SECTION I

Building Blocks of Nursing Informatics

Nursing professionals are information-dependent knowledge workers. As health care continues to evolve in an increasingly competitive information marketplace, professionals, the knowledge workers, must be well prepared to make significant contributions by harnessing appropriate and timely information. Nursing informatics (NI), a product of the scientific synthesis of information in nursing, uses concepts from computer science, cognitive science, information science, and nursing science. NI continues to evolve as more and more professionals access, use, and develop the information, computer, and cognitive sciences necessary to advance nursing science for the betterment of patients and the profession. Regardless of future roles, it is clear that nurses need to understand the ethical application of computer, information, and cognitive sciences to advance nursing science.

To implement NI one must view it from the perspective of the current healthcare delivery system and specific, individual organizational needs, while anticipating and creating future applications in both the healthcare system and the nursing profession. Nursing professionals should be expected to discover opportunities to use NI; participate in the design of solutions; and be challenged to identify, develop, evaluate, modify, and enhance applications to improve patient care. This book is designed to provide the reader with the information and knowledge needed to meet this expectation.

Section I presents an overview of the building blocks of NI: nursing, information, computer, and cognitive sciences. Also included in this section is a chapter on ethical applications of healthcare informatics. This section lays the foundation for the remainder of the book.

Chapter 1 describes nursing science and introduces the Foundation of Knowledge model as the conceptual framework for the book. In this chapter, a clinical case scenario is used to illustrate the concepts central to nursing science. A definition of nursing science is also derived from the American Nurses Association definition of nursing. Nursing science is the ethical application of knowledge acquired through education, research, and practice to provide services and interventions to patients to maintain, enhance, or restore their health, and to acquire, process, generate, and disseminate nursing knowledge to advance the nursing profession. Information is a central concept and health care's most valuable resource. Information science and systems, together with computers, are constantly changing the way healthcare organizations conduct their business. This will continue to evolve.

To prepare for these innovations, the reader must understand fundamental information and computer concepts, covered in Chapters 2 and 3, respectively. Information science deals with the interchange (or flow) and scaffolding (or structure) of information and involves the application of information tools for

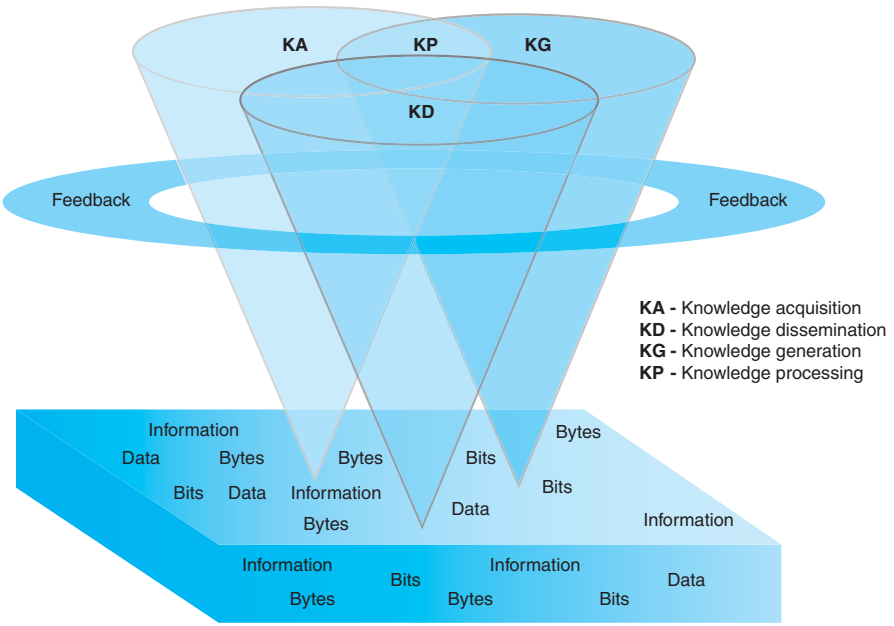
solutions to patient care and business problems in health care. To be able to use and synthesize information effectively, one must be able to obtain, perceive, process, synthesize, comprehend, convey, and manage the information. Computer science deals with understanding the development, design, structure, and relationship of computer hardware and software. This science offers extremely valuable tools that, if used skillfully, can facilitate the acquisition and manipulation of data and information by nurses, who can then synthesize these into an ever-evolving knowledge and wisdom base. This not only facilitates professional development and the ability to apply evidence-based practice decisions within nursing care, but if disseminated and shared, can advance the profession's knowledge base. The development of knowledge tools, such as the automation of decision making and strides in artificial intelligence, has altered the understanding of knowledge and its representation. The ability to structure knowledge electronically facilitates the ability to share knowledge structures and enhance collective knowledge.

As discussed in Chapter 4, cognitive science deals with how the human mind functions. This science encompasses how people think, understand, remember, synthesize, and access stored information and knowledge. The nature of knowledge, how it is developed, used, modified, and shared, provides the basis for continued learning and intellectual growth.

Chapter 5 focuses on ethical issues associated with managing private information with technology and provides a framework for analyzing ethical issues and supporting ethical decision making.

The material within this book is placed within the context of the Foundation of Knowledge model (shown in Figure I-1 and periodically throughout the book, but more fully introduced and explained in Chapter 1). The Foundation of Knowledge model is used throughout the text to illustrate how knowledge is used to meet the needs of healthcare delivery systems, organizations, patients, and nurses. It is through interaction with these building blocks—the theories, architecture, and tools—that one acquires the bits and pieces of data necessary, processes these into information, and generates and disseminates the resulting knowledge. Through this dynamic exchange that includes feedback, one continues the interaction and use of these sciences to input or acquire, process, and output or disseminate generated knowledge. Humans experience their environment and learn by acquiring, processing, generating, and disseminating knowledge. When one then shares (disseminates) this new knowledge and receives feedback on the knowledge they have shared, the feedback initiates the cycle of knowledge all over again. As one acquires, processes, generates, and disseminates the knowledge, they are motivated to share, rethink, and explore their own knowledge base.

FIGURE I-1 Foundation of Knowledge model.



SOURCE: Designed by Alicia Mastrian.

This complex process is captured in the Foundation of Knowledge model. Reading the chapters in Section I, the reader is challenged to think about how the model can help them to understand the ways in which one acquires, processes, generates, disseminates, and then receives feedback on their new knowledge of the building blocks of NI.

CHAPTER 1

Nursing Science and the Foundation of Knowledge

Kathleen Mastrian and Dee McGonigle

Objectives

1. Define nursing science and its relationship to various nursing roles and nursing informatics.
2. Introduce the Foundation of Knowledge model as the organizing conceptual framework for the book.
3. Explain the relationship among knowledge acquisition, knowledge processing, knowledge generation, knowledge dissemination, and wisdom.

Key Terms

Borrowed theory
Building blocks
Clinical databases
Clinical practice guidelines
Conceptual framework
Data
Data mining
Evidence
Feedback
Foundation of Knowledge model
Information
Knowledge
Knowledge acquisition
Knowledge dissemination
Knowledge generation
Knowledge processing
Knowledge worker
Nursing informatics
Nursing science
Nursing theory
Relational database
Transparent wisdom

Nursing informatics is defined as the combination of **nursing science**, information science, and computer science. This chapter focuses on nursing science as one of the **building blocks** of nursing informatics, although in this text the traditional definition of nursing informatics is extended to include cognitive science as one of the building blocks. The **Foundation of Knowledge model** is also introduced as the organizing **conceptual framework** of this text, and the model is tied to nursing science and the practice of nursing informatics. To lay the groundwork for this discussion, a patient scenario is first presented.

Tom H. is a registered nurse who works in a very busy metropolitan hospital emergency room. He has just admitted a 79-year-old man whose wife brought him to the hospital because he is having trouble breathing. Tom immediately clips a pulse oximeter to the patient's finger and performs a very quick assessment of the patient's other vital signs. He discovers a rapid pulse rate and a decreased oxygen saturation level in addition to the rapid and labored breathing. Tom determines that the patient is not in immediate danger and that he does not require intubation. Tom focuses his initial attention on easing the patient's labored breathing by elevating the head of the bed and initiating oxygen treatment; he then hooks the patient up

to a heart monitor. Tom continues to assess the breathing status as he performs a head-to-toe assessment of the patient that leads to the nursing diagnoses and additional interventions necessary to provide comprehensive care to this patient.

Consider Tom's actions and how and why he intervened as he did. Tom relied on the immediate **data** and information that he acquired during his initial rapid assessment to deliver appropriate care to his patient. Tom also used technology (pulse oximeter and heart monitor) to assist with and support the delivery of care. What is not immediately apparent, and some would argue is transparent (done without conscious thought), is the fact that during the rapid assessment, Tom reached into his **knowledge** base of previous learning and experiences to direct his care, so that he could act with **transparent wisdom**. He used both **nursing theory** and **borrowed theory** to inform his practice. Tom certainly used nursing process theory, and he may have also used one of several other nursing theories, such as Rogers's science of unitary human beings, Orem's theory of self-care deficit, or Roy's adaptation theory. In addition, Tom may also have applied his knowledge from some of the basic sciences, such as anatomy, physiology, psychology, and chemistry, as he determined the patient's immediate needs. Information from Maslow's hierarchy of needs, Lazarus's transaction model of stress and coping, and the health belief model may also have helped Tom practice professional nursing. He gathered data, then analyzed and interpreted that data to form a conclusion—the essence of science. Tom has illustrated the practical aspects of nursing science.

The American Nurses Association (2003) defines nursing in this way: "Nursing is the protection, promotion, and optimization of health and abilities, prevention of illness and injury, alleviation of suffering through the diagnosis and treatment of human response, and advocacy in the care of individuals, families, communities, and populations" (p. 6). Thus, the focus of nursing is on human responses to actual or potential health problems and advocacy for various clients. These human responses are varied and may change over time in a single case. Nurses must possess the technical skills to manage equipment and perform procedures; the interpersonal skills to interact appropriately with people; and the cognitive skills to observe, recognize, and collect data, analyze and interpret data, and reach a reasonable conclusion that forms the basis of a decision. At the heart of all of these skills lies the management of data and information. This is a definition of nursing science as the ethical application of knowledge acquired through education, research, and practice to provide services and interventions to patients to maintain, enhance, or restore their health and to acquire, process, generate, and disseminate nursing knowledge to advance the nursing profession.

Nursing is an information-intensive profession. The steps of using information, applying knowledge to a problem, and acting with wisdom form the basis of nursing practice science. **Information** is data that are processed using knowledge.

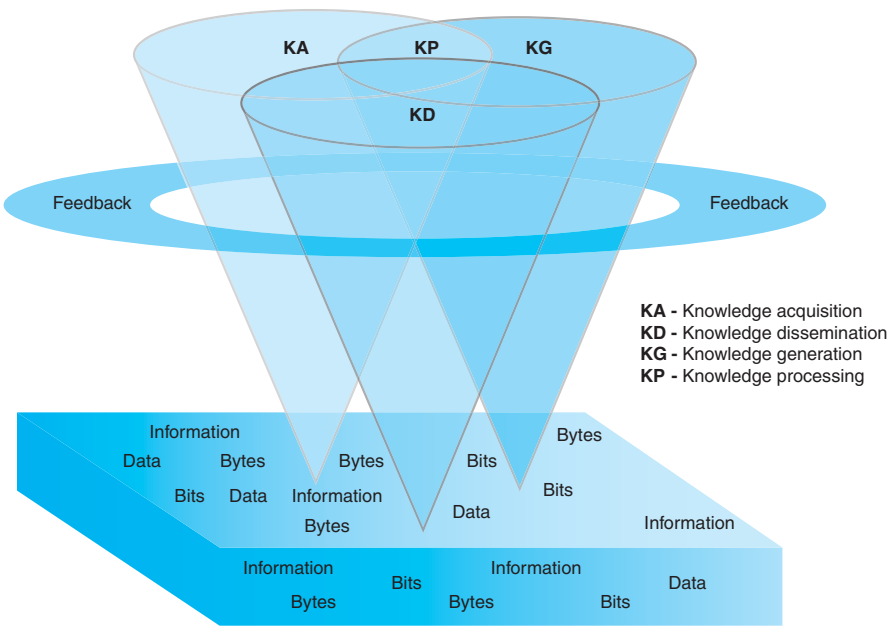
For information to be valuable, it must be accessible, accurate, timely, complete, cost effective, flexible, reliable, relevant, simple, verifiable, and secure. Knowledge is the awareness and understanding of a set of information and ways that information can be made useful to support a specific task or arrive at a decision. In the case example, Tom used accessible, accurate, timely, relevant, and verifiable data and information. He compared that data and information to his knowledge base and previous experiences to determine which data and information were relevant to the current case. By applying previous knowledge to data, he converted data into information and information into new knowledge, an understanding of what nursing interventions were appropriate in this case. Thus, information is data made functional through the application of knowledge.

Humans acquire data and information in bits and pieces and then transform the information into knowledge. The information-processing functions of the brain are frequently compared to those of a computer and vice versa (discussed further in Chapter 4). Humans can be thought of as organic information systems constantly acquiring, processing, and generating information or knowledge in their professional and personal lives. Individuals have an amazing ability to manage knowledge. This ability is learned and honed from birth as one makes their way through life interacting with the environment and being inundated with data and information. One experiences the environment and learns by acquiring, processing, generating, and disseminating knowledge. Tom acquired knowledge in his basic nursing education program and continues to build his foundation of knowledge by such activities as reading nursing research and theory articles, attending continuing education programs, consulting with expert colleagues, and using **clinical databases** and **clinical practice guidelines**. As he interacts in the environment, he acquires knowledge that must be processed. This processing effort causes him to redefine and restructure his knowledge base and generate new knowledge. He can then share (disseminate) this new knowledge with other colleagues, and he may receive **feedback** on the knowledge that he shares. This dissemination and feedback builds the knowledge foundation anew as he acquires, processes, generates, and disseminates new knowledge as a result of his interactions. As others respond to his **knowledge dissemination** and he acquires yet more knowledge, he is engaged to rethink, reflect on, and re-explore his **knowledge acquisition**, thus processing, generating, and then disseminating anew. This process is captured in the Foundation of Knowledge model, used as an organizing framework for this text.

At its base, the model has bits, bytes (computer terms for chunks of information), data, and information in a random representation. Growing out of the base are separate cones of light that expand as they reflect upward and represent knowledge acquisition, **knowledge generation**, and knowledge dissemination. At

the intersection of the cones and forming a new cone is **knowledge processing**. Encircling and cutting through the knowledge cones is feedback that acts on and may transform any or all aspects of knowledge represented by the cones. One should imagine the model as a dynamic figure with the cones of light and the feedback rotating and interacting rather than remaining static. Knowledge acquisition, knowledge generation, knowledge dissemination, knowledge processing, and feedback are constantly evolving for nurse scientists. The transparent effect of the cones is deliberate and is intended to suggest that as knowledge grows and expands its use becomes more transparent—one uses it during practice without even being consciously aware of what aspect of knowledge is being used at any given moment.

FIGURE 1-1 Foundation of Knowledge model.



SOURCE: Designed by Alicia Mastrian.

An experienced nurse, thinking back to the novice years, may recall feeling like their head was filled with bits of data and information that did not form any type of cohesive whole. As the model depicts, the processing of knowledge begins a bit later (imagine a time line applied vertically) with early experiences on the bottom and expertise growing as the processing of knowledge ensues. Early on in a nurse's education conscious attention is focused mainly on knowledge acquisition, and they depend on their instructors and others to process, generate, and disseminate knowledge. As the nurse becomes more comfortable with the science of nursing, they begin to take over some of the other Foundation of Knowledge functions. However, to keep up with the explosion of information in nursing and health care, one must continue to rely on the knowledge generation of nursing theorists and researchers and the dissemination of their work. In this sense, nurses are committed to lifelong learning and the use of knowledge in the practice of nursing science.

This book uses the Foundation of Knowledge model, reflecting that knowledge is a powerful tool and that nurses focus on information as a key building block of knowledge. The application of the model is described in each section of the book to help the reader understand and appreciate the foundation of knowledge in nursing science and how it applies to nursing informatics. All of the various nursing roles (practice, administration, education, research, and informatics) involve the science of nursing. Nurses are **knowledge workers**, working with information and generating information and knowledge as a product. They are knowledge acquirers, providing convenient and efficient means of capturing and storing knowledge. They are knowledge users, individuals or groups who benefit from valuable, viable knowledge. Nurses are knowledge engineers, designing, developing, implementing, and maintaining knowledge. They are knowledge managers, capturing and processing collective expertise and distributing it where it can create the largest benefit. They are knowledge developers or generators, changing and evolving knowledge based on the tasks at hand and information available.

In the case scenario, at first glance one might label Tom as a knowledge worker, a knowledge acquirer, and a knowledge user. However, stopping here might sell Tom short in his practice of nursing science. Although he acquired and used knowledge to help him achieve his work, he also processed the data and information he collected to develop a nursing diagnosis and a plan of care. The knowledge stores Tom used to develop and glean knowledge from valuable information are generative (having the ability to originate and produce or generate) in nature. For example, Tom may have learned something new about his patient's culture from the patient or his wife that he will file away in the knowledge repository of his mind to be used in another similar situation. As he compares this new cultural information to what he already knows, he may gain insight into the effect of culture on a patient's response to illness. Thus, Tom is a knowledge generator. If he shares

this newly acquired knowledge with another practitioner, and as he records his observations and his conclusions, he is then disseminating knowledge. Tom is also using feedback from the various technologies he has used to monitor his patient's status. He may also use feedback from laboratory reports or even other practitioners to help him rethink, revise, and apply the knowledge about this patient that he is generating.

Knowledge must also be viable. Knowledge viability refers to applications (most technology based) that offer easily accessible, accurate, and timely information obtained from a variety of resources and methods and presented in a manner so as to provide the necessary elements to generate new knowledge. In the case scenario, Tom may have felt the need to consult an electronic database or a clinical guidelines repository that he has downloaded on his PDA or that reside in the emergency room's networked computer system to assist him in the development of a comprehensive care plan for his patient. In this way, Tom is also using technology and **evidence** to support and inform his practice. It is also possible in this scenario that an alert may appear in the electronic health record or the clinical information system (CIS) reminding Tom to ask about influenza and pneumonia vaccines. Clinical information technologies that support and inform nursing practice and nursing administration are an important part of nursing informatics and are covered in detail in Sections III and IV of this text. Technologies that support and inform nursing education and nursing research are covered in Section V.

This book provides a framework that embraces knowledge so that the reader can develop the wisdom necessary to apply what they have learned. Wisdom is the application of knowledge to an appropriate situation. In the practice of nursing science, one expects actions directed by wisdom. Wisdom uses knowledge and experience to heighten common sense and insight to exercise sound judgment in practical matters. It is developed through knowledge, experience, insight, and reflection. Wisdom is sometimes thought of as the highest form of common sense resulting from accumulated knowledge or erudition (deep, thorough learning) or enlightenment (education that results in understanding and the dissemination of knowledge). Wisdom is the ability to apply valuable and viable knowledge, experience, understanding, and insight while being prudent and sensible. Knowledge and wisdom are not synonymous because knowledge abounds with others' thoughts and information, whereas wisdom is focused on one's own mind and the synthesis of experience, insight, understanding, and knowledge. Wisdom has been called the foundation of the art of nursing.

Some nursing roles might be viewed as more focused on some rather than other aspects of the foundation of knowledge. One might argue that nurse educators are primarily knowledge disseminators and nurse researchers are knowledge

generators. Although the more frequent output of their efforts can certainly be viewed in this way, it is important to realize that nurses use all of the aspects of the Foundation of Knowledge model regardless of their area of practice. For nurse educators to be effective, they must be in the habit of constantly building and rebuilding their foundation of knowledge about nursing science. In addition, as they develop and implement curricular innovations, they must also evaluate the effectiveness of those changes. In some cases, they use formal research techniques to achieve this and are therefore generating knowledge about the best and most effective teaching strategies. Similarly, nurse researchers must acquire and process new knowledge as they design and conduct their research studies. All nurses have the opportunity to be involved in the formal dissemination of knowledge via their participation in professional conferences, either as presenters or attendees. In addition, some nurses disseminate knowledge by formal publication of their ideas. In the cases of conference presentation and publication, nurses may receive feedback that stimulates rethinking about the knowledge they have generated and disseminated, thus prompting them to acquire and process anew.

All nurses, regardless of the practice arena, must use informatics and technology to inform and support that practice. The case scenario discussed Tom's use of various monitoring devices that provide feedback on the physiologic status of the patient. It was also suggested that Tom might consult a clinical database or nursing practice guidelines residing on a PDA or a clinical agency network as he develops an appropriate plan of action for his nursing interventions. Perhaps the CIS in the agency supports the collection of data about patients in a **relational database**, providing an opportunity for **data mining** by nursing administrators or nurse researchers. Thus, administrators and researchers can glean information about best practices and what improvements are necessary to deliver the best and most effective nursing care (Swan, Lang, & McGinley, 2004).

The future of nursing science and nursing informatics is closely associated with nursing education and nursing research. Skiba (2007) suggests that techno-savvy and well-informed faculty are needed who can demonstrate the appropriate use of technologies to enhance the delivery of nursing care. Along those lines, Greenfield (2007) conducted research among nursing students to determine the effectiveness of PDA technology applied to medication administration. Her study makes a good case for incorporating PDA technology into nursing curricula. Girard (2007) discussed cutting-edge operating room technologies, such as nanosurgery using nanorobots, smart fabrics that aid in patient assessment during surgery, biopharmacy techniques for the safe and effective delivery of anesthesia, and virtual reality training. She makes an extremely provocative point about nursing education: "Educators will need to expand their knowledge and teach for

the future and not the past. They must take heed that the old tried-and true nursing education methods and curriculum that has lasted 100 years will have to change, and that change will be mandated for all areas of nursing …" (p. 353).

Bassendowski (2007) specifically addresses the potential for the generation of knowledge in educational endeavors as faculty apply new technologies to teaching and the focus shifts away from individual to group instruction that promotes sharing and processing of knowledge.

Several key national groups are promoting the inclusion of informatics content in nursing education programs. These initiatives include the National League for Nursing (NLN, 2008), the Quality and Safety Education for Nurses (Cronenwett et al., 2007) report, the Technology Informatics Guiding Education Reform (TIGER) Initiative (2007), and the American Association of Colleges of Nursing (AACN, 2008).

The NLN (2008) Position Statement, Preparing the Next Generation of Nurses to Practice in a Technology-Rich Environment: An Informatics Agenda, challenges nurse educators to prepare informatics-competent nurses who can practice safely in a technology-rich healthcare environment. In the Quality and Safety Education for Nurses (2007) report, Cronenwett and colleagues identified several core competencies for nursing education. One competency specifically addressed nursing informatics: "Use information and technology to communicate, manage knowledge, mitigate error, and support decision-making" (p. 129). Another addressed the appropriate use of data and information in nursing practice to promote quality improvement: "Use data to monitor the outcomes and processes and use improvement methods to design and test changes to continuously improve the quality and safety of health care systems" (p. 127).

The TIGER (2007) initiative identifies a key purpose, "to create a vision for the future of nursing that bridges the quality chasm with information technology, enabling nurses to use informatics in practice and education to provide safer, higher-quality patient care" (p. 4). The pillars of the TIGER vision include the following:

- Management and Leadership: Revolutionary leadership that drives, empowers, and executes the transformation of health care.
- Education: Collaborative learning communities that maximize the possibilities of technology toward knowledge development and dissemination, driving rapid deployment and implementation of best practices.
- Communication and Collaboration: Standardized, person-centered, technology-enabled processes to facilitate teamwork and relationships across the continuum of care.

- Informatics Design: Evidence-based, interoperable intelligence systems that support education and practice to foster quality care and safety.
- Information Technology: Smart, people-centered, affordable technologies that are universal, useable, useful, and standards-based.
- Policy: Consistent, incentives-based initiatives (organizational and governmental) that support advocacy and coalition-building, achieving and resourcing an ethical culture of safety.
- Culture: A respectful, open system that leverages technology and informatics across multiple disciplines in an environment where all stakeholders trust each other to work together towards the goal of high quality and safety (p. 4).

The Essentials of Baccalaureate Education for Professional Nursing Practice (AACN, 2008, pp. 18-19) includes the following technology-related outcomes for baccalaureate nursing graduates:

1. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice.
2. Use telecommunication technologies to assist in effective communication in a variety of healthcare settings.
3. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers.
4. Understand the use of CIS systems to document interventions related to achieving nurse-sensitive outcomes.
5. Use standardized terminology in a care environment that reflects nursing's unique contribution to patient outcomes.
6. Evaluate data from all relevant sources, including technology, to inform the delivery of care.
7. Recognize the role of information technology in improving patient care outcomes and creating a safe care environment.
8. Uphold ethical standards related to data security, regulatory requirements, confidentiality, and clients' right to privacy.
9. Apply patient care technologies as appropriate to address the needs of a diverse patient population.
10. Advocate for the use of new patient care technologies for safe, quality care.
11. Recognize that redesign of workflow and care processes should precede implementation of care technology to facilitate nursing practice.
12. Participate in the evaluation of information systems in practice settings through policy and procedure development.

The report suggests the following sample content for achieving these student outcomes (AACN, 2008, pp. 19-20):

- Use of patient care technologies (e.g., monitors, pumps, computer-assisted devices)
- Use of technology and information systems for clinical decision making
- Computer skills that may include basic software, spreadsheet, and healthcare databases
- Information management for patient safety
- Regulatory requirements through electronic data-monitoring systems
- Ethical and legal issues related to the use of information technology, including copyright, privacy, and confidentiality issues
- Retrieval information systems, including access, evaluation of data, and application of relevant data to patient care
- Online literature searches
- Technologic resources for evidence based practice
- Web-based learning and online literature searches for self and patient use
- Technology and information systems safeguards (e.g., patient monitoring, equipment, patient identification systems, drug alerts and IV systems, and barcoding)
- Interstate practice regulations (e.g., licensure, telehealth)
- Technology for virtual care delivery and monitoring
- Principles related to nursing workload measurement and resources and information systems
- Information literacy
- Electronic health record and physician order entry
- Decision support tools
- Role of the nurse informaticist in the context of health informatics and information systems

This text is designed to include the necessary content to prepare nurses for practice in the ever changing and technology-laden healthcare environments.

Goossen (2000) believes that the focus of nursing informatics research should be on the structuring and processing of patient information and how these inform nursing decision making in clinical practice. The increased use of technology to enhance nursing practice, nursing education, and nursing research will open new avenues for acquiring, processing, generating, and disseminating knowledge.

In the future, nursing research will contribute significantly to the development of nursing science. Technologies and translational research will abound and clinical practices will be evidence based, thus improving patient outcomes and de-

creasing safety concerns. Schools of nursing will embrace nursing science as they strive to meet the needs of changing student populations and the increasing complexity of healthcare environments.

SUMMARY

This chapter provides an overview of nursing science and how nursing science relates to typical nursing practice roles, nursing education, and nursing research. The Foundation of Knowledge model was introduced as the organizing conceptual framework for this book. Finally, the relationship of nursing science to nursing informatics was discussed. In subsequent chapters the reader will learn more about how nursing informatics supports nurses in their many and varied roles. In an ideal world nurses would embrace nursing science as knowledge users, knowledge managers, knowledge developers, knowledge engineers, and knowledge workers.

THOUGHT-PROVOKING Questions

1. Imagine you are in a social situation and someone asks you, "What does a nurse do?" Think about how you will capture and convey the richness that is nursing science in your answer.
2. Choose a clinical scenario from your recent experience and analyze it using the Foundation of Knowledge model. How did you acquire knowledge? How did you process knowledge? How did you generate knowledge? How did you disseminate knowledge? How did you use feedback, and what was the effect of the feedback on the foundation of your knowledge?

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References

American Association of Colleges of Nursing. (2008, October 20). The Essentials of Baccalaureate Education for Professional Nursing Practice. Retrieved from American Association of Colleges of Nursing Web site: http://www.aacn.nche.edu/Education/pdf/ BaccEssentials08.pdf

American Nurses Association. (2003). *Nursing's social policy statement* (2nd ed.). Silver Spring, MD: Author.

Bassendowski, S. (2007). NursingQuest: Supporting an analysis of nursing issues. *Journal of Nursing Education, 46*(2), 92–95. Retrieved from Education Module database [document ID: 1210832211].

Cronenwett, L., Sherwood, G., Barnsteiner J., Disch, J., Johnson, J., Mitchell, P., …Warren, J. (2007). Quality and safety education for nurses. *Nursing Outlook, 55*(3), 122–131.

Girard, N. (2007). Science fiction comes to the OR. *Association of Operating Room Nurses. AORN Journal, 86*(3), 351–353. Retrieved from Health Module database [document ID: 1333149261].

Goossen, W. (2000). Nursing informatics research. *Nurse Researcher, 8*(2), 42. Retrieved from ProQuest Nursing & Allied Health Source database [document ID: 67258628].

Greenfield, S. (2007). Medication error reduction and the use of PDA technology. *Journal of Nursing Education, 46*(3), 127–131. Retrieved from Education Module database [document ID: 1227347171].

National League for Nursing. (2008). Preparing the next generation of nurses to practice in a technology rich environment: An informatics agenda. (Position Statement). Retrieved from: http://www.nln.org/aboutnln/PositionStatements/informatics_052808.pdf

Skiba, D. (2007). Faculty 2.0: Flipping the novice to expert continuum. Nursing Education Perspectives, *28*(6), 342–344. Retrieved from ProQuest Nursing & Allied Health Source database [document ID: 1401240241].

Swan, B., Lang, N., & McGinley, A. (2004). Access to quality health care: Links between evidence, nursing language, and informatics. *Nursing Economics, 22*(6), 325–332. Retrieved from Health Module database [document ID: 768191851].

Technology Informatics Guiding Education Reform. (2007). Evidence and Informatics Transforming Nursing: 3-Year Action Steps Toward a 10-year Vision. Retrieved from The Tiger Initiative website: http://www.aacn.nche.edu/Education/pdf/TIGER.pdf