

Informatics: Professional Tools and Issues

THE end product of informatics is knowledge. The process of transforming data into knowledge is the crux of informatics, but it does not end there. Using the products made possible by informatics is one of the themes of this unit. This, of course, is the main opportunity in informatics, but like all opportunities, there are many challenges associated with achieving these ends.

The first three chapters in this unit are interdependent. They are structured to focus on different aspects of using and finding information, but to gain a full perspective they must be viewed as a whole. Chapter 15 provides background information that will facilitate the knowledge work that nurses, and all healthcare professionals, must do. Knowledge work requires information literacy and the use of technology, which are examined along with a brief description of the critical thinking necessary in this process. Also included in this chapter is information about the use of informatics in research and administration. Chapter 16 examines another tool for knowledge work: databases, which can enable the uncovering of knowledge hidden in the current black hole of patient

care documentation. Bibliographic databases are the subject of Chapter 17. Written by the well-known healthcare librarian Peg Allen, this chapter provides insights about the many bibliographic databases and tips for successful searching. Chapter 18 looks at the use of informatics in education and includes a discussion of the various types of CAI, how it is used, and some pointers for using it. The final chapter in this unit and this book addresses many of the issues that informatics professionals are confronting, including the benefits of a universal healthcare record, privacy concerns, and ergonomics.

Other Facets of Informatics: A Wide Impact

Linda Q. Thede, PhD, RN, BC; Susan Pierce, EdD, RN;
and Margaret (Peg) Allen, MLS-AHIP



Objectives

After studying this chapter you will be able to:

1. Interpret the nurse's knowledge worker role.
2. Interpret the relationship between information technology and information literacy.
3. Discuss the steps in information literacy.
4. Interpret the place of critical thinking in nursing.
5. Discuss the different types of knowledge-based information systems.

Informatics is valuable to healthcare in many ways. Too often it is only considered in terms of computers and information systems; the end product, data, is ignored. These data, provided by and transformed into information through informatics, support improved patient care practices. Transforming this information into knowledge, however, is not the sole province of informatics; it requires the involvement of all healthcare professionals. This participation depends on skills in **information literacy**, the appreciation, development, and use of evidence-based practice (EBP), the use of knowledge-based systems, and the use of special purpose software. Not all healthcare workers need specialized skills in each area, but all need to have an appreciation of how each area contributes to the goal of improved patient care.



Nurses and Healthcare Workers as Knowledge Workers

Today, the changes in the healthcare environment are demanding more information management tasks from nurses and other healthcare professionals than ever before. These changes are rooted in changes in society and healthcare. In developed countries, people over 65 are the fastest growing group; the U.S. population is more diverse than ever before; world population is increasing; and incidences of chronic illness and infectious disease are increasing (American Association of Colleges of Nursing, 1998). Additionally, today's ease of travel increases the likelihood of patients presenting with unfamiliar diseases, and the threat of bioterrorism creates an environment in which one must

constantly be alert to a sudden onrush of patients presenting with similar infectious symptoms. Furthermore, the characteristics of the healthcare consumer have changed. No longer content to be passive patients, consumers now have easy Internet access to medical knowledge. This has changed consumer expectations about healthcare.

Healthcare workers must provide care to diverse clients in various settings, demonstrate accountability for quality of care and cost containment, and become life-long learners in response to the information explosion. All of these changes require nurses and other healthcare workers to acquire and use previously unknown healthcare knowledge—information that must be located, evaluated, synthesized, and applied. Information needs can be related to a model developed by Graves and Corcoran (1988), where sources of information for a clinical decision are shown as coming from both patient-specific data found in the patient record, from domain knowledge, expert personal (or colleague) knowledge, and knowledge found in published information (Figure 15-1).

The frequency and use of information serve as evidence to administrative officials and other healthcare disciplines of the essential nature of the information needed to support nursing practice. Identifying the types of information used contributes to recognition of the specific information resources needed at the point of care and the types of client problems encountered in specific care settings. Nurses must become aware of their information needs and be active in meeting them. This involves seeking out research information to make clinical practice decisions and developing a value for the use of this information. This value is essential for engagement in evidence-based-practice (Pierce, 2000).

Information systems that facilitate access to knowledge resources at the point of care are a first step in meeting practice information needs. These may consist of:

▼ **Decision-support systems**

- ▼ Bibliographic databases that provide access to published literature including original research and reviews of individual research, as well as standard care plans, critical paths, practice guidelines, protocols or other tools designed to enhance patient care

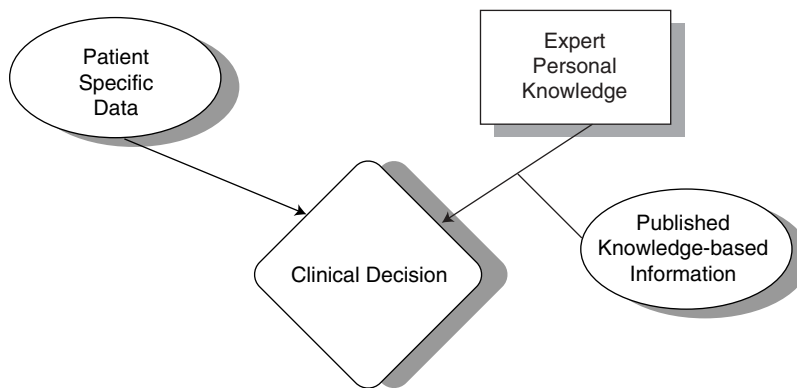


Figure 15-1 • Data use in clinical decisions. Adapted from Graves, J., & Corcoran, S. (1988). Design of nursing information systems: conceptual and practice elements. *Journal of Professional Nursing*, 4 (3), 168–177.

- ▼ Factual databases that provide information about drugs, diagnostic tests, and treatments, as well as resource directories

Access in the care setting is vital; without convenient access to information, nurses and other health professionals usually rely on either personal or colleague “expert” knowledge, which may or not be current or valid.



Information Literacy

Having additional sources of information easily available is helpful, but these sources cannot provide all the knowledge that a nurse needs. To meet these knowledge-based information needs, healthcare workers need information literacy, which can be described as the ability to define a need for information and the possession of the skills to locate, evaluate, and synthesize information to meet this need. It was recognized by the American Association of Colleges of Nursing (1999) as one of the fourteen essential content strands for nursing education programs. Being information literate is an expected competency for the beginning or experienced nurse (American Nurses Association, 2001) because it is through application of the information literacy process that research-based information is acquired and used (Display 15-1). In addition, information literacy skills are necessary to continue life-long learning.

INFORMATION TECHNOLOGY

Information technology skills are necessary to support the application of information literacy. Information literacy is concerned with information seeking, access, content, communication, analysis, and evaluation, whereas information technology is concerned with an understanding of the technology and skills necessary for using it productively. Information technology skills require three kinds of knowledge: current skills, foundational concepts, and intellectual abilities (Committee on Information Technology Literacy, 1999). Current skills imply the ability to use up-to-date computer applications such as desktop applications and search engines, as well as the ability to understand the underlying principles of computers, networks, and information. These two skill areas provide insight into the abilities as well as the limitations of this technology in information man-

Display 15-1 • INFORMATION LITERACY BEHAVIORS

People who are information literate:

- Access information efficiently and effectively.
- Evaluate information critically and competently.
- Use information accurately and creatively.

Adapted from American Library Association (1998). Information literacy standards for student learning. In *Information Power: Building Partnerships for Learning*. Retrieved May 28, 2002 from http://www.ala.org/aasl/ip_nine.html.

TABLE 15-1 • Information Literacy Process

Step	Activity
1	Become aware of the need for information
2	Develop a searchable question or statement, then plan and implement the search
3	Retrieve the needed information
4	Organize, synthesize, and evaluate the information
5	Apply knowledge gained to patient care and evaluate results

Adapted from Elfrink, V., Bakken, S., Coenen, A., McNeil, B., & Bickford, C. (2001). Standardized nursing vocabularies: A foundation for quality care. *Seminars in Oncology Nursing*, 17(1), 18–23.

agement. Additionally, they provide the raw material for adapting to new information technology. The ability to apply information technology to problem solving requires intellectual capabilities that encompass abstract thinking about information and the ability to manipulate it to produce new understanding. Along with information literacy, these skills enable people to cope with unintended and unexpected problems when they occur.

STEPS IN INFORMATION LITERACY

Information literacy is a five-step process. It is based on the principles of information (library) science and is adaptable to all disciplines (American Library Association, 1989). These steps range from discovering a need for information to applying knowledge in practice (Table 15-1).

Discovering a need for information—the first step in this process—involves the nurse’s developing recognition of when and how information can be used to improve the quality and cost-effectiveness of patient care. From this awareness comes identification of specific needs for more information to solve a problem. The next step involves planning how to obtain this information. This step involves two procedures. First, the problem that needs to be resolved must be formally identified and clearly stated; then, a search plan for finding this information must be devised. For a search to be successful, it is important to frame the searchable clinical question adequately so that it defines and describes the problem to be resolved.

To illustrate, a 16-year-old girl has been admitted to the pediatric unit because of complaints of headaches that have increased in frequency for 4 months. Organic causes have been ruled out and medications she has taken either have unpleasant side effects or offer little relief. To find information to meet the specialized needs of this client, the nurse must determine three variables or elements. The use of a template such as the one in Figure 15-2 is helpful at this stage. The first variable identified is that of outcome—what change in the patient’s status is desired? In this example, this nurse has identified that the desired outcome is a reduction in the frequencies of tension headaches. She or he has decided to investigate the effects of structured relaxation on tension headaches. The desired population is identified as girls 13 to 19 years old.

With this template completed, the nurse is ready to plan the search strategies using these three variables as key words for the search. The nurse must now think about how to use and combine the terms to yield the most effective results and then which literature databases would be most useful for the search. The greater the nurse’s proficiency

What is the effect of	Structure relaxation X Intervention (Predictor Variable)
On	Reducing the frequency of tension headaches Given Characteristic (Outcome)
For	Females ages 13 to 19 Specific group of patients (Patient Characteristics)

Figure 15-2 • Example of use of a template to develop a searchable question.

in developing search strategies, the greater the value will be of the information retrieved. Search competency in combining question variables into search terms is critical in identifying the best available current information that can be used to guide clinical decision-making. A health sciences librarian can be very helpful with this and the next step (Pike, 2001; Pond, 1999).

With the question developed and the search strategy planned, the nurse is prepared for step three, which is locating and retrieving the needed information. This step combines the skills of information technology with those of information literacy. Selecting appropriate databases among the many available for searching is the first part in locating needed information. (Chapter 17 addresses selecting and searching bibliographic databases.) Using several bibliographic databases is helpful to ensure that the resources are varied and derived from different viewpoints.

After a search has been completed and the necessary resources have been identified, they must be retrieved. The nurse may find some of the resources in online journals, some of which are free, but others require a paid subscription. Additionally, a few print journals make some or all of their articles from back issues freely available on the Internet. Others may be available online to subscribers or as part of the full-text databases that are licensed by library systems and healthcare providers for access by their authorized users. Many resources, however, are still found in a library. If the library does not have the resource, it may be available through interlibrary loan.

When the identification and retrieval of information are complete, appraise the information resources for their relevance to practice. During this step, the literature is read to find and organize relevant information and to establish the accuracy and comprehensiveness of the information. For help with evaluation, see articles such as “How to Assess a Research Study” (Rankin & Esteves, 1996) and research-based texts such as *Knowledge for Healthcare Practice: A Guide for Using Research Evidence* (Brown, 1999). When the evaluation of the information is complete, the information must be synthesized and translated into an action plan.

The final step of the information literacy process is the actual application of this plan. Administrative support may be needed at this point, especially when it is necessary to develop new procedures before implementation. The results of the intervention must also be documented. If it is to be used with multiple patients, the best plan is to document with an electronic database, either an established information system or a database from one of the office suites. This will allow easy retrieval of the data for further decision-making and provide evidence to increase the body of nursing knowledge.

PLUSES FOR INFORMATION LITERACY

Synthesizing the results of a literature search is an important consideration for improving the quality of patient care and must be the first step in any research study. Research has shown that the information provided by literature searches changes clinical decisions (King, 1987). Other researchers have found that when searches were done early during a patient's hospitalization, the results shortened the length of stay (Klein, Ross, Adams, & Gilbert, 1994). A study conducted in the United Kingdom determined that information from searches was usefully applied not only to immediate clinical decisions, but also to the evaluation of practice outcomes and the design of practice guidelines and educational offerings (Urquhart & Davies, 1997). Studies such as these support Joint Commission on the Accreditation of Healthcare Organizations (JCAHO) and other healthcare accreditation requirements for access to knowledge-based information resources. Information literacy is essential for EBP.

CRITICAL THINKING

Information literacy is supported by critical thinking. Critical thinking is, however, a difficult concept to define. It is a little like good nursing care; we know it when we see it, but defining it in objective terms is complex. Consequently, it has been defined using several different perspectives. Some say it is thinking *about* thinking *while* you are thinking to facilitate more precise, fair, and accurate thinking (Paul, 1988 quoted in Wilkinson, 2000). Others believe that it is thinking that is purposeful, that is goal directed, and that requires the use of cognitive strategies to increase the probability of a desired outcome. Most would agree that it is rational thinking that recognizes a need for more information, is without bias, and with a goal to reach the most accurate conclusion possible. It is supported by information literacy. Breivik (1991, p. 226) related information literacy to critical thinking stating, "In this information age, it does not matter how well people can analyze or synthesize if they do not start with an adequate, accurate, and up-to-date body of information, they will not come up with a good answer."

Critical thinking is not the acquisition and retention of information, but a plan to acquire, analyze, evaluate, synthesize, and apply such information (Scriven & Paul, n.d.). It has two components: the skill set necessary to process and generate information and the intellectual commitment to use those skills to guide behavior. Critical thinkers approach a problem from multiple angles, but always in a logical manner. A vital part of critical thinking includes knowing when one needs more information, developing, and applying a plan for acquiring this information, and using this plan to generate knowledge. This plan can encompass searching for information in established databases, creating a database for the purpose of creating information and knowledge, or both. Either way, the result is directed toward improved outcomes based on information and knowledge.

KNOWLEDGE GENERATION

Integrating the published literature with **aggregated data** from computerized clinical information systems creates new knowledge. Knowledge generation has two parts. In terms of clinical informatics, knowledge generation refers to knowledge developed from turning nursing data into information and interpreting that to reach a new conclusion. From

the research perspective, knowledge generation starts with the application of the steps of information literacy—identifying, retrieving, appraising, and synthesizing nursing literature to solve nursing problems in new and more useful ways. Recognition of the nurse's role as a knowledge worker evolves from understanding both parts and their relationships to nursing practice. Information literacy and informatics are keys to knowledge work and generation.

KNOWLEDGE DISSEMINATION ACTIVITIES

When data are changed into information and information is transformed into knowledge by nurses, such conclusions only maintain value if they are shared among the members of the profession to have an impact across practice settings. Knowledge sharing allows nurses to influence not only nursing but also to drive health policy and influence interdisciplinary health practices. The computer is a tool that facilitates knowledge dissemination in many ways. In a broad sense, raw data can be transferred between settings to facilitate use in different ways by different nurse groups. For example, spreadsheets and databases are software applications used to “crunch” new data or cluster it for interpretation; e-mail can be used to share these files between users.

After data have been transformed into information and interpreted, the findings can be published for dissemination across the profession. This can be accomplished by using desktop software such as:

- ▼ Word processing to create a manuscript
- ▼ Presentation and graphics programs to develop drawings or create a presentation or poster presentation
- ▼ Spreadsheets to create graphs
- ▼ Web development software to create Web documents and databases

Whether information is shared between two nurses or more widely across other members of the profession, information technology is helpful.



Informatics and Clinical Practice

Knowledge generation and knowledge dissemination activities are an integral part of all nursing roles. Few nurses will become informatics nursing specialists, but all nurses need an awareness and general understanding of the potential of informatics. The nurse as a knowledge worker should embrace those activities and processes that are role appropriate.

EVIDENCE-BASED PRACTICE

The emphasis on outcomes and efficiency in the healthcare environment has changed the focus of clinical information systems from data gathering to the use of data (i.e., evidence) both from the literature and clinical documentation. The outcome emphasis has also contributed to the desire for best practices derived from EBP to increase the likelihood of efficacy of care.

“Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The

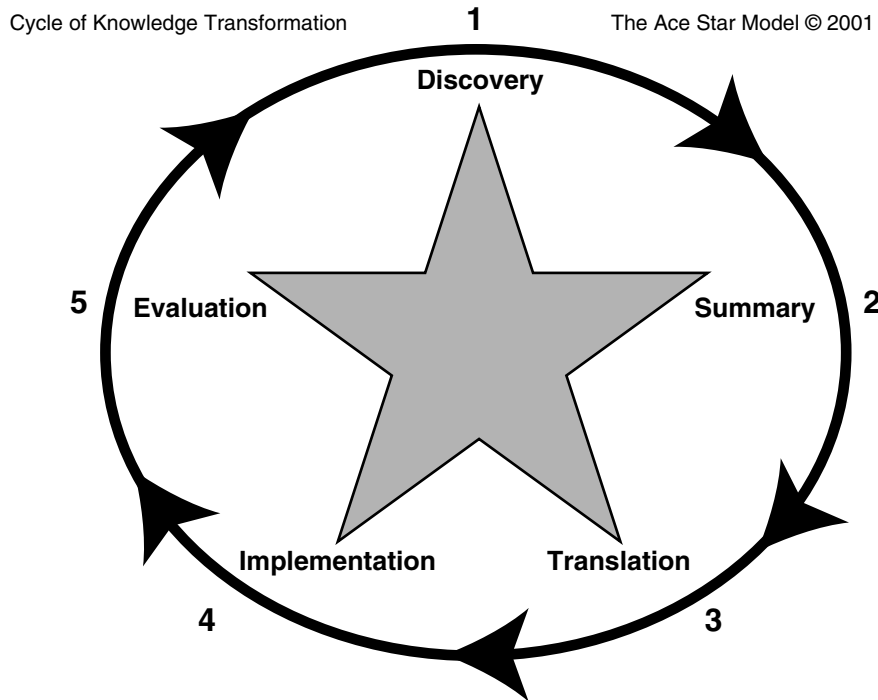


Figure 15-3 • ACE star model of evidence-based practice—the cycle of knowledge transformation. Used with permission from Stevens, K. R. (2001). ACE star model of EBP: The cycle of knowledge transformation. Academic Center for Evidence-based Practice. Retrieved June 4, 2002 from <http://www.acestar.uthscsa.edu>.

practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise we mean the proficiency and judgment that individual clinicians acquire through clinical experience and clinical practice... By best available external clinical evidence we mean clinically relevant research, often from the basic sciences of medicine, but especially from patient centered clinical research into the accuracy and precision of diagnostic tests (including the clinical examination), the power of prognostic markers, and the efficacy and safety of therapeutic, rehabilitative, and preventive regimens.” (Sackett, Gray, Haynes, & Richardson, 1996, p. 71)

The Star Model of EBP seen in Figure 15-3 (Stevens, 2001) depicts EBP as a cyclical process of moving knowledge from original research into patient care. In the first step of this process, original research studies are synthesized to produce an evidence summary. The goal of an evidence summary is to provide the best evidence of effectiveness by summarizing an entire body of studies. The process involves identifying pertinent research evidence through a critical appraisal of original studies using defined questions. The evidence is then translated into practice guidelines for use in the clinical setting, and it is often combined with clinical expertise to produce a set of recommendations of best practice. These best practices are then implemented into practice and evaluated in terms of

patient outcomes, health status, efficiency, satisfaction, and economic factors. Conclusions from the evaluation stage may lead to more research.

EBP is about *using* rather than *doing* research. It is a tool for clinical decision making aimed at improving healthcare delivery. Its goal is to bridge the gap between research and clinical practice. In EBP, clinical observations must be systematically recorded without bias and synthesized with original research that has been subjected to a systematic review.

KNOWLEDGE-BASED DECISION SUPPORT SYSTEMS

A nurse, like all other healthcare professionals, is primarily a knowledge worker. To practice effectively, nursing must be supported in this role. Snyder-Halpern, Corcoran-Perry, and Narayan (2001) described nurses as data gatherers, information users, knowledge builders, and knowledge users. The nurse collects clinical data, structures these data, and transforms them into information that is interpreted with the nurse's specialty information and used in clinical decision making. When clinical data are collected and used to create knowledge, the nurse functions as a knowledge builder. In the knowledge user role, the nurse combines her specialty knowledge with the clinical data as part of both information use and knowledge building. These functions are supported within the clinical area by informatics.

When clinical data are made available and combined with synthesized research, knowledge-based systems can be created. A knowledge-based decision system is one that assists users in making clinical decisions. These systems range from those that assist a user to formulate a problem and consider the alternative courses to those that combine user inputs with a knowledge base from experts to make suggestions for courses of action. Little agreement exists about the appropriate terminology for this type of system; terms such as **decision support**, **expert system**, and **artificial intelligence** are often used interchangeably (Turley, 1993). If a distinction is to be made, it is generally based on the part played by the computer, with decision support systems having the greatest user input and the smallest role for the computer, and artificial intelligence having the greatest computer role and smallest user input. Theoretically, a decision support system will make suggestions based mostly on user input, whereas the suggestions of an expert system will have the recommendation and authority of an expert. Artificial intelligence software may or may not be programmed to act on input without user guidance. In reality, these distinctions often become blurred, and for the purpose of aiding the clinician, are probably not important. How these systems can help the practitioner is what is really important. In this chapter, we consider a decision support system as one that allows a user to consider alternatives; an expert system is one that uses a knowledge base to make suggestions.

Decision Support System

The purpose of a decision support system is to extend decision-making abilities, not replace them. There are different approaches to decision-support, each with a different application. One approach is to assist the user in formatting the problem. This type of software facilitates the identification, reduction, and summarization of information. Spreadsheets are excellent tools for this task. They allow the essentials in a decision to be formatted in such a way that the user can play "what if" by changing data in cells and viewing the result. Spreadsheets also include built in functions, such as basic statistical tools and financial formulas, and a sophisticated tool to allow users to rotate rows and

columns to see different summaries of the source data. They also facilitate the production of graphs to allow the user to visualize the elements of a problem. Databases are also useful in formatting data and can produce reports for different groups about the same characteristic.

Making a decision involves analyzing and synthesizing known information while guessing at unknown conditions. An analysis approach to decision-support is useful in these situations. When using this type of software, a user is asked to identify all the variables involved and to assign a specific weight to each one (Meehan, 1996). These weights are then used to determine priorities.

Another type of decision-support software is an optimization program. Users input all the facts about a situation into the software, which will then generate a number of possible solutions (McHugh, 2001). The program then simulates the implementation of the various solutions, allowing the user to see the results and select the best solution based on calculated outcome. Scheduling software is often based on this model. The usefulness of this type of software depends on the user's being able to identify all the impinging variables.

EXPERT SYSTEMS

The purpose of an expert system is to evaluate data and make a recommendation that an expert would make, given the same information and situation. The expert system accomplishes this by combining inputs from clinicians with its knowledge base in a way that mimics the reasoning of a human expert. Expert systems have three overall parts: a database or knowledge base that contains the information needed for the domain of the system; a model base, or inference engine, which includes statistical and analytical methods for processing the data; and a user interface, or procedures for use in interacting with the system (Brennan, 1985). Several expert systems have been developed in medicine that focus on the diagnosis of disease (Pillar & Golumbic, 1993).

There have been several expert systems developed in nursing such as the Creighton Online Multiple Modular Expert system (COMMES) developed at Creighton University and the Computer-Aided Nursing Diagnosis and Intervention (CANDI) system developed at the University of Michigan. None of these has been widely used in clinical settings. Several problems remain inherent in developing an expert system for a domain as large as nursing. One difficulty is the existence of a multitude of conceptual and philosophical models that are different and potentially incompatible (Ozbolt, 1995). Another difficulty is the development of a knowledge base in nursing; this involves identifying and defining the phenomena that comprise nursing and then determining how they are related.

Nevertheless, some systems that work only within limited areas have been developed and successfully tested. One, in Thailand, assists nurses in making nursing diagnoses in the care of mechanically ventilated neonates (Jirapaet, 2001). Another system that supports family physicians and nurse practitioners in the management of patients with outer eye complaints has been found to perform nearly as well as an experienced ophthalmologist (Martin, 2001). This system is being distributed to primary care for use in managing this specific type of complaint.

As can be seen with these two examples, expert systems perform best in a situation in which the "depth of knowledge is greater than the breadth of knowledge, and where the content is specific and knowledge well understood. In these areas rules can be applied to

restricted knowledge domains” (Turley, 1993). As standardized nursing terminologies become more common in information systems, it will become possible to use not only expert knowledge, but to combine it with data from actual clinical practice.



Informatics and Research

Research is integrated and aided by informatics. Most information management needs in research are met by adapting word processing, spreadsheet, statistical package, database, or presentation software. There are, however, some special purpose software packages that can facilitate research, such as the reference management tools discussed in Chapter 17. Additionally, electronic literature searches are part of a researcher’s tool box. All these tools are discussed in other chapters.

PREPARING AND ANALYZING DATA

Software for analyzing quantitative data is discussed in Chapter 11. Qualitative research, however, requires many different tasks and approaches, necessitating several different types of software. Deciding which software package to use involves investigating different types of software and obtaining a detailed description of what each software application does (or does not do). There are software tools that assist in recording, analyzing, and transcribing audio and video data; there are others that specialize in the collection, analysis, and management of observational data (QDA Resources, 2002). Text analysis is supported by three different types of software: text retrievers, code-and-retrieve packages, and theory-building software (Fielding, 1994). Text retrievers use keywords from the data to recover data that is determined pertinent to each category. A code-and-retrieve package facilitates dividing text into chunks, attaching code to the chunks, and displaying all the chunks with a given code. Theory building software usually includes the features of code-and-retrieve, but then it assists in making connections between codes for the purpose of formulating propositions.

RESEARCH USING THE WORLD WIDE WEB

The use of the Internet and the World Wide Web (WWW) has vastly increased in the last few years. The Internet and the WWW are natural additions to a researcher’s tools. The WWW lends itself well to survey research, although it has also been successfully used in qualitative research through electronic mailing lists, forums, or a Web page inviting participants to respond in narrative format to questions. There are numerous advantages to using the WWW. The most obvious is the savings involved in not having to print and mail questionnaires. One study found a 38% savings over mail-based methods (Schleyer & Forrest, 2000). The pool of possible study subjects is also large. This worldwide pool could increase the generalizability of the research (Thomas, Stampler, Lafreniere, & Dumala, 2000), even though one study found differences in disease activity between a WWW-based population and patients surveyed in a clinical practice. In the study, the patients selected from the WWW were sicker than those in the clinic population (Soetikno, Mrad, Pao, & Lenert, 1997). Another advantage is the elimination of the laborious step of entering data. Data entered into WWW forms can be saved and moved to an application package, such as a database or spreadsheet, and then exported to a data analysis package.

One of the disadvantages of using the WWW is the possibility of multiple submissions of the survey by one person, although this is also possible with mailed surveys that do not have an identifying number. Additionally, the pool of study subjects is of necessity limited to those subjects who have Internet access. The demographics of this group tend to show a higher level of education and income. Other difficulties can be technical, but as the WWW and browsers for use in it have been upgraded, these difficulties have decreased. They can be kept to a minimum by designing Web pages that are accessible by older versions of browsers, particularly if study subjects are sought in less developed countries.

Creating a successful WWW survey often depends on the design of both the site and the survey. Using expertise in website design and letting respondents know the expected time required to complete the survey are good practices (Thomas, et al., 2000). The use of a security expert to protect respondent anonymity as well as to inform users of the privacy policies is also helpful. Marketing is often done using mailing lists to publicize the study. Before selecting a list, it should be monitored to ascertain that it is active. Asking organizations with web pages who have an interest in the topic of the research for publicity on their web page is another excellent marketing tool.



Informatics and Administration

One of the primary roles of nursing administration is the management of both business and clinical information. This involves many tasks such as staffing, budgeting, reporting, and supporting the clinical practitioner. Fluency in the use of desktop application programs can assist in many administrative tasks. Other more specialized software packages can assist nurse managers.

PERSONNEL MANAGEMENT

Personnel management is one of the most important jobs a nurse manager has. Nursing personnel, staffing, and employment data can be managed with personnel management systems, which generally include four categories: personnel profiles including demographic data; daily work schedule and time-off requests; payroll data; and educational and skill qualifications as well as licensure information. They can also produce qualitative data useful in assessing the skills and qualifications of nursing personnel.

Staffing is one of the most difficult decision-making roles a nurse manager fulfills. To try to arrange staff scheduling needs accurately, patient acuity systems have been developed. Most patient acuity systems generate data to calculate the number of full-time equivalents needed for a nursing unit (Saba, Johnson, & Simpson, 1994). Some look at self-care deficits such as those related to activities of daily living, treatments, medications, and patient teaching. Another approach, known as time-based activities, is to assign each task a time based on hospital-specific, predetermined measures. Another method is the use of specified nursing diagnoses based on patient dependency. This approach uses decisions made by the primary nursing care provider. All depend on accurate data input.

PATIENT CARE MANAGEMENT

Most patient care systems are subsystems of larger information systems (Saba, Johnson, & Simpson, 1994). Some examples of these systems are nursing care planning, quality assurance, inventory systems, and discharge planning systems. They all add to the ability of a nurse manager to improve patient care.

Nursing care planning systems have been available for the last 25 years. Several approaches are used in such systems (Saba, Johnson, & Simpson, 1994). The older traditional approach generates a plan based on medical diagnoses. Newer systems of this type may even generate the nursing diagnoses commonly seen with a given medical diagnosis. A third approach is to base care planning on the nursing process. Advantages of the latter type of system include improved quality of information, reduced errors, and increased interdepartmental communication. A major disadvantage for a nursing process-based approach is development time. Schemes must be developed for each phase of the process.

Quality assurance systems can evaluate the quantity and quality of nursing services (Saba, Johnson, & Simpson, 1994). They use data from sources such as patient records, nursing care plans, and patient observations and can compare nursing performance against predetermined goals to facilitate making quality improvements. Inventory systems assist in the task of ordering, dispensing, and billing for supplies. Discharge planning systems include items such as a summary of the patient's learning needs at discharge, requirements for exercise and physical therapy, and a medication and problem list. They provide an excellent report for admission of a patient to home care or to a long-term care facility.

PROJECT MANAGEMENT

Project management is a task faced by both researchers and administrators. Many software programs exist that can assist in this task. They generally fall into one of three categories: bar charts (Gantt), critical path method (CPM), and program evaluation review technique (PERT). A Gantt chart uses a bar representing the amount of time each task will take placed on a time line for the dates when this task is scheduled. CPM and PERT are very similar (Project Management Tools, n.d.). They use a graphic representation called a project network or CPM diagram to visualize the interrelationships of project elements and the time element determined in advance for each activity. They both lead to a critical path. The differences rest in how they treat the time for each activity and their focus. PERT's main focus is the time variable, whereas the focus of CPM includes an analysis of the time/cost trade-off.

INFORMATICS AND EDUCATION

In the education environment, faculty and student can use informatics in different ways to enhance the teaching-learning process. These applications include the development of both information literacy and technology literacy. For a thorough understanding of the integration of informatics into nursing education, refer to Chapter 18.



Summary

The pervasiveness of technology and the importance of information management in nursing cannot be overemphasized. Information literacy facilitates the access and use of re-

search in guiding practice. Using evidence to validate practice provides nurses with a means for accountability and for clinical decision making. Generation and dissemination of new understanding increase the knowledge base of the profession and define the value of nursing care in developing positive client outcomes. The nurse's ability to manipulate information assures the place of the profession in direct care delivery and healthcare policy making.

Many needs in both research and administration can be met by desktop applications, but other tools are available to meet more specialized needs, such as qualitative research. Many of these systems are often part of a total information system that assists the nurse manager in personnel management and in improving patient care.

connection

For definitions of bolded key terms, visit the online glossary available at <http://connection.lww.com/go/thede>.

CONSIDERATIONS AND EXERCISES

1. Identify and discuss areas in clinical practice that demand knowledge work.
2. Describe the relationship between information technology and information literacy.
3. Employ the steps in information literacy used to solve a clinical problem.
4. Describe your use of critical thinking in a clinical situation.
5. Identify the differences between the various types of knowledge-based systems.
6. Write two or three paragraphs illustrating the use of informatics in administration and research.
7. One of the items in the list of Considerations and Exercises at the end of Chapter 1 asked you to "Think of the act of giving a medication. What data would you tell a systems developer was needed for this act? How should it be processed?" You were asked to save this answer and compare it to an answer you write after studying Chapter 15. Now that you've read information about an expert system, what would you now like to have included in this system?

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