the field.

CAREER PREPARATION

Many nurses who currently fill informatics positions have prepared for their careers through workshops, conferences, on-the-job training, and self-study. A majority of nurses currently practicing completed their diploma or baccalaureate education without acquiring computer skills. More students are acquiring computer skills in schools of nursing but the number remains inadequate. In 1988, Heller, Romano, Damrosch and McCarthy found that 84% of 128 hospitals with 200 or more beds were using computers in clinical or administrative nursing practice. The remaining 16% of hospitals in the survey had plans to adopt computer technology. That same year the National League for Nursing (NLN) reported that less than half of all nursing programs in the United States had computer technology courses available for students. Even though hospitals are installing information systems in increasing numbers and requiring nurses to use computers, nursing students may not be adequately prepared to perform these tasks.

A survey of entry level computer skills of 39 students entering the Nursing Informatics Track at the University of Maryland supports these findings. At least half of the students had no experience with mainframe computers, Lotus or dBase, leading healthcare industry computing tools. If nurses are to keep their practice current, they need to access research findings. It is interesting that only half (56%) of students knew how to retrieve references from

electronic databases. In addition electronic communication could reduce time spent on communication within agencies. However, less than one-third (30%) of the students entering the program had ever used electronic-mail communication. If one speculates that students entering a graduate nursing informatics program are more likely than other nurses to possess computer skills, there is a definite need for more nurses to be prepared to use computers.

In 1987, the NLN first passed a resolution requesting the Committee on Accreditation to examine the issue of computer education and make recommendations about including it in accreditation criteria. In 1990 the NLN Board of Governors passed a motion encouraging educational councils to include a criterion insuring computer literacy. In June 1991, the Council on Nursing Informatics in NLN will introduce a resolution requesting that ways to meet informatics learning needs be identified and that Councils establish goals for using nursing informatics. Further action is needed to assure that all nurses are prepared to use information technology upon exiting their schools of nursing.

The International Medical Informatics Association Working Group Eight, Nursing Informatics, has identified three levels of competencies in nursing informatics (Peterson & Gerdin Jelger, 1988). At level one, nurses are users of information systems and have an awareness of, understand, use, and interact with systems in their practice. It is this level of preparation that should be reached by all graduates of schools of nursing.

At level two, nurses are information system modifiers who analyze, manage, critique, modify and evaluate information systems. The University of Maryland Masters Track in Nursing Informatics prepares nurses to be Nursing Information System (NIS) specialists and fulfill the role of system modifiers (Heller, Romano, Moray & Gassert, 1989). The program combines courses in nursing, administration, and information science to prepare graduates to analyze system requirements, design system alternatives, manage information technology, identify and implement user training strategies and evaluate the effectiveness of systems. The curriculum consists of 42 credit hours and is divided as follows: core courses in theory, research and health policy--12 hours; major courses in administration and nursing informatics--15 hours; support courses in information science--9 hours; and either 6 hours of electives or thesis work. It is at this level of preparation that most career opportunities in nursing informatics are currently available.

At level three, nurses are system innovators and are responsible for designing and developing unprecedented but appropriate systems for nursing. Included in the development cycle of these systems is extensive research on design considerations and implications for nurses. To become nurse innovators, additional study in nursing science, nursing research methodologies, computer science and information science is necessary. The University of Maryland plans to establish an emphasis area in nursing informatics at the doctoral level to adequately prepare nurses for designing and developing innovative nursing systems. Preparation at this level will allow nurses to pursue careers as researchers and educators in nursing informatics.

SUMMARY

With increased use of information technology in healthcare, career opportunities for nurses in informatics will be enhanced. Schools of Nursing must be responsive in preparing nurses to pursue careers within the field. Initially, schools must prepare nurses to be users of information systems. If nurses choose to enter nursing informatics as a career, opportunities to specialize at the graduate level should be provided through programs such as those available at the University of Maryland and the University of Utah.

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CAREER OPPORTUNITIES IN NURSING INFORMATICS

William L. Holzemer

The opportunity to contribute to the enhancement of nursing care through preparing for a career in nursing informatics is a wonderful challenge. A professional nurse, who has earned a minimum of a baccalaureate degree or its equivalent, and who wishes to prepare for a career in nursing informatics usually asks the question, "How do I prepare beyond my nursing background for the informatics aspects of nursing informatics." Because organized nursing in each country has different goals for advanced preparation, it is difficult to make generalized statements. In the United States and Canada, for example, advanced preparation in nursing informatics would mean enrolling in a master's or doctoral academic degree program. In other countries the mechanism for advanced preparation is through certification procedures. However, regardless of one's respective country model, the demands placed upon an expert in nursing informatics suggest that the preparation required for nursing informatics goes significantly beyond the basic professional nursing degree.

Three types of patterns are common in preparing for a career in nursing informatics and the needs of the health care industry require that there be nurses prepared for all three roles. These roles are: systems development or sales in industry, often as a vendor representative; service position such as a director of nursing information systems or hospital information systems; and an academic role with responsibilities for teaching, service, and research. Each role suggests a different career goal and aspiration with respective levels of preparation, yet there is also overlap among the three roles.

Basic nursing preparation, clinical nursing experience, and an enjoyment of working in the computer industry may be adequate preparation for participating in nursing informatics as a vendor representative. Vendors will provide specific product knowledge required to complement the nursing background. However, nurses considering a career goal in nursing informatics in development, information systems, or academia should plan to earn at least the equivalent of a master's degree in the USA educational model. Of course, there are leaders currently working in these areas who do not have advanced preparation; however, this fact does not justify a boot-strapping strategy as particularly effective.

Depending upon personal interest, there may be a struggle between seeking advanced preparation in nursing or an interest to pursue business related knowledge. For some, the Master's of Business Administration (MBA) may be an appropriate career route while others may pursue academic preparation in computer science. However, the challenges faced by the nursing aspect of nursing informatics will not be served by the MBAs or computer scientists alone. Those seeking to contribute to nursing informatics must develop an expert knowledge of advanced clinical practice as well as of the management issues of health care, combined with technological expertise. Consequently, career goals of working in systems

development, clinical settings as a information system specialist, or an academic environment warrant advanced preparation in nursing. An academic career goal demands doctoral preparation in order to have an adequate knowledge base for the research and evaluation of information technology that is required.

The major challenges that must be addressed by health care services and nursing practice -- access, quality, and cost -- can be met more effectively and efficiently with individuals who have advanced training in nursing informatics. In addition, research on clinical nursing practice and the development of valid and reliable patient outcome indicators are dependent upon the contribution of nursing informatics to the science and discipline of nursing. The challenge to nursing informatics is great. In order to understand the complexity of this challenge, some of the current issues faced by practitioners that are related to informatics are discussed in this paper. These include: Quality Improvement/Outcomes of Care, Electronic Care Planning, Fiscal Modeling, Real Time Monitoring, Evaluation, Computer Programming, Human Resources Development, Management, Decision Support Systems, and Ethics. Implicit in this presentation is that all of these topical areas are important for the expert in nursing informatics; however, as with every sub-field, specialization is often demanded. If you are planning a career in nursing informatics for the 1990s and beyond, you may wish to examine each of these areas for their importance to your career goals and select several for in-depth expertise development.

a) **Quality Improvement / Outcomes of care**: The role of developing, maintaining, and utilizing data bases to provide accurate and timely outcome data is pressing. The application and manipulation of information in data bases is relatively easy. What is challenging is how to define outcomes and how to measure them in a valid and reliable manner. Thus, information required for quality improvement in nursing informatics includes a focus on understanding data bases, but more importantly upon understanding clinical nursing practice and how to conceptualize and measure outcomes of care.

b) **Electronic Care Planning**: Many vendors are struggling with the challenge of developing easy-to-use, efficient, and accurate patient record systems that can in some cases be maintained and updated at the bedside. There are many technological challenges involved in developing these systems which include programming for relational data bases, large storage requirements, systems integration, etc. However, the challenge for experts in nursing informatics is the lack of a common conceptualization of what and how to chart. The work on the nursing minimum data set is a beginning; however, it only states that nursing diagnoses should be recorded. The nursing minimum data set does not provide a model for how to conceptualize nursing diagnoses. Also, the work of the North American Nursing Diagnosis Association has begun to develop a common set of nursing diagnoses, yet there is marginal consensus in clinical settings about their utility. Again, there is a technical challenge in informatics to develop the hardware and software to support an electronic charting system. Nursing has the more complex problem of a lack of professional consensus about what data to chart. In addition, the relationship between care documentation and quality patient outcomes is unclear.

c) **Fiscal Modeling**: Excellent computer support systems exist for tracking financial data. However, nursing has not yet achieved consensus on how to conceptualize costing of nursing care across different types of settings with different pay systems. The costing literature has dramatically expanded but because nursing exists within the context of its larger health care environment, national recommendations have a difficult time being adopted at the institutional level. The literature reports many important accomplishments in costing of direct and indirect nursing care. However, because costing is usually related to patient acuity systems, staffing protocols, etc. this literature becomes complicated to implement. If you are seeking to develop a career in nursing informatics you may choose the fiscal area in which to develop advanced expertise. A combination of cost accounting and computer supported software is required to work in connection with an understanding of nursing care and the complexity involved in costing the activity and clinical expertise of nurses.

d) **Real Time Monitoring**: Real time monitoring of physiological parameters is currently available in most critical care units to support the monitoring of patient status and enhance clinical decision making. Unfortunately, these systems are usually not related to a total patient care management system so that data collected in real time monitors tend to be stand alone systems. Hospital-wide information systems rarely capture this type of data and consequently it is not available for retrieval. A challenge for the expert in nursing informatics is to understand the monitoring needs required in the critical care environment, particularly as real time monitoring in the home care environment is becoming more important, and to relate this information to patient outcomes and costing information. Decisions need to be made about which type of data is important to be retrieved in the future and hence linked to mainframe systems. The expert in nursing informatics, therefore, is required again to have an appreciation for the clinical demands of the intensive care environment.

e) **Evaluation**: The need to conduct needs assessments and evaluation of work and nursing practice demands expert skills in evaluation and research. Decisions are made about the cost-benefit issues surrounding informatics decisions and cost-benefit analyses is another type of evaluation. Advanced academic preparation is the best mechanism to gain the necessary skills in statistics, research design, instrument development, and evaluation. In addition, cost accounting is another significant area demanded of the nurse informatics expert (see fiscal modeling above).

f) **Computer Programming**: Is it necessary to have a background in computer programming to become an expert in nursing informatics? Probably there are varying opinions about the degree of expertise required in programming, but there is consensus that a minimum understanding of at least one programming language - any one will really do - is mandatory. In order to understand the complexity of software development and the logic behind programming, a minimum level of expertise is required. There is no expectation that an expert in nursing informatics would actually do programming; however, nurses with the skill and talent at programming and nursing are highly valued by nursing and industry. A fundamental knowledge of programming will also assist when contracting for services of

programmers so that one is aware of the actual hours required for projects and to facilitate communication among developers, programmers, nursing clinicians, and administrators..

g) **Human Resources Development**: Most individuals who are challenged by the application of technology to nursing practice will at some point in their career be involved with the implementation of a new system. The implementation of a new system will require educating staff nurses about the system and enlisting their support in implementing and evaluating the system. Hence, expertise in human resource development is required, with particular emphasis upon educating and evaluating the adult learner. The literature is filled with articles on the difficulties of implementing new systems and the challenges faced by those responsible for implementing the new systems. Hence, expertise in human resource development (staff development) is a highly desired area of expertise for those interested in nursing informatics.

h) **Management**: A strong background in management is essential for an expert in nursing informatics. Because of this need, both the University of Maryland's School of Nursing and the University of California, San Francisco's School of Nursing programs in nursing informatics are offered within the respective specialty areas of nursing administration. Expertise in nursing informatics must go beyond the clinical skills of the expert nurse and the computer/technology skills of the informatics expert. Designing, implementing, and evaluating informatics systems requires a thorough understanding of management, implementing change, organizational theory, and motivational theory. These skills are essential components of most management programs.

Management programs today have integrated financial accounting and fiscal theory into their curriculum. At the same time, it is more evident that fiscal modeling, forecasting, or optimization theory are more and more important in understanding costing today in the complex health care environments of today. In order to understand forecasting models and optimization theory, it is necessary to have a background in linear programming, returning one to linear algebra. It may not be the goal of those interested in nursing informatics to return to linear algebra, but one's career would be enhanced with this skill.

Some management programs offer separate courses in project planning, implementation, and evaluation. Often the work in nursing informatics can be conceptualized as project planning, implementation, and evaluation and developing an understanding of these skills can support the success of project implementation.

i) **Decision Support Systems**: With the great interest in the development of expert systems or in most cases clinical decision support systems, an awareness of the relationship of these programs to clinical practice is critical. It is important to understand how a knowledge base is conceptualized and codified. This knowledge quickly reminds one of the difficulty in nursing of reaching consensus about a documentation system. It is not yet clear how nursing will develop clinical support systems, given the nature of nursing practice. The medical model of computer supported diagnostic systems is easier to conceptualize as patient signs and symptoms required for making such a diagnoses are more clearly explicated. The development of nursing decision support systems, beyond the real time modeling systems

that currently are available, is an exciting challenge for those interested in nursing informatics in the 1990s.

j) **Ethics**: Finally, the ethical decisions embodied in health care today demand that all advanced practitioners have a thorough understanding of ethics and ethical decision making. The potential lack of confidentiality of information through the easy access of information from the computer demands that we develop an ethical position on access to data. A related ethical or legal issue is the use or non-use of expert systems information when it is available. Who will be liable for the misinformation generated by decision support systems?

In summary, the career opportunities for those pursuing nursing informatics are diverse and intellectually challenging, and can be personally and financially rewarding. The issues raised here are designed to challenge you as you construct your future in nursing informatics. You are challenged to "remember your future" through your creative vision, nursing expertise, and awareness of current issues. Patient care and nursing will be well served by your accomplishments. Good luck!

SPIRALLING COSTS OF HEALTH CARE -- CAN COMPUTERS HELP TO CONTAIN COSTS

Carol F. Gaston

INTRODUCTION

Micro-economic reform is one means by which productivity increases and efficiencies can be realised in the health system. This paper examines some means by which the South Australian Health Commission is addressing such reform. Strategies are being developed to encourage and make possible changes to nursing management and clinical practices which will provide cost savings to be used to meet the increasing demand for health services.

Every clinical and administrative decision made by nurses has a financial cost. In fact the negative side may also be true in that every clinical and administrative decision not made may also have financial implications.

In order to make the appropriate and most cost effective decision one must have all the necessary information. A clinician does not make a diagnosis without having completed a thorough assessment and investigation. Yet decisions regarding types of treatments, therapies, methods of staff allocation and rostering, numbers of staff required and their skill mix are often made without appropriate or sufficient information. This has meant that old systems, procedures and practices have persisted longer than appropriate and have resulted in significant inefficiencies.

A SOUTH AUSTRALIAN CASE STUDY

The South Australian Health Commission's budget was approximately $1,100 million in 1990/91 and it employed nearly 26,000 persons. Nursing salaries amounted to $289 million, that is, nearly 26% of the total health expenditure and 35.5% of the salaries budget. The nursing workforce was 38.5% of the total Commission workforce. Whilst this data might indicate that nurses provide value for money over and above other categories of worker, it cannot be denied or in fact ignored that the nursing workforce is the largest workforce category and as such must participate in any process of micro-economic reform.

Over the last 5 years there has been an inexorable increase in the number of hospital admissions and an increase in complexity of cases presenting for treatment. Ageing of the population, rapid growth of medical technology and rising community expectations will continue to put increasing pressures on the health systems ability to meet the demands placed upon it. The pool of funds available to the health industry is not going to increase to the extent required to meet current demand nor are there going to be sufficient nurses to provide the care required if activity continues to increase at its current rate of 3% per annum.

Micro-economic reform is one means by which productivity increases and efficiencies can be realised in the health system. Strategies need to be developed to encourage and make possible changes to nursing management and clinical practices to provide cost savings for use in meeting the increasing demand for health services.

In recent years, over and above the traditional wage adjustments, there has been an increase in nursing costs in South Australia in the vicinity of $100 million. This has been as a direct result of the transfer of nurse education to universities, the introduction of a 38 hour week, the implementation of a new clinical career structure for nurses and the achievement of professional rates of pay. Whilst we have seen increases in costs, status, and education, there has been little evidence of change in management and clinical practices. Strategies are currently being developed in South Australia to assist and support nurses in bringing about changes to their clinical and management practices.

ALLOCATION AND SCHEDULING OF NURSING STAFF

Issues relating to allocation and scheduling of staff have been well documented and the evidence is overwhelming that poor rostering practices result in increased costs and inefficient use of staff. Rostering based on available supply of staff rather than patient demand is still common. This results, interalia, in uneven staffing. e.g. understaffing by two on one shift requiring top up by agency staff and overstaffing by two the next shift. If this practice occurs just once in a two week roster period the cost per annum would be approximately $10,000 per ward. Place this in the context of a health unit with 600 beds and you have an overall annual cost increase in excess of $250,000.

The requirements for initiating changes to rostering practices include:

(i) an automated rostering system which can optimise staff utilisation according to patient acuity and available funds,

(ii) a means by which acuity levels can be calculated by ward by shift,

(iii) interfacing/integration of the rostering system with the patient acuity system,

(iv) the facility to roster according to demand i.e. variable shift length,

(v) the willingness and ability of nursing staff to change.

Activities initiated to date include:

(i) the trialling and evaluation of selected automated nurse rostering systems.

(ii) commitment of funds to introduce automated nurse rostering systems into major metropolitan hospitals during 1991/92,

(iii) the trialling of a patient acuity system,

(iv) changes to the industrial agreements to facilitate more flexible rostering,

(v) the contracting of consultants to provide a benchmark for more creative, flexible and cost effective rosters.

Proposed short-term outcomes include:

- an automated Nurse Rostering System will be introduced in all major metropolitan hospitals by December 1991,
- in the financial year 1991/92 an agreed percentage of nursing salaries will be saved as a result of changed rostering practices.

NURSING STAFF DEVELOPMENT

Historically post registration inservice courses in Australia have been conducted by health units in order to attract staff to particular areas of practice for a given period of time. Courses have been structured to meet immediate staffing requirements rather than providing appropriate numbers of nurses with required levels of competency to meet community needs. The Review of Specialist Nurse Education in South Australia (Slater, 1985) in the mid 1980's and the development of the Nurse Career Development Model (Gaston, 1988) have resulted in some changes to course length but there is still little evidence of rationalisation or course planning based on community needs and nursing staff competency requirements.

Current educational administrative practice results in:

(i) duplication of programmes

e.g. Neonatal Intensive Care, Accident and Emergency,Midwifery

(ii) reduced access to some clinical areas for educational purposes

e.g. Operating room and obstetrics

(iii) over supply of competent practitioners

e.g. Midwifery

(iv) undersupply of competent practitioners

e.g. Palliative Care

(v) limited provision of programmes in some areas

e.g. Graduate Nurse Programme

(vi) lack of integration of programmes

e.g. Clinical experiences limited to one institution.

The summary result of these deficiencies is that nursing staff development programmes are fragmented, have no system-wide focus and are far from cost-effective.

Given the previous lack of information systems, there has been little or no consideration given to planning, evaluation and analysis of the cost-effectiveness of staff development. Whilst provision for creativity, innovation and flexibility must exist, accountability should also apply. The existence of data relating to demand, actual requirements and actual expenditures provide opportunities for planning, evaluation and review. Although there will be no direct savings from such an exercise, assurance that all nurses will have access to staff development and that education in areas of practice currently not provided can only assist in

assuring quality nursing care and retention of nursing staff.

The requirements for initiating changes to the management of nursing staff development include:

(i) systems for collecting data on activity levels of various areas of practice,

(ii) systems for determining current and future requirements for given areas of nursing practice,

(iii) a centralised mechanism for determining the category of courses required over say a three year period which includes consideration of the number of courses, the locations and the appropriate number of places to be available,

(iv) development of courses based on competency rather than length,

(v) a system for evaluating cost-effectiveness of programmes.

Activities initiated to date include:

(i) trialling of a patient acuity system which will provide data on activity in various areas of nursing practice,

(ii) allocation of funds to establish a means of planning nursing workforce levels in particular areas of practice based on activity data,

(iii) development of a workforce planning model for midwifery practice,

(iv) some rationalisation of current courses,

(v) provision of a consultancy to five metropolitan and country health units to assist them in developing competency-based post registration programmes,

(vi) establishment of a data base for monitoring the cost of staff development.

With respect to the latter the first round of data was collected and manipulated to calculate the hours of education received by each nurse per annum as well as the cost per hour and the cost per nurse (Table 1). Comparisons can be made across sites and questions asked as to why certain variations exist. The data collected in this first exercise supported the hypothesis that programmes were unevenly distributed and some programmes were less cost effective than others.

Table 1

HEALTH UNIT	A	B*	C*	D	E	F
NURSING STAFF NUMBERS	900	1700	1000	800	400	300
NURSE NUMBERS INVOLVED IN EDUCATION	1374	2839	965	1060	143	508
EXPENDITURE ($)	1.1M	6.05M	3.56M	0.93M	0.87M	0.45M
HOURS/NURSE	29.5	19.5	42	47	423	62
$/HOUR	27.5	110	88	19	14	14
$/NURSE	811	2130	3721	877	6039	892

*These health units had pre-registration nursing students included in their numbers which are being withdrawn over the next 2 -3 years.

Proposed short-term outcomes include:

- by 1992/93 all nurses will have access to inservice based staff development
- rationalisation of programmes where there is ineffective duplication will cccur during 1992,
- savings made from the reduction in duplication or oversupply will be used to cover the gaps in areas of undersupply,
- by 1992/3 an agreed percentage of the equivalent of nursing salaries in each health unit will be allocated to nursing staff development.

NURSING RESEARCH

Most nursing practices are based on tradition rather than any scientific reasoning. Given the non-availability of additional dollars for nurses to meet the increasing demand for services and the system inability to continue to provide sufficient nurses to match activity levels, nurses will have to "work smarter". Nursing practices need to be questioned, investigated and revised and clinical research is one means by which this can occur.

The evaluation in South Australia of the newly implemented Nursing Clinical Career Structure carried out in 1989 showed that the research component of nurses' job descriptions was rarely enacted. This is not surprising given the lack of higher education opportunities available to nurses until this last decade, as well as the serious lack of clinical information systems to provide them with the necessary data. However with the increasing numbers of nurses with tertiary qualifications in nursing, it is not unreasonable to expect that nurses fulfil there professional responsibility and question their practice.

Simple procedures and practices have significant cost implications relating to both staff

time, patient length of stay and resource use. Examples of questions which could be answered are:

(i) do arterial lines need to be changed every 3 days?

(ii) do unconscious patients need to be turned every 2 hours?

(iii) should patients on self care and vital signs be hospitalised?

(iv) is gloving and gowning required for certain procedures?

(v) what are the critical indicators for determining a patients degree of risk of infection?

There are thousands of such questions which, if answered, could bring about significant efficiency opportunities. It should be stressed, however that the failure to provide nursing departments with appropriate hardware and software systems, despite continuing requests over the last 10 years, has been a major inhibitor to change. Manual data collection by highly paid professionals is far from cost-effective.

The requirements for initiating changes to clinical practice include:

(i) appropriate hardware and software systems,

(ii) documentation of process and outcome standards of care,

(iii) a system which automates the measurement of expected outcomes against actual outcomes

(iv) mechanisms which support clinical nursing research and ensure its inclusion in Quality Assurance and inservice education programmes,

(v) availability of funds to motivate nurses to engage in clinical research.

Activities initiated to date include:

(i) trialling of a nursing clinical decision support system which amongst other things provides a means of documenting standards and automated measurement of actual outcomes against expected outcomes,

(ii) provision of funds to the Centre for Nursing Research from the Nursing Branch in 90/91 in support of clinical nursing research.

Proposed short-term outcomes include:

- automated clinical decision support systems will be introduced in all major metropolitan hospitals by December 1992,
- health units will be expected to provide evidence of nursing research activities by documenting them in the Annual Report,
- in the financial year 1991/92 an agreed percentage of nursing salaries will be saved as a result of changed clinical practices.

NURSING STAFF MIX

In recent years there has been much debate and extensive argument regarding appropriate

nursing numbers and in particular, staff mix in health units. Whilst South Australia has the highest ratio of nurses per head of population in Australia it has the lowest ratio of registered nurses to other nursing staff (e.g. enrolled nurses, students). Traditionally, staffing requirements have been determined by patient census, regardless of the amount of nursing care demanded by the individual patient.

Today, patient classification methodologies enable the grouping of patients into care categories which provide better estimates of the amount of nursing care the patient requires. These patient classification methodologies have certain limitations, not the least of which is their inability to take into account skill mix and the involvement of manual computation which is time consuming. Therefore, due to the absence of any tool which assesses staff mix, professional judgement and available funds have been the determinants.

The following is an approximation of the situation at one health unit as highlighted by the clinical decision support system being trialled. These data (Table 2) provide evidence that cost savings can be made by adjusting staff mix on a shift-by-shift basis to meet patient activity calculated on actual care being given.

Table 2

AREAS	ACTUAL MIX	PROFESSIONAL JUDGEMENT	ACUITY SYSTEM
High Dependency	100	100	80:20
Surgical Units	80:20	80:20	70:30
Medical Units	70:30	80:20	50:50

The requirements for determining and using appropriate staff mix include:

(i) an automated system of matching staff level with patient requirements

(ii) an automated system of summing the required staff levels by shift

(iii) a linking of the automated patient data system to an automated nursing rostering system.

Activities initiated to date include:

(i) the trialling of nursing clinical decision support system, and

(ii) the implementation of automated nurse rostering systems.

Proposed short-term outcomes include:

- automated clinical decision support systems will be introduced in all major metropolitan hospitals by December 1992.
- in the financial year 1992/93 an agreed percentage of nursing salaries will be saved as a result of adjustment to nursing staff mix.

CONCLUSION

This paper has put forward a number of strategies which are being considered by the South Australian Health Commission. These strategies are part of a plan to maximise the use of resources and produce cost efficiencies which will assist in meeting the demands for health services within existing budgets. Micro-economic reform is being used to produce efficiencies in the health system and changes are occurring to nursing management and clinical practice. These changes are providing savings for use in meeting the increasing demand for health services. The success of these strategies, however, is reliant on the existence of computerised information systems.

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PATIENT CLASSIFICATION AND COMPUTERS: TOOLS FOR PATIENT CARE MANAGEMENT IN THE NURSING SERVICE

Edward J. Halloran

INTRODUCTION

> To the experienced eye of a careful observing nurse, the daily, I had almost said hourly, changes rarely come under the cognizance of the periodical medical visitor, afford a still more important class of data, from which to judge of the general adaptation of a hospital for the reception and treatment of sick.
>
> Nightingale (1863, p. 6.)

The principle task of professional nurses is to ensure that their agencies provide effective nursing care to patients in the most efficient manner. Finite human and capital resources compel nurses to compete with all other health providers (and theoretically with all other possible uses of resources) for the support to adequately provide nursing care. While strong belief systems have served nurses well in the competitive arena, the need to specify what objective is to be achieved with quality nursing care, grows stronger every day. In a world characterized by an exponentially expanding number of resource allocation choices, nurses (and their spokespersons -- the nursing administrators) need to clearly articulate why society should invest in them.

Virginia Henderson (1966) most clearly specified what nursing is about. She said:

> Nursing is primarily helping people (sick or well) in the performance of those activities contributing to health or its recovery (or to a peaceful death) that they would perform unaided if they had the necessary strength, will, or knowledge. It is likewise the unique contribution of nursing to help people be independent of such assistance as soon as possible.

Our task as leaders in the nursing profession is to actualize this (or some equally coherent) description nursing. In short, we must organize nursing services in such as way as to make our patients be independent.

The outcomes of good nursing can then be quantified in terms of patient independence. Measures of patient dependence are commonly generated by nurses for patients: they are the basis for patient classification. These measures have been used to quantify nursing workload and are also the basis for many computerized nurse staffing algorithms.

PATIENT CLASSIFICATION

While patient classification data has long been used for nursing workload/nurse staffing purposes, these data can also be used for other purposes. The most important use of clinical data about patients is for patient management. Knowledge of urinary incontinence among patients, for example, (an element of most patient classification tools) can give rise to the examination of the relationship between bladder function and the use of long term institutional care. If, as has been shown, the odds of nursing home placement increase when the patient is incontinent, a program of care can be established to prevent placement in selected incontinent patients (Halloran, England, et al, 1988). In fact a program or even a business plan, can be developed for incontinence management.

This patient management strategy is well founded in nursing practice literature where individualized patient care is the hallmark of good nursing. Since 1983, with the advent of the prospective payment system using the diagnosis related group (DRG), classes of like patients have been grouped for patient management purposes. Dramatic changes have occurred in both admission rates and lengths of hospital stays. Not all changes have been positive however. Premature discharge and unnecessary transfers to nursing homes have taken place (Fitzgerald, et al, 1988). In these cases, nurses are in the best position to moderate patient care decisions with alternative ideas about patient management. Yet data is needed to support nurses' decision-making. Patient classification data is reassuringly related to length of stay - that is, the more a patient is dependent the greater is the likelihood that the patient will be longer in the hospital (Caterinicchio & Davies, 1983). When the patients DRG length of stay standard is reached, pressure may build to discharge the patient. Yet, due to the variability of patients within a DRG, many patients may be ready for discharge before the norm and some after (Sovie, et al, 1984).

Individual patient attributes, (some call nursing diagnoses, others call them nursing problems/needs/symptoms) are all characteristics on factor type patient classification tools which can be used to reveal patterns of dependency about the patient. A clinician can interpret the patterns in terms of care planning, implementation and outcome evaluation. For example, a hip fracture patient who exhibits confusion and urinary incontinence but is orthopedically progressing, and having reached the length of stay norm, may be transferred to a nursing home. Alternatively the nurse observing the pattern of nursing conditions in the patient may develop and institute a sensorium clearing care regimen for a three or four day trial in an attempt to resolve the confusion and incontinence thus obviating the placement. If such a regimen were successful, the patient would be saved untold misery and society saved the cost of support for a nursing home bed. The computer is an ideal tool to use to organize clinical data on which to observe patterns of dependency for the purpose of differentially managing patient care.

The measurement of outcomes of care increasingly involve functional status and quality of life attributes (Stewart, et al, 1989; Katz, 1987). Functional status data is the same as nursing workload data but is used for a clinical nurse-patient perspective [process and outcome components of care quality assessment] rather than a nurse staffing perspective [the

structure component of care quality assessment]. Most patient classification systems in nursing need to be augmented with quality of life attributes which are indicative of the patients' psycho-social status. A nursing diagnosis based nursing minimum data set approach has been proposed for patient classification and is described elsewhere (Halloran, et al, 1987). These data have also been promoted for use in Identification of the Nursing Minimum Data Set (Werley & Lang, 1988).

APPLICATIONS IN NURSING MANAGEMENT

Budget/finance, personnel and payroll functions, are all computerized in most health care agencies. These functions are now performed on agency mainframes or in service bureaus. Typically, the patient classification/nursing workload/nursing staffing/nurse scheduling functions are the only computer applications housed in the nursing service. Mini or personal computers are most frequently employed to run standard software for the staffing and scheduling applications. Some large agencies have developed sophisticated mainframe applications for their nursing department.

If computer tools are to be more fully utilized by nurse managers in the future, it is on the basis of existing applications that they will probably be built. Often existing functions that have grown obsolete form the basis for increased computer use. In one Cleveland hospital for example, the utilization review function employing five nurses was converted to an automated quality assurance program employing two programmers and three nurses, all of whom had access to the hospital's data processing system. In an Iowa hospital the inservice staff in nursing was reoriented to working with hospital computer staff to teach automated care planning functions to nurses who use terminals on the wards connected to the hospital mainframe. In each case greater productivity was achieved through the use of automated systems. In Cleveland a new and priority function was performed with no new expense. In Iowa the productivity gain was based on fewer nurses being needed after the care planning was automated.

MINICOMPUTERS / PERSONAL COMPUTERS (PCs)

Of importance in the use of computer tools as aides in decision-making, is estimating the size of the job to be performed and then matching computer resources to accomplish the task. A seemingly endless series of choices needs to be made regarding personnel, equipment and software. Each choice made establishes limits on subsequent choices. Use of a PC based patient classification - nurse staffing application, for example, limits the amount of information that can be retained about any one patient. Often such an application can inform one about how many Class IV patients there are on any ward, but because of computer space limitations imposed by the hardware/software choices, one cannot specify which patients by name are in

Class IV or which nurse(s) are caring for them.*

In general PCs are used where the application can be accomplished using static data. Static data is a matrix of data encompassing a fixed number of cases and a fixed number of variables per case. In the patient classification example it may be 1000 patients and each patient is described as having, incontinence, immobility, a DRG, a zip code, and so on up to 100 or so variables. The PC hardware/software combinations now range from 640K memory to 16 megabytes (and soon 1 gigabyte), and are easily able to process statistical software, spreadsheets and most PC designed software for many standard applications using data from a 1000 patients by 100 variable matrix.

Use of the PC for packaged standard applications requires the input of data for manipulation with the software. Many mainframe data files are amenable to downloading to a format for entry into PC minicomputers. Use of common data for multiple purposes is preferred to insure assumptions about data quality are met. Because payroll files, for example, are audited frequently (by each employee when they receive paychecks), and payroll forms the basis for the greatest nursing department expense, personnel, these files can be used fruitfully for both payroll and budgeting purposes. If one wants to use a spreadsheet program for a personal expense budget forecast for a ward, for example, data on budget and actual payroll expense for previous months may be obtained from existing mainframe files and downloaded to a format for PC minicomputer analysis.

Obtaining data from the mainframe for use in a PC minicomputer requires the cooperation of the department that generated the data (finance and/or personnel in the example of payroll data) as well as data processing professionals' help in formatting for downloading. Issues of confidentiality are as important in these matters as they are in preserving patient records. Many institutions have data security conventions organized around data access policies. In general these policies and conventions give supervisors access to data for their areas of responsibility. A head nurse can readily obtain data concerning the ward, a nursing director for a clinical area like medicine or pediatrics, and so on. Nursing vice presidents as corporate officers often have access to all organizational data.

Increasingly PC minicomputers and standard application software, purchased off the shelf in computer stores, employing existing data are the basis for decision-making support in organizations. Zuboff (1988) coined the word "informating" defined as the dissemination of data to the lowest possible level of the organization where it can be used by (in Druckers

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*Patient classification systems have been described as categorical or factor based. Categorical systems reduce classification to classes of patients, i.e., Class I are the most dependent, Class IV are the least. Factor systems specify the patient characteristic which is indicative of greater dependence; incontinence of bladder or immobility, for example. Usually, these factors are weighted and summarized as scores for patients and summed again to derive a ward score. In factor and categorical systems, staff are deployed based on categorical frequency or ward scores.

[1988] term) "knowledge workers" to improve the product or service. The use of existing data is important because it is familiar, audited and as a rule underanalyzed. Many projects amenable to computerization lead to the gathering of single purpose use data, sometimes of unknown validity, and usually at great cost. Efforts should be made to use existing data for new creative and unique analyses. Software tools like a spreadsheet program facilitate the use of data for decision-making support for multiple purposes under numerous assumptions.

MAINFRAME COMPUTERS

Mainframes are used for dynamic data; data which is added to on a regular and sustained basis. Patient charges for service/equipment use in the agency is managed on the mainframe as an example of dynamic data. The care planning data in the Iowa hospital, New York University Medical Center's nursing documentation system and the Cleveland Hospitals' patient classification program are all mainframe nursing applications because the amount of data employed changes every day as patients are admitted, discharged and change status. Each of these installations has developed unique software based on the philosophical underpinnings of the systems, the programming resources available and the tasks the systems were designed to achieve. While each of these applications has potential to be marketed, there does not now seem to be evidence of sufficient benefit to incur the added cost of software development and sales. IBM has, however, developed a new product which employs a bedside terminal (actually a PC minicomputer) which is to be used for care planning and documentation. A portion of the data gathered for each patient is sent to the mainframe for storage and presumably, subsequent report writing and/or analysis. IBM's health care product development objectives are to develop a digital (computer stored and retrievable) patient record.

Patient management strategies, stimulated by DRG use and with attendant merging of financial and clinical data, have not reached optimum use because data on patient functional status and psychosocial well being is not factored into the new clinical managerial decision-making. Patient discharge may occur because a DRG norm has been reached rather than because the patients physical functioning and/or psychosocial well being indicate readiness for discharge. If one does not systematically measure, record, retrieve and use functional and psychosocial data, clinical decision-making is compromised. At minimum, patient classification data from nurses must be added to mainframe data bases to reflect patient variability within what otherwise seem to be homogenous ICD-9 or DRG categories. Nurses are at the bedside making clinical care decisions on a case by case basis, but their patient management decision-making would improve if they had the benefit of knowing, from the retrieval and analysis of similar case data, how other cases in the category were handled. If patients' confusion is related to long lengths of stay would nurses' sensorium clearing techniques shorten stays? Nurses are too important and too expensive professionals not to use optimally. Data from nurses about patients offers considerable potential to optimize care

or in Henderson's words would "help people (patients) gain independence as rapidly as possible."

IBM, University of Iowa's Hospitals and Clinics, University Hospitals of Cleveland, New York University's Hospital, the Clinical Center at the National Institutes of Health and quite likely many other institutions have invested substantial mainframe time and expertise because nurses input to patient care management functions are essential to insure quality care at the least cost. These systems are crucial to the development of future health care programs that meet the needs of patients and are tools that assist nurses and nurse administrators to make decisions, in conjunction with patients, about who should give care and where nursing care should be given. Such systems support the resource allocation decisions of the future, much as nurse staffing methodologies are resource allocation decision aids of the past. The need for such computer-based decision support has been known for some time.

Florence Nightingale (1863), in her efforts to explain and predict morbidity and mortality rates in London hospitals, advocated the adoption of a statistical system incorporating nurses' daily observations of patients, as well as medical diagnostic and treatment information and demographic data. In Nightingale's words:

> They (these data) would show subscribers how their money was spent, what amount of good was really being done with it, or whether the money was not doing mischief rather than good: they would tell us the exact sanitary state of every hospital and of every ward in it, where to seek for causes of insalubrity and their nature; and if wisely used, these improved statistics would tell us more of the relative value of particular operations and modes of treatment than we have any means of ascertaining at present. (1863, p. 176.)

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GUIDELINES FOR MEASURING QUALITY HEALTH CARE OR WHAT DO WE DO UNTIL WE HAVE A LARGE DATABASE

Marcia Orsolits Stevic

INTRODUCTION

The hopes, dreams and promises of 1970s and 80s have not come true. Health care organizations and hospitals in particular have not become paperless sites of sophisticated automation. Large databases are not available for tracking trends in clinical outcomes over time. Institution-specific financial and clinical databases seldom speak to each other. Why?

Is it perhaps due to attitudes and fears of health care professionals? Nurses and physicians have separated practice from documentation and, in fact, resent the increasing focus on their written words by payors, regulators and accreditors. What would a day on a hospital unit be like if physicians, residents, nurses, respiratory therapists, physical therapists, and social workers were required to base their daily interventions for patients on only the written results of the previous care giver? Mayhem?! It is obvious we do not base our clinical decisions on documented progress. Most patients would say they were never asked what had occurred and how they felt as a result. Then how do professionals make health care decisions? By basing them on some floating textbook picture of a plan of care? Their own patterns of successful interventions? Certainly not yet on pre-defined protocols or guidelines. We must help health care professionals appreciate and master information before we can expect them to develop the data sets required to support the complexities of clinical decision making, organizational operations and the learning process. One place this has occurred to some extent is in research (Eddy, 1990).

The explosion of health care information hardware and software that flooded the market was not unlike the oil boom in Texas (IBM is now seeking to reduce their workforce substantially internationally). Health care professions played a very minor role and the technological skill and expertise came from a wide variety of industries including banking and manufacturing. In health care, there is a very strong pattern of increasing specialization that fosters new roles, jobs, and diversification and that fragments patient care. In the future, information technology may modify that pattern. Professionals may be freed to provide more time to direct patient care.

EVALUATIVE DATA

As our keynote presentation noted, Information Technology (IT) has a very powerful role in determining attitudes and beliefs of a society. Participation in health care can be particularly influenced by the type and amount of information available to the consumer. Industrialized

societies all over the world are becoming more and more complex and characterized by high chronic levels of stress. This can lead to a demand for quick fixes and minimizing decisions whenever possible. In selecting and utilizing health care services, simple, clear information is preferable. At first, it was thought that mortality data would be helpful to the consumer (as well as to payors) in identifying the "good" and the "bad" health care organizations and services. It soon became evident that deaths occur relatively infrequently, but complications and traumas can be problematic and substantial. (Blumberg, 1989; Chassin, 1989)

Next, it seemed the characteristics of the physician and/or hospital could help us select a "good" one. Board certification, volume rates, liability records, staffing ratios and for profit status have all been compiled. These measures too have proven less useful than expected.

Both mortality and characteristics data are available in large national databases. These can be merged with cost/charge data for fairly comprehensive analyses. However, this information is not readily available to nor entirely understandable to the consumer (Shortell, 1988).

The next wave of evaluative data is developing around a predictive, probability model. "If you see Doctor X for Y procedure at Z hospital, your chances of dying (walking again, having a repeat, etc...) may be B percent." Data collection must be highly focused, systematic and scientifically rigorous to provide predictive information. And what of Nurse M and Social Worker N? What role do they play in the probability of a good outcome? We're not quite sure. We have some guesses and empirical hints, but we do not have the breadth and depth of patient provider and specific data to even begin to answer these questions. (Berwick, 1989).

"The operation was a success, but the patient died or was disabled." An all too familiar, but disconcerting reality. A physician may perform an appropriate procedure for a patient, and do so effectively; however, there still is a potential for a poor outcome. Infection, dehydration, prolonged pain or decubiti can develop as a result of nursing care, extending the length of stay, increasing costs and incurring disability.

STATE OF THE ART

In spite of the major strides made by selected organizations and individuals, the health care industry is still embarrassingly behind in information technology development. While this is certainly not earth-shaking or life-threatening news, a crisis is eminent as society's need for information about the cost accessibility and quality of its health care services rises rapidly.

Health care is often characterized by "doers" vs. "thinkers." The recent Medicare's Relative Value Unit system threatens to invert the hierarchy of "valued" health care services by increasing reimbursement for cognitive care over technological/invasive care. This is a good example of society's need to better understand those abstract aspects of care that cannot be readily checked off a list, that require a flow of meaningful information over time, and that seem to have a substantial influence on patient outcomes. By and large, many of these aspects are nursing care.

What is "quality" health care? Let's consider the recent definition from the Institute of Medicine (IOM): "Quality of care is the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge" (Donaldson, Harris-Wehling, & Lohr, 1991).

This definition is quite consistent with the World Health Organization's (WHO) definition of health "...a state of complete physical, mental and social well-being, and not just the absence of disease or infirmity."

This broader view of health beyond disease, morbidity and mortality, and the IOM's definition of quality of care are necessary to the successful provision of useful information for society. We now must broaden our internal evaluation of health care quality beyond death rates and clinical complications. In this context, the patients' ability to function and their satisfaction with care become major measures of the effectiveness of the health care we provide society. If we are to measure our success in this way, what role will information technology play and how will nursing be implicated?

This is perhaps one of the most challenging issues for the profession of nursing. Information technology will be a major focus of health care's future. Nursing decision making and interventions/actions will comprise a substantial portion of critical facts and assumptions that will be required to measure/understand the outcomes of patient care and which processes contribute to these outcomes.

The USA's recent policy thrust to measure medical effectiveness is long overdue. It is time to stop and take an inventory of where we are today with various diagnoses, treatments and procedures. Have we applied all the knowledge we have gained through clinical research over the past 25 years? Why do health care services and costs vary so much across the country, and indeed, across one city? Why do patient outcomes vary for similar treatments/procedures? Can we do better for our society? Better applications of professional knowledge? Better matches of patient preferences and treatments? Better outcomes at less cost (Donkin, 1989; Faltermayer, 1988)?

To its credit, the new Agency for Health Care Policy and Research (AHCPR) acted on an "expanded" definition of medical to include the scope of services provided by a variety of health care professionals. A nursing group was charged with developing practice guidelines to support quality measurement in three key areas: pain management, continence care and skin care. These are all areas that have been finally recognized as mainly under nursing management. There is a growing awareness, at the United States (U.S.) policy level, that nursing care makes a difference in cost, length of stay, disability incurred, and quality of care delivered.

STRATEGIES FOR SUCCESS

What is the challenge? Now we need to convince ourselves - our nursing organizations, our bedside nurses and, most importantly, our future professionals that nursing care makes a difference. We have always taken pride in our technical skills, but often label our "caring skills" as our real value - the quality of nursing care: that powerful and mysterious aspect of

our actions and behaviors that to date has been unmeasurable. We need to broaden our definition of value to society and take the necessary risks to develop measures of our success that coincide with patients' and society's views. A recent U.S. newscast focused on the ten year anniversary of an assassination attempt on former President Ronald Reagan. It included an interview with "his nurse" at the hospital. She was praised for her "hand holding" and support of Mr. Reagan. Now, we can surmise that many nurses would not be pleased with this definition of "value" with a patient who was critically ill and to the exclusion of his/her knowledge and skill base. However, consider the ways in which we could more clearly demonstrate and articulate our contribution to that "quality outcome." That patient left the hospital quite functional and probably more knowledgeable about his body and his strength/weaknesses as a human being than previously. Chances are he did not receive the wrong medication, fall out of bed or acquire a urinary tract or IV site infection or a skin ulcer. In other words: excellent nursing care outcomes!

These are some measures of quality that we can build upon. The federal government and the AHCPR have already included these in their quality initiatives. We must prepare ourselves in the future to develop these further, before they are defined for us.

The very exciting opportunity here is the chance for nursing to rally around the aspects of care that have been targeted at the policy level as core indicators of the quality of our care and which also happen to represent the core definition of our practice. Patient/family education and functional independence are the heart of nursing care. Often these are the things that make the real difference in the quality and the outcomes of care.

What to do until the database arrives? Take two aspirin and call the bureau of health statistics in a few years? Purchase the Medicare Claims (MEDPAR) file and "extrapolate?" Pull up the Tumor Registry and guess who received nursing interventions? Or better still, create one ourselves? Yes, but how, when and who should be involved? And most importantly, what is the question to be answered by the database?

What are the potential questions for our "large database"? What is nursing's contribution to the effectiveness of patient care? Does nursing care make a difference? Which outcomes are we mainly responsible for? How can we systematically measure the quality of nursing care? Which data will need to be patient and nurse specific?

It is recommended that we consider the set of Generic Quality Screens currently used by the U.S. Medicare system. Six straight-forward screens flag potential quality problems. These include: adequacy of discharge planning, medical stability at discharge, nosocomial infection, hospital incurred incidents, unexpected death, unplanned return to surgery.More importantly, there are several nursing studies which could provide the beginning framework for such a database including, but not limited to the Nursing Minimum Data Set (NMDS) (Werley & Lang, 1988). Many studies have begun to go in this same direction, but severe limitations exist in the lack of large, standardized tests of data, the elements and/or tools and their relative acceptance into nursing practice.

SUMMARY

We have a significant opportunity to work in collaboration with the major efforts under way to develop measures of effectiveness and outcomes of patient care. We cannot afford to be or appear to be separatists. Differentiating nursing from medical contributions to various outcomes is useful only to understand the components and articulate the mysterious. Success in improving outcomes can only come from blending the information back into integrated care delivery and shared responsibilities.

To believe that the whole is greater than the sum of the parts is to temporarily and at times artificially pull apart the components to better understand each one, the details of timing and precision, while basing actions/reactions on the powerful sum.

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ACCESS TO CARE: REALITIES OF THE AMERICAN MARKETPLACE

Roy L. Simpson

INTRODUCTION

In America, we are in the midst of a continuing health care crisis. Our Social Security and Medicare programs, designed to help the sick, disabled and the elderly, are being stripped bare. Meanwhile, American children face one of the highest infant mortality rates in the West, along with increasing poverty, neglect and despair. More and more Americans, particularly the economically disadvantaged, forgo health insurance and are unable to pay for even basic care. Yet as we face this growing health care crisis, Americans seem increasingly paralyzed to act to alleviate the pressures. This is true for nursing as well. But to understand, and cope effectively with the problem, we must define its boundaries. When nursing cloaks itself in the language of "morality," we fail to see that in the U.S., the health care crisis is not so much a "moral" problem as it is a political one.

To understand the political aspects of health care in America, we must explore why it is that so many U.S. nurses are not only suspicious of the free enterprise system, but downright hostile. In this light, it is important not only to define what the marketplace is, but also clear up mistaken notions about nursing's role in the system.

THE AMERICAN ECONOMIC SYSTEM

In the U.S., "capitalism" is the term used to describe the economic system. Capitalism is defined as "the economic system in which the ownership and exploitation of wealth are left largely in private hands" (Morehead, 1972). We often hear capitalism compared to socialism, which is defined as, "ownership of exploitable capital and means of production by the government, not by individuals or by private enterprise" (Morehead, 1972).

Any economic system must produce and distribute goods and services. A system must decide what commodities to produce, and how to produce them. How much of the commodities to produce, and when must also be decided. Then, the manner and timing of distribution must be settled in addition to who is allowed to consume what. And finally, who gets the income from the trade or exchange must be answered.

That is the theoretical model. Now we need to apply it to the practical and living context within which America works. First, the American economic system is "free." It works because of voluntary individual cooperation. Second, the American economic system is characterized by private property. Ownership of the means of production is decentralized. Third, the American economic system is characterized by business organizations or enterprises. We use business, not households, to specialize and divide the work. Fourth, in America, as in

most modern economies, we trade money rather than goods; economy is one of exchange, not barter. Our system is a decentralized, voluntary system for the production, distribution, and consumption of goods and services in which individuals specialize and divide the work into business and trade goods and services using money. The primary and defining characteristics of the American economic system are private property, free access to the market, individual initiative, and competition.

NURSING'S HOSTILITY TO THE REALITY OF THE MARKETPLACE

It is my belief that for any significant changes to be made in the profession of nursing in America, nursing must first become committed to the marketplace. Yet there are many nurses in the U.S. who are hostile to the American marketplace, or at least hostile to the health care corporations who claim a profit.

The problem is grounded in a vague uneasiness that is best expressed in the generality: "It is not right to make money off of sick people." This implies a misunderstanding of American free enterprise. First, the marketplace is neither amoral or immoral. The marketplace is neutral; it is neither good nor evil. The only thing the entrepreneur or capitalist cares about is whether or not the consumer or customer has the money to complete the transaction or exchange. The corner grocer does not distinguish between "bad" people and "good" people, or between nice people and mean people. The grocer sells bread to the people who have money to buy it. Now, this grocer may deplore hunger in America, but the vehicle for protest is typically not his or her grocery store. The same concepts apply to the health care capitalists in the U.S. They are providing a service, and the only criterion they have for providing the service is a form of payment. Just like the grocer, health care capitalists want to see evidence of a means to pay.

At this point, many American nurses opposed to a free enterprise health care system decry that buying bread is different from buying emergency room trauma care. As an economic model, however, there is no difference. In the past decade, the American health care industry has become more and more like the grocer--and the unfortunate consequence is that there are people who cannot buy the bread or medical care they need. The problem lies not in the fact that there are people who cannot afford these services, but the society as a whole has not come up with a unified strategy for dealing with those who cannot pay for the services they need or receive. So the problem is not only for health care to solve, but for the larger society to address.

In other words, paying for the care for the uninsured--be it the poor or the underinsured--is a political problem, not a market problem. We do not ask our local grocery stores to give bread to the poor--why should we expect a hospital to give their services away? If any firm did this for a long period of time, it would not be able to stay in business. It would go bankrupt. Those are the simple economic facts. Meanwhile, American society is beginning to address the problem of indigent care by grappling with these issues in the arenas where political solutions are established--the halls of government.

The market, then, is ethically neutral. It is not immoral; only people can be immoral. Of course, there are greedy, unethical people and it is expected that some of these individuals would be in the health care industry. Nursing must not be naive, but must prepare itself for dealing with these types of people--whether this person is a physician, an owner of a hospital, or a grocer.

CHANGES IN AMERICAN HEALTH CARE

At the same time that Americans are facing the health care crisis, we are dealing with a minor revolution in the industry as a whole. First, we are squarely in the middle of an explosive growth in the service sector. The health care industry is just one example of an industry that provides service to people rather than manufactures a product.

Secondly, there is a shift away from the public vision of service to the private provision of service. The term "privatization" is used to describe this phenomenon. Health care services are included in this trend along with such services as fire protection, garbage collection and waste management. Third, there are many more choices available for health care consumers--from traditional providers to alternative techniques and approaches.

Fourth, we are seeing a shift from sickness control to wellness. Scientific discoveries are establishing clear cause and effect relationships which link behavior to disease. As a result, American consumers are more willing to ask, "Who is responsible for my wellness?" Finally, we are witnessing a revolt against what is perceived by many to be paternalism on the part of physicians. American consumers are becoming more aggressive about monitoring the care they receive. They are taking responsibility for their care--and sometimes obtaining second and third opinions before authorizing medical action.

SECURING AN ETHICAL FOUNDATION

In order to function within a changing marketplace in an ethically neutral environment, nursing must, as a profession, secure an ethical foundation for itself--under which all nurses must comply. An ethical grounding is desirable for several reasons. It provides individuals--as well as professions and whole industries--with an anchor and a set of clearly delineated limits or boundaries. An ethical foundation serves as a moral grounding, which, as we have noted, is absent from the marketplace. A moral grounding protects the neutrality of the marketplace--and also protects the integrity of those individuals who desire to serve. This way, nursing can seize opportunities in the marketplace while still acting with professionalism and a strong sense of ethics.

The American marketplace, because of its neutrality, demands responsibility and ethics. As one Nobel laureate put it: "Liberty not only means that the individual has both the opportunity and the burden of choice; it also means that he must bear the consequences of his actions and will receive praise or blame for them" (Hayek, 1960).

Within this changing environment, and with a professional commitment to ethics, American nursing must act within the political context to ensure access to care by all individuals in the U.S.--the elderly, the poor and the underinsured. Only by understanding the

economic principles of the marketplace--and its inherent moral neutrality--can the American medical profession, and the people of the U.S. begin shaping a system that allows access to medical care by all people, no matter what economic standing.

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