Section I

Building Blocks of Health Informatics

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

To implement HI, one must view it from the perspective of both the current health care delivery system and specific, individual organizational needs while anticipating and creating future applications in both the health care system and the allied health professions. Health care professionals should be expected to discover opportunities to use HI, participate in the design of solutions, and be challenged to identify, develop, evaluate, modify, and enhance applications to improve patient care. This text 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 HI: disciplinary, information, computer, and cognitive sciences. Also included in this section is a chapter on ethical and legal applications of health care informatics. This first section lays the foundation for the remainder of the book.

The *Informatics, Disciplinary Science, and the Foundation of Knowledge* chapter describes disciplinary science and introduces the Foundation of Knowledge model as the conceptual framework for the book. In this chapter, a clinical case scenario involving a physical therapist is used to illustrate the concepts central to disciplinary science and the data, information, knowledge, wisdom paradigm central to health informatics. Core informatics competencies are identified, and a self-assessment tool for informatics competencies is also provided.

Information is a central concept and health care's most valuable resource. Information science and systems, together with computers, are constantly changing the way health care 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 the *Introduction to Information, Information Science, and Information Systems* and *Computer Science and the Foundation of Knowledge Model* chapters, 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, an individual 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 health care professionals, who can then synthesize these resources into an ever-evolving knowledge and wisdom base. This not only facilitates professional development and the ability to apply evidence-based practice decisions within patient care but, if the results are disseminated and shared, can also 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 the *Introduction to Cognitive Science and Cognitive Informatics* chapter, 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, including how it is developed, used, modified, and shared, provides the basis for continued learning and intellectual growth.

The *Ethical and Legal Aspects of Health Informatics* chapter focuses on ethical issues associated with managing private information with technology and provides a framework for analyzing ethical issues and supporting ethical decision making. In addition, this chapter provides insights into the rules of the Health Insurance Portability and Accountability Act and an overview of the rules associated with technology implementation as defined by the HITECH Act. The information provided in this text reflects current rules that were in effect at the time of publication. The reader should follow the rules development and evolution of informatics legislation at the U.S. Department of Health and Human Services website (http://www.hhs.gov) to obtain the most current information related to health information management.

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 the *Informatics, Disciplinary Science, and the Foundation of Knowledge* chapter). The Foundation of Knowledge model is used throughout the text to illustrate how knowledge is used to meet the needs of health care delivery systems, organizations, patients, and health care professionals. 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, which includes feedback, individuals continue 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 they then share (disseminate) this new knowledge and receive feedback on the knowledge they have shared, the feedback initiates the cycle of knowledge all over again. As individuals acquire, process, generate, and disseminate knowledge, they are motivated to share, rethink, and explore their own knowledge base. This complex process is captured in the Foundation of Knowledge model. Throughout the chapters in the *Building Blocks of Health Informatics* section, readers are challenged to think about how the model can help them to understand the ways in which they acquire, process, generate, disseminate, and then receive feedback on their new

knowledge of the building blocks of HI. Health care professionals, as knowledge workers, must be able to understand the evolving specialty of HI to harness and use the tools available for managing the vast amount of health care data and information central to their practice. It is essential that HI capabilities be appreciated, promoted, expanded, and advanced to facilitate the work of the health care professionals, improve patient care, and enhance the science of the professions.

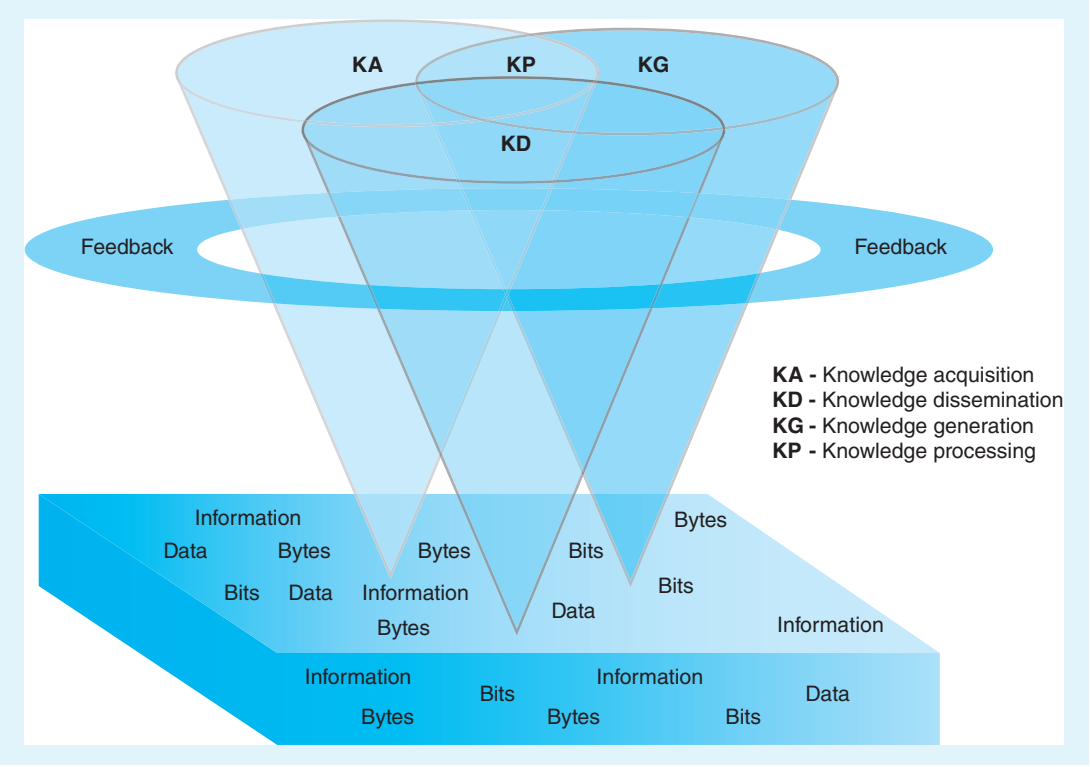

Figure I–1 Foundation of Knowledge Model
Source: Designed by Alicia Mastrian.

chapter 1

Informatics, Disciplinary Science, and the Foundation of Knowledge

Kathleen Mastrian and Dee McGonigle

OBJECTIVES

1. Define health informatics.
2. Illustrate the relationship between disciplinary science and informatics.
3. Introduce the Foundation of Knowledge model as the organizing conceptual framework for the text.
4. Explain the data, information, knowledge, wisdom (DIKW) paradigm.
5. Establish health care professionals as knowledge workers.

Key Terms

Clinical database
Clinical practice guideline
Competency
Data
Data mining
Data–information–knowledge–wisdom paradigm
Electronic health record
Evidence
Feedback
Foundation of Knowledge model
Health informatics
Informatics
Information
Knowledge
Knowledge acquisition
Knowledge dissemination
Knowledge generation
Knowledge processing

(*continues*)

Introduction

Health care is an information intensive endeavor. Our patients are complex, often presenting with multiple health challenges and requiring interventions by several health care disciplines at the same time. Interprofessional collaboration and communication are essential for the coordination of this care and to ensure that all are working toward the same clinical outcomes while promoting safe, evidence-based, efficient, and cost-effective care. The use of technology tools, especially the **electronic health record** (EHR), helps us collect, integrate, and manage all of the important clinical information to provide the best possible care and facilitate communication among the various disciplines interacting with patients. Data collected from EHRs and the aggregation of these data may provide insights into the health of populations and identify global health challenges. **Informatics** is the term used to describe the science of information management in health care.

Key Terms (continued)

Knowledge worker
Relational database
Wisdom

All health care workers, regardless of discipline, need a basic understanding of informatics principles. That is, how are data, information, and knowledge used in the discipline, and how does this understanding promote wisdom in practice? All health care workers need a core skill set related to the use of computers, EHRs, various health care technologies, and an understanding of how knowledge is generated in their respective disciplines. The study of informatics provides these insights.

We will use the more general term **health informatics** throughout the text, as many of the principles and concepts we are discussing are applicable across disciplines. When you are thinking about your specific field, it is appropriate to substitute its name for the more general term *health*. For example, dental informatics, physical therapy informatics, respiratory therapy informatics, and nutrition or dietary informatics are all acceptable terms. In this text, we define health informatics as the combination of principles from the disciplinary science, computer science, information science, and cognitive science. The more traditional definitions of informatics do not include cognitive science, but we believe that the principles of cognitive science provide important insights in the understanding of informatics, especially when one is exploring knowledge structures in a discipline. In this chapter, we will explore the core elements of informatics—the **data–information–knowledge–wisdom (DIKW) paradigm** and the foundation of disciplinary knowledge using the **Foundation of Knowledge model**, the organizing conceptual framework of this text. We will also introduce the core informatics competencies needed by all health care professionals to practice in the information-intensive 21st-century health care environments. Various chapters and sections of the text will then expand on the core informatics competencies as a way of helping you attain them.

The DIKW Paradigm

Let's begin this exploration of the DIKW paradigm using the following patient scenario:

> *Tom H. is a physical therapist who works in a metropolitan hospital providing physical therapy services to a wide variety of patients. Today, Tom is evaluating the mobility of a 90-year-old man with multiple health challenges—aortic stenosis, atrial fibrillation, hypertension controlled with medication, and arthritis—who was admitted to the hospital for treatment of gross hematuria. The patient lives at home with his wife, who reports progressive weakness and reluctance to ambulate. The urologist wrote the consult for physical therapy to help the patient meet his goal of continuing to live at home. Tom first reviews the EHR to learn the key diagnoses, the patient's blood count, and the latest set of vital signs before approaching the patient. The clinical decision support system (CDSS) of the EHR also lists the patient as a fall risk. After interviewing the patient and checking the oxygen saturation level with a pulse oximeter, Tom prepares to assess the patient's ambulation. Tom asks the patient to sit up first and pause, then carefully assists him to a standing position. Tom notices that the patient's walker is not adjusted properly for his height, so Tom makes the adjustment before they begin to walk.*

Pause to consider Tom's actions so far and how they relate to the DIKW paradigm. Tom relied on the **data** and **information** that he acquired during his review of the EHR and the patient interview and assessment to deliver appropriate care to his patient. Tom also used technology (a pulse oximeter) 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 that Tom reached into his **knowledge** base of previous learning and experiences to direct his care so that he could act with transparent **wisdom**. Tom knew that since the patient had multiple cardiovascular issues, orthostatic hypotension was a real possibility, so he asked the patient to sit up on the edge of the bed and pause before attempting to stand. He wants to measure the effect of exertion on the patient's oxygen saturation, so he obtains a baseline using the oximeter. Tom also noticed that the walker was not adjusted to the correct height. While all of these actions appear almost automatic, they are the result of Tom's learning and previous experiences as well as evidence generated over many years of clinical research.

Tom and the patient begin their walk. Tom notices that the patient walks slowly and carefully with an appropriate gait and uses the walker effectively. After about 30 steps, the patient's breathing becomes a bit more labored, and he slows down even more. Tom suggests turning around to head back to the room. Tom notices that the patient is starting to sweat and that his breathing is becoming more labored. He helps the patient into bed and checks the oxygen saturation once again, finding that it is has dropped to 92% from 99%. Tom elevates the head of the bed, checks the patient's blood pressure and pulse, and signals for the nurse to initiate oxygen therapy. Tom will use the EHR to communicate his findings to others involved with the patient's care.

Tom clearly applied his knowledge from physical therapy science and some of the basic sciences, such as anatomy, physiology, psychology, and chemistry, as he determined the patient's immediate needs and the reasons for his weakness and lack of stamina. Tom understands that the patient's already compromised cardiovascular system (medical diagnoses of hypertension, atrial fibrillation, and aortic stenosis) has been further stressed by the blood loss and the low blood counts that he read about in the EHR. He gathered data and then analyzed and interpreted those data to form a conclusion—the essence of science. Tom will use the EHR to communicate his findings, concerns, and recommendations for a graduated exercise program designed to increase the patient's stamina and strength. While this scenario is specific to physical therapy, other allied health disciplines rely on the DIKW paradigm to direct their interventions. Can you think of a patient scenario specific to your discipline?

The steps of using information, applying knowledge to a problem, and acting with wisdom form the basis of the science of health professional practice. Information is composed of data that were 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 scenario, Tom used accessible, accurate, timely, relevant, and verifiable data and information. He compared those data and information to the patient and to his knowledge base and previous experiences to determine which data and information were relevant to the current case. By applying his previous knowledge to data, he converted those data into information and information into new knowledge—that is, an understanding of which 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 (an idea discussed further in Chapter 4). Humans can be thought of as organic information systems that are constantly acquiring, processing, and generating information or knowledge in their professional and personal lives. We have an amazing ability to manage knowledge. This ability is learned and honed from birth as individuals make their way through life interacting with the environment and being inundated with data and information. Each person experiences the environment and learns by acquiring, processing, generating, and disseminating knowledge.

Tom, for example, acquired knowledge in his physical therapy education program and continues to build his foundation of knowledge by engaging in such activities as reading 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. Tom can then share (disseminate) this new knowledge with colleagues, and he may receive **feedback** on the knowledge that he shares. This dissemination and feedback builds the knowledge foundation anew as Tom 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 reexplore his **knowledge acquisition**, leading to further processing, generating, and then disseminating knowledge. This ongoing process is captured in the Foundation of Knowledge model, which is used as an organizing framework for this text.

The Foundation of Knowledge Model

In order to simplify the understanding of the Foundation of Knowledge model, it may be helpful to think back on an early learning experience. Recall the first time you got behind the wheel of a car. There was so much to remember and do and so much to pay attention to, especially if you wanted to avoid an accident. You had to think about how to start the car, adjust the mirrors, fasten the seat belt, and shift the car into gear. You had to take in data and information from friends and family members who tried to "tell" you how to drive. They disseminated knowledge and you acquired it, and they

most likely provided lots of feedback about your driving. As you drove down the street, you also noticed multiple bits of data in the environment, such as stop signs, traffic signals, turn signals, speed limit signs, and so on, and tried to interpret these environmental data into usable information for the current situation. You had to pay attention to lots of things at the same time in order to drive safely. As your confidence grew with experience, you were able to drive more effectively and generated new knowledge about driving that became part of your personal knowledge structure. After lots of driving experiences, the process of driving became transparent and seamless. Think about this example in relation to a skill that you have acquired or are acquiring in your health profession education. How does or did your learning experience mirror the components of the Foundation of Knowledge model?

Let's explore the model in more detail. At its base, the model contains bits, bytes (computer terms for chunks of information), data, and information in a random representation (**Figure 1-1**). Growing out of the base are separate cones of light that expand as they reflect upward; these cones 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 in which the cones of light and the feedback rotate and interact rather than remain static. Knowledge acquisition, knowledge generation, knowledge dissemination, knowledge processing, and feedback are constantly evolving for health care professionals. The transparent effect of the cones is deliberate and is intended to suggest that as knowledge grows and expands, its use becomes more transparent—a person uses this knowledge during practice without even being consciously aware of which aspect of knowledge is being used at any given moment.

Experienced practitioners, thinking back to their 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 the education experience, conscious attention is focused mainly on knowledge acquisition, and students depend on their instructors and others to process, generate, and disseminate knowledge. As students become more comfortable with the science of their discipline, they begin to take over some of the other Foundation of Knowledge functions. However, to keep up with the explosion of information in health care, they must continue to rely on the knowledge generation of expert theorists and researchers and the dissemination of their work. There must be a conscious commitment to lifelong learning and the use of knowledge in practice in order to be a successful practitioner in any health care field.

The Foundation of Knowledge model permeates this text, reflecting the understanding that knowledge is a powerful tool and that health care workers focus on information as a key building block of knowledge. The application of the model is described in

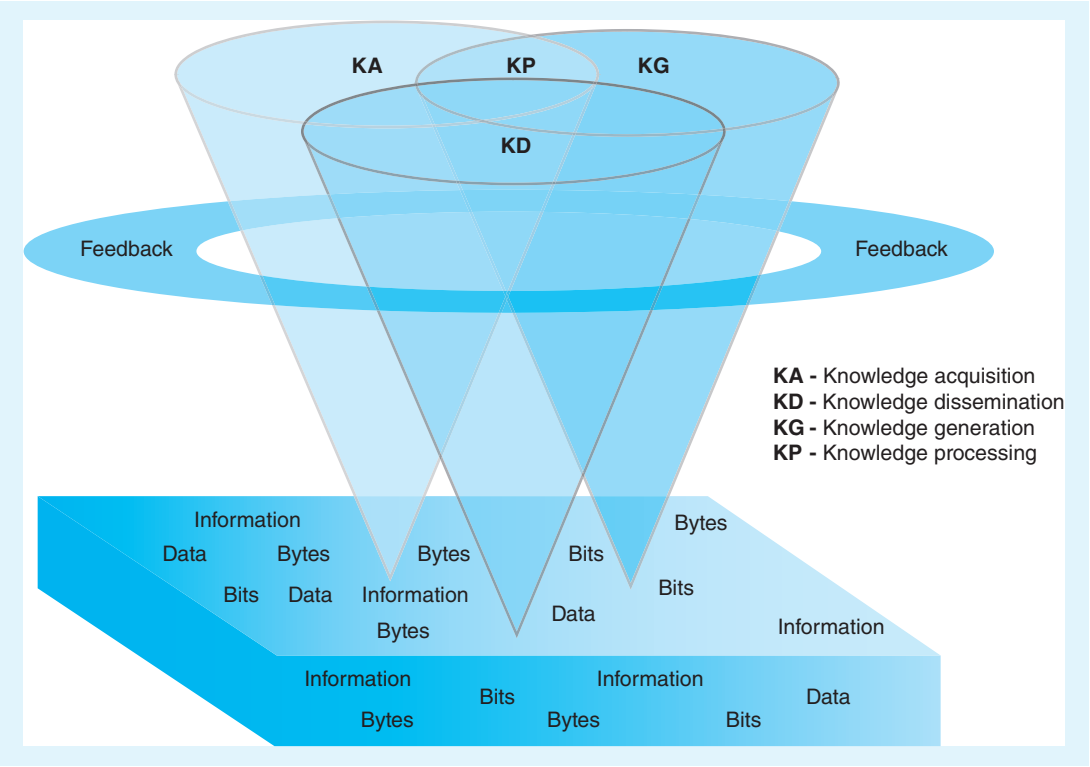

Figure 1–1 Foundation of Knowledge Model

Source: Designed by Alicia Mastrian.

each section of the text to help the reader understand and appreciate the foundation of knowledge in disciplinary science and see how it applies to health informatics. All of the various health practice roles (clinical practice, administration, education, research, and informatics) involve the science of the discipline. Health care professionals are **knowledge workers**. Knowledge workers are those who work with information and generate information and knowledge as a product. Health care professionals are knowledge acquirers, providing convenient and efficient means of capturing and storing knowledge. They are knowledge users, meaning individuals or groups who benefit from valuable, viable knowledge. Health care professionals 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. Finally, they are knowledge developers and generators, changing and evolving knowledge based on the tasks at hand and the 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 physical therapy 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 science-based approach to the patient and a plan of care. The knowledge stores that 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. In this sense, 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 also uses feedback from the various technologies he has applied to monitor his patient's status. In addition, he may rely on feedback from laboratory reports or even other practitioners to help him rethink, revise, and apply the knowledge about this patient that he is generating.

To have ongoing value, knowledge must 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 tablet or that reside in the EHR or networked computer system to assist him in the development of a comprehensive plan for his patient. In this way, Tom uses technology and **evidence** to support and inform his practice. Remember also in this scenario that an alert appeared in the patient's EHR informing Tom of the fall-risk status of the patient. Clinical information technologies that support and inform professional practice, administration, education, and research are an important part of informatics and are covered in detail in the latter sections of this text.

This text provides a framework that embraces knowledge so that readers can develop the wisdom necessary to apply what they have learned. Wisdom is the application of knowledge to an appropriate situation. Wisdom uses knowledge and experience to heighten common sense and insight to exercise sound judgment in practical matters. Wisdom 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). It is the ability to apply valuable and viable knowledge, experience, understanding, and insight while being prudent and sensible. Knowledge and wisdom are not synonymous: 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.

Some health care professional roles might be viewed as focused more on some aspects than on other aspects of the foundation of knowledge. For example, one might argue that educators are primarily knowledge disseminators and that 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 health care professionals use all of the aspects of the Foundation of Knowledge model regardless of their area of practice. For educators to be effective, they must be in the habit of constantly building and rebuilding their foundation of knowledge about the discipline in which they are teaching. In addition, as they develop and implement curricular innovations, they must evaluate the effectiveness of those changes. In some cases, they use formal research techniques to achieve this goal and, therefore, generate knowledge about the best and most effective teaching strategies. Similarly, researchers must acquire and process new knowledge as they design and conduct their research studies. All health care professionals have the opportunity to be involved in the formal dissemination of knowledge via their participation in professional conferences, either as presenters or as attendees. In addition, some disseminate knowledge by formal publication of their ideas. In the cases of conference presentation and publication, these professionals may receive feedback that stimulates rethinking about the knowledge they have generated and disseminated, in turn prompting them to acquire and process data and information anew.

All health care professionals, regardless of their practice arena, must use informatics and technology to inform and support that practice. The case scenario discussed Tom's use of a monitoring device that provides feedback on the physiologic status of the patient. It was also suggested that Tom might consult a clinical database or a practice guideline residing on a tablet or a clinical agency network as he develops an appropriate plan of action for his physical therapy interventions. Perhaps the clinical information system (CIS) in the agency supports the collection of aggregated data about patients in a **relational database**, providing an opportunity for **data mining** by administrators or researchers. Data mining provides opportunities to explore large amounts of data to look for patterns in the data as a way of evaluating or informing practice. As more health care facilities and professional practices embrace the use of EHRs, opportunities for data mining will increase. We will discuss data mining in more detail in a later chapter.

We have established that health care professionals are knowledge workers and that all must use informatics and technology to inform and support practice. This text is designed to include the necessary content to prepare health care professionals for practice in the ever-changing and technology-laden health care environments. So what do health care professionals need to know about informatics, and what informatics skills and competencies are necessary for safe, effective practice?

Core Informatics Competencies

A **competency** demonstrates proficiency. According to Hunter, McGonigle, and Hebda (2013), "At its most basic level, competency denotes having the knowledge, skills, and ability to perform or do a specific task, act, or job" (p. 71). Based on this definition, an

informatics competency would be the knowledge, skills, and ability to perform specific informatics tasks. Knowing the competencies we are expected to meet allows us to understand our strengths and weaknesses. It helps us assess where we are and where we need to go with our education and skill development.

Several national and international groups have worked to identify core informatics competencies for health care professionals. In 2008, the American Health Information Management Association (AHIMA) and the American Medical Informatics Association (AMIA) convened a task force to identify basic informatics competencies for all health care professionals who work with EHRs. The task force emphasized that

> *new graduates in any healthcare profession need a skill set adaptable to computer technologies and EHRs to support work processes and information access experienced in the course of daily workflow. Employees at all levels and job types within today's healthcare workplace need a new set of skills and knowledge to embrace and effectively utilize computer technologies and electronic information. Part of the challenge is ensuring these workers function in a broad continuum of care and effective use of health information and electronic information systems. (p. 5)*

The joint AHIMA–AMIA Task Force identified five domains for informatics competencies for all health care workers (**Figure 1-2**):

I. Health information literacy and skills
II. Health informatics skills using the EHR
III. Privacy and confidentiality of health information
IV. Health information/data technical security
V. Basic computer literacy skills (p. 6)

AHIMA also worked in collaboration with the Health Professions Network and the Employment and Training Administration to create a graphic depiction of competencies necessary for EHR interaction (AHIMA & Health Professions Network, n.d.). The electronic health records competency model is divided into six levels—personal effectiveness competencies, academic competencies, workplace competencies, industry-wide technical competencies, industry-sector technical competencies, and a management competencies level shared with occupation-specific requirements. Although beyond the scope of this discussion, it is important to realize the extent of work in the competency development arena.

Clearly, the degree of interaction with EHRs will vary somewhat from profession to profession; however, we can say with confidence that health care technologies will continue to evolve and that everyone in the health field must be prepared to embrace and interact with new technologies. We believe that everyone, regardless of health care discipline, needs to acquire core health informatics skills for 21st-century practice.

Table 1-1 provides you with an opportunity to assess your core informatics skills and competencies. The list of competencies is derived from several sources—the Academy of Nutrition and Dietetics (2012) Delphi study of nutrition informatics competencies

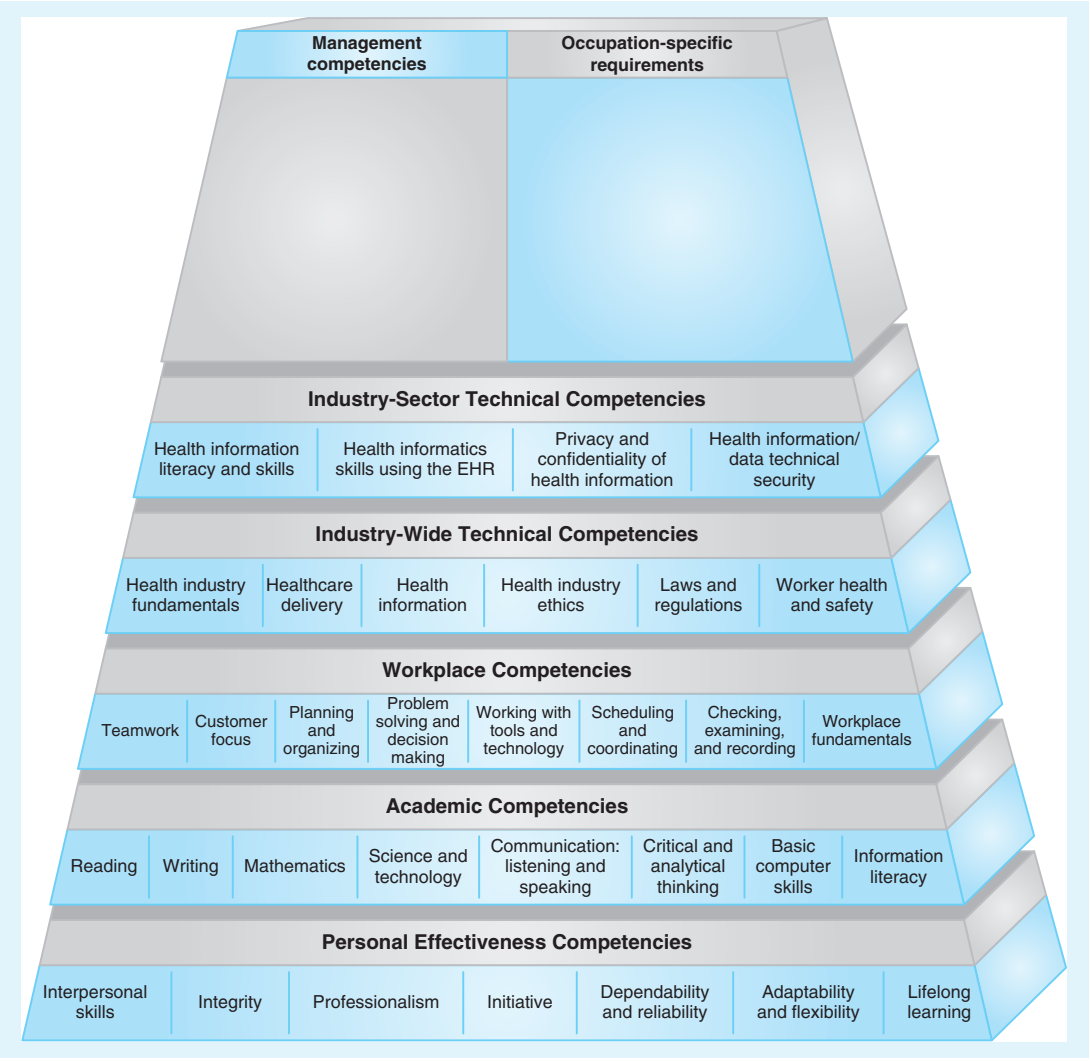

Figure 1–2 Electronic Health Records Competency Model

(Ayres, Greer-Carney, McShane, Miller, & Turner, 2012), the AHIMA–AMIA (2008) Task Force for the development of EHR competencies, the Competency Model Clearinghouse (n.d.-a, n.d.-b), and the authors' long-term experiences teaching nursing informatics. The subsequent chapters in this text provide information to help you gain these valuable informatics competencies and skills.

TABLE 1-1 SELF-ASSESSMENT OF CORE INFORMATICS COMPETENCIES

Please rate each of the following core informatics competencies on the following scale by assigning the number in the rating block that best describes your level of competency:

1. Unaware; no experience
2. Basic awareness
3. Some experience
4. Moderately competent
5. Proficient

Health Information Literacy and Skills	**1–5**
Recognize a need for information	
Select specific types of information resources appropriate to information needs	
Effectively use a browser to search for information	
Assess the credibility of information—authority, accuracy, timeliness, and value in fulfilling need	
Differentiate between data, information, and knowledge	
Differentiate between scholarly and popular sources of information	
Locate and retrieve information from a variety of credible electronic sources	
Health Informatics Skills using the EHR	
Understand the relationship between the organization's mission and meaningful use of the EHR	
Differentiate between types of health records—paper, EHR, and personal health records	
Understand expectations for EHR documentation and adhere to institution polices, requirements of accreditation agencies, and professional standards of the discipline	
Use various electronic tools to update the EHR, including portable computing devices, word processing, spreadsheet, database, and desktop presentation applications	
Locate information specific to your practice in the EHR	
Know and adhere to the standard terminologies for the discipline	
Identify and adhere to discipline-specific classification health-related terminologies for coding of procedures	
Use health record data collection tools appropriately—drop-down menus and checklists	
Use text notes appropriately to amplify and clarify information not easily documented in pre-prepared menus	
Access reference material available in the EHR for clinical decision support	
Use remote access tools for documentation in the EHR, such as workstation on wheels (WOW), tablets, smartphones, smart room technology, telehealth tools, etc.	
Use health record tools and software applications to create trended data reports to measure patient outcomes	
Ensure accuracy of documentation in the health record	
Ensure data quality and recognize and correct inaccurate data in the EHR	
Use the EHR to its fullest extent to exchange information with other providers, coordinate care, avoid duplication of services, promote safe practice, and increase patient satisfaction	

(*continues*)

TABLE 1-1 SELF-ASSESSMENT OF CORE INFORMATICS COMPETENCIES (continued)
Resolve minor technological problems associated with using an EHR
Know who to contact for help with using or troubleshooting the EHR
Understand basic principles of work flow and the impact of technology
Define work-arounds and identify how they may create safety issues
Provide feedback on system usability to improve work flow
Privacy and Security of Health Information
Know key aspects of national laws and organizational policies governing privacy and security of health information
Know and adhere to institutional policies and procedures for signing in and using the EHR
Know principles of authentication for access to EHRs
Follow security and privacy policies and procedures to the use of networks, including intranets and the Internet
Create strong passwords and safeguard them to prevent unauthorized access by others
Define protected health information
Identify what constitutes authorized use of protected health information
Understand confidentiality and what constitutes a breach of confidentiality
Differentiate between confidentiality and anonymity
Know how to secure devices used to collect private health information
Describe procedures for preventing unauthorized use of the EHR
Understand how the use of all electronic devices leaves a trail that can be audited for unauthorized use
Know institutional procedures for reporting data breaches
Understand potential information security issues associated with the use of personal electronic devices in the workplace
Know where to find general policies related to electronic security and specific policies related to personal devices
Describe potential issues related to the use of social media by health care professionals
Describe the consequences of inappropriate use of personal health information (disciplinary measures, fines, and prison penalties)
Computer Literacy Skills
Understand and efficiently use basic computer hardware (e.g., PCs and printers) and software (e.g., word processing and spreadsheet software) to perform tasks
Understand common computer terms
Describe common functions and capabilities of a computer
Use word processing programs to create, edit, save, and retrieve document files
Save a document in an alternative file format or zip a series of documents for efficient transmission
Efficiently scan, save, and share documents
Possess file management skills to organize files—name appropriately, use folders, etc.

TABLE 1-1 SELF-ASSESSMENT OF CORE INFORMATICS COMPETENCIES (continued)

Use basic reference materials and tools (thesaurus, grammar, and spell-checker) to ensure accuracy
Format documents according to discipline specific style—American Psychological Association, Modern Language Association, etc.
Effectively use the Internet and web-based tools to manage basic workplace tasks (e.g., timekeeping, maintaining employee records, and shared calendars)
Compose professional e-mails to communicate business-related information to coworkers, colleagues, and customers
Create and send e-mails, respond appropriately, and attach files to e-mails
Use CC and BCC functions appropriately
Describe principles of netiquette
Use a computer as an education tool—download podcast, participate in webinar, or join a community of practice
Provide information and support for patient education using gaming, smartphone apps, and computer-based tools
Use spreadsheet software to enter, manipulate, edit, and format text and numerical data
Effectively create, save, and print worksheets, charts, and graphs
Use presentation software effectively
Understand and use firewalls and software to protect devices from viruses, spam, and cookies

The self-assessment tool presented here represents information on core informatics competencies pulled from several different health professions. You may want to look specifically at your professional organization's website to see how informatics competencies are discussed. Remember that this is only the beginning; new technologies will continue to emerge and evolve. Possessing basic informatics competency will serve you well, as many of these basic skills are translatable and provide a strong platform for learning more complex technology skills in the future.

Summary

This chapter provided an overview of informatics and core informatics competencies, the DIKW paradigm, and the relationship of the paradigm to disciplinary science and established that health care professionals are knowledge workers. The Foundation of Knowledge model was introduced as the organizing conceptual framework for this text. Core informatics competencies were presented with an opportunity for self-assessment. In subsequent chapters, the reader will learn more about how informatics supports health care professionals in their many and varied roles. We suggest that in the future, health care research will make significant contributions to the development of the practice sciences for health care professionals. Technologies and translational research will abound, and clinical practices will be evidence based, thereby improving patient outcomes, decreasing safety concerns, and providing cost-effective care.

Thought-Provoking Questions

1. Describe a scenario in your discipline where you used data, information, knowledge, and wisdom.
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?
3. Complete the self-assessment of informatics competencies presented in Table 1-1 and create an action plan for achieving these competencies.

Apply Your Knowledge

This chapter introduced you to concepts related to the scientific basis of your profession and the relationship between health informatics and your discipline.

1. You are at a social event, and you are sharing a story about your education experience and your course on health informatics. A friend asks you, "What is informatics?" Answer the question by using terms and examples that a layperson will understand.
2. As the conversation continues, you share that you are excited about the allied health major you have chosen because of the scientific basis of the practice. Again, your skeptical friend asks, "What do you mean by the science of the discipline?" Answer this question by describing at least three examples of the scientific basis of practice for your discipline.

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