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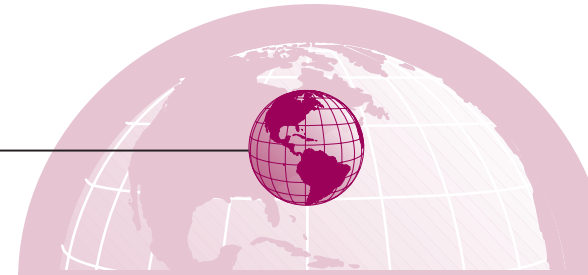
FEATURE ARTICLE



Defining and Integrating Informatics Competencies Into a Hospital Nursing Department

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Expanding use of complex patient information management systems and communication technology in healthcare organizations requires nurses to possess core competencies that until recently were not considered as integral to practice as those of a strictly clinical nature. Organizational changes necessary to formally integrate informatics competencies into nursing practice require strong partnerships among facility nursing leaders, educators, and informaticists. The authors describe a strategic initiative one acute care organization used to develop nursing practice that ensures use of system tools to manage patient information, support clinical decision making, optimize workflow, and communicate with members of the care team. The initiative involved defining nursing computer and informatics management skills for the clinical system applications and technologies utilized in the organization and integrating the introduction, evaluation, and ongoing professional development of the defined informatics competencies into organizational processes and tools to support the bedside nurse.

KEY WORDS

Informatics in practice • Information literacy skills • Nursing informatics competencies • Performance evaluation

In April 2004, the national healthcare scene was energized by an Executive Order calling for all Americans to have access to an interoperable electronic medical record by 2014.[1] This strategic direction created an immediate requirement for a workforce trained to implement and use healthcare information management systems and communication technologies.[2,3] Accelerating use of these complex systems coupled with ever-expanding professional nursing knowledge and emphasis on evidence-based practice requires nurses to acquire and apply core informatics competencies in their daily work.[4,5]

Multiple publications related to informatics competencies for nurses have focused on informatics within the context of nursing education, including implications for faculty, students, and curricula.[6–11] The importance of this educational focus was further affirmed by the 2003 report from the Institute of Medicine (IOM) Committee on the Health Professions Education, *Health Professions Education: A Bridge to Quality*, which recommended that knowledge and skills in interdisciplinary collaboration, patient-centered care, evidence-based practice, quality improvement, and informatics should be an integral part of educational programs for all health professionals.[12] The National League for Nursing (NLN) Task Group on Informatics Competencies expanded on the role of informatics in the IOM report, indicating that informatics competencies transcend and provide an infrastructure for the other competencies listed.[13] The American Association of Colleges of Nursing now includes specific information management and healthcare technology content as part of the essential core competencies to be acquired over the course of the professional nursing student's academic program at the undergraduate and graduate levels.[14–16]

Despite being identified as a core component of professional nursing education, until recently, many bedside nurses have not recognized that informatics competencies are integral to their professional practice. Importance of informatics competencies for all nurses was articulated in

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DOI: 10.1097/NCN.0b013e3181f9db36

the 2001 American Nurses Association's (ANA's) *Scope and Standards of Practice for Nursing Informatics*.[17] This document divided informatics competencies into three general groupings: computer literacy skills, information literacy skills, and overall informatics competencies.[17] Although helpful for setting strategic direction, informatics nurses, not bedside nurses, were the target audience for this document, and bedside nurses were unlikely to be aware of its implications for their practice.

In 2002, Staggers et al[18] published the results of a Delphi study describing the first research-based master list of informatics competencies for nurses. The study by Staggers et al[18] identified nursing informatics competencies in the areas of computer skills, informatics knowledge, and informatics skills for four levels of nursing practice: beginning nurse, experienced nurse, informatics specialist, and informatics innovator. Most bedside nurses were included in the beginning and experienced levels, but the need to define the core competencies by level of practice and job type and to develop informatics competency evaluation tools remained.[19] Further research reported by Curran[20] in 2003 began to address this gap with a focus on expanding the list of essential informatics competencies for nurse practitioner education and practice, and in 2008, Westra and Delaney[21] reported results of a Delphi study that identified informatics competencies for nurse leaders.

In 2006, the Technology Informatics Guiding Education Reform (TIGER) Summit convened a group of national leaders from nursing, technology organizations, government, and other stakeholders to create a vision for nursing's future that enables nurses to use informatics in practice and education to support patient safety and quality of care delivery.[22] The resulting TIGER action plan for healthcare delivery organizations focused on practicing nurses in the workplace and included a recommendation to develop a professional nursing model that supports attainment and development of informatics competencies, including creation of performance systems that encourage clinicians to consider informatics as part of their professional development.[22]

The importance of informatics competencies for practicing nurses has been recognized at the state level as well. For example, in 2005, the Oregon Nurse Leadership Council Education Committee, a working group of the Oregon Center for Nursing, articulated a set of competencies required for three levels of nursing personnel within the state's healthcare system to meet the needs of Oregon's population currently and for the next decade.[23] One of the four defined competency categories, overall professional, addressed effective and appropriate use of communication and information technology, including a focus on nursing professional development. The stated goal was to develop a nursing workforce able to access, evaluate, and use data and information to guide care delivery, outcome evaluation, and quality improvement; to adapt information resources to provide education about health and disease management; and to assist clients in navigating healthcare technologies to meet their health education needs.[23]

Although the literature addresses the need to provide nurses with education and support to attain informatics competencies and broad categories of these competencies have been defined,[4–6,11–23] specific examples of applying these concepts to clinical systems and technologies used by bedside nurses in a hospital-based work environment have not been published. Without this application step, the competency statements are less usable by nursing leadership and bedside nurses and cannot be easily incorporated into existing organizational processes and structures for education and performance evaluation.

This article describes one hospital system's experience over the past 3 years to define clinically relevant informatics competencies linked to professional developmental levels and to develop and implement the organizational infrastructure required for their support. The organization's translation of informatics competencies into the professional nursing practice model began in 2006 and continues to evolve as the culture shifts and lessons learned are applied.

RETHINKING INFORMATICS COMPETENCIES

At the organization, nurses have traditionally perceived the definition of informatics competencies as simply the computer skills necessary to enter patient data in yet another tool in the work setting. However, appreciation of their professional role as patient information managers is now evolving as nurses recognize the integral connection of informatics competencies to evidence-based practice and the role those competencies play in clinical decision making, nursing research, measurement of nurse-sensitive outcomes, professional development, operational effectiveness, and, ultimately, the patient-nurse relationship.

Launching the work to explicitly and formally integrate informatics competencies into nursing practice required strong partnerships among nursing leaders in multiple roles—chief nurse executive, managers, educators, and informatics specialists. Nursing leaders recognized the strategic opportunity and organizational accountability to provide nurses with the processes and structures to support safe practice—including the expectation and support for nurses' acquisition and appropriate use of informatics competencies. The strategic goal was to develop nursing education approaches that link informatics to practice, ensuring the appropriate and effective use of system tools to manage patient information, support clinical decision making, and improve nursing workflow.

In early 2006, the concept for this initiative was proposed by the nursing informatics specialists who invited

partnership with the nursing educators to develop the model for application in the clinical setting. A core work group of informatics nurses and nurse educators was formed to tackle the work. The first step was to establish a common understanding of each professional domain's practice framework and focus through a shared review of the literature and lively dialogue about its application to practice. Nurse informatics specialists conveyed the foundational concepts of data, information, knowledge, and wisdom as described in the ANA's *Scope and Standards of Nursing Informatics Practice*[17] and extended by Nelson[24] and described the importance and relevance of nurses embracing their role as patient information managers in an information technology–enabled care delivery environment. Nurse educators shared information and insights about adult learning and the professional nurse development model used at the organization, which is based on Benner's[25] application of the Dreyfus model of skill acquisition to nursing. A blending of the concepts reflected in the stages of clinical competence, from novice to expert, as described by Benner,[25] and the concepts of the data to wisdom continuum[17,24] was applied to help reshape nurses' thinking about describing and developing informatics competencies. The concept of the nurse as a knowledge worker, with various roles enabled by a healthcare information technology tool set as described by Snyder-Halpern et al,[26] also helped bedside nurses recognize the importance of developing and continually refreshing informatics competencies.

In the organization's application of the data to wisdom continuum for this work, data are defined as uninterpreted unique elements such as a number that may represent patient age, systolic blood pressure, heart rate, pain rating, or other numeric data such as a laboratory value. Information emerges as data are aggregated—linked together with other data—and interpreted in context. A vital sign graphics display showing trended data becomes information. Knowledge emerges from the integration and analysis of information—a pattern emerges and reveals what is known based on a combination of the current context, the nurse's previous experience, and other documented knowledge. Knowledge is demonstrated through the nurse integrating and analyzing what is known to tell the story of the patient's illness and immediate issues of concern. Wisdom is described as connoting an understanding of the implications of applying knowledge based on previous experience, current evidence, and patient information in the most appropriate and ethical way—applying the right decision at the right time for the patient. The data to wisdom continuum is described as fluid and nonlinear, with each component having the potential to help support decision making.

Informatics competencies include the knowledge, skills, and abilities needed to use and manipulate electronic media in support of these processes. In the context of the data to wisdom continuum, informatics competencies are defined as the skills needed to use these tools to support the highest levels of nursing clinical judgment. Once informatics competencies were described in the context of the data to wisdom framework, their value became explicit to practicing nurses at the organization.

Acquisition of informatics competencies was described in the context of novice to expert, using the language and applying concepts from a model already familiar to nursing staff. Benner's[25] model identifies the way that nurses develop the skilled know-how, clinical judgment, and ethical comportment of nursing practice. The novice is described as learning the tools and an abstract way to think like a nurse. The advanced beginner nurse is commencing to apply not only the know-how but also the clinical judgment required to deliver patient care in the clinical setting. The competent nurse has developed the facility to use the tools and reason through problems typical to a familiar patient population. A proficient nurse, having both the facility of using all the tools of the practice and a base of experience, recognizes the pattern of patient presentation and anticipates care needs. The expert, in addition to all the preceding, has the peripheral vision to be able to orchestrate the team and look beyond the current moment to problems inherent in systems and practices and seek continued improvement of the practice.[25] If a new tool or unfamiliar patient population presents, the nurse moves back to the novice level. The nurse experiences constant flux within the novice-to-expert levels, depending on the clinical scenario or set of tools used to support practice—including clinical information systems or other technologies.

DEFINING INFORMATICS COMPETENCIES—FIT FOR NURSING AND THE ORGANIZATION

By blending the concepts of data to wisdom and novice to expert, informatics nurses and nurse educators identified common threads of understanding upon which to build informatics competency statements and educational design. The next organizational step was to revisit the literature for informatics competency descriptions and begin the translation to the organization's relevant healthcare information and communication systems. The competencies were mapped to an applicable level of skill acquisition as described by Benner, providing a new context for the novice-to-expert concepts. Extensive observation of bedside nurses with varying levels of experience using informatics tools revealed typical patterns of informatics competency development. These patterns then informed the process of setting organizational expectations and defining metrics for nurse acquisition of informatics competencies.

The next step in the process was to translate and apply the research-based master list of informatics competencies

reported by Staggers et al[18,19] and described in the ANA's 2001 *Scope and Standards of Nursing Informatics Practice*.[17] For application in the organization, the decision was made to divide the informatics competencies into two broad categories: (1) computer literacy skills and (2) informatics skills (encompassing information literacy and information management components). Practically applied, computer literacy skills included the psychomotor use of the tools (eg, keyboarding) and learning the basic computer hardware and software functionality required as part of the nurse's daily work. Information literacy skills focused on the nurse's ability to recognize when information is needed and to retrieve, evaluate, and use it appropriately. Information management skills were multifaceted, including (but not limited to) applying the data to wisdom concept continuum to support clinical decision making and tell the patient's story; ensuring data integrity, confidentiality, and security; articulating the value of information systems and their links to improved quality, financial, and satisfaction outcomes; and mentoring peers in their acquisition of higher levels of informatics skill acquisition.

The competencies within each category were then stratified based on application of the professional skill development model used by the organization (novice to expert). This distinction allowed practicing nurses to recognize their level of informatics competency development as unique from their clinical competency development. For example, a bedside nurse can be a clinical expert, a computer skill advanced beginner, and a proficient advocate for the value of information technology simultaneously. Since nurses need to gain proficiency in use of the tools unique to their work, informatics competencies were further refined by identifying the specific software and hardware in each care setting throughout the organization. This definition process excluded competencies needed only by nursing informatics specialists.

Once the competencies were identified and stratified, behavioral evidence of attainment, education strategies to support attainment, and the means for evaluation were delineated and constructed. The competencies themselves, the behavioral evidence, education, and evaluation strategies were then integrated into the organizational infrastructure so that they became a part of the way nursing is practiced and advanced in the organization. By the end of 2006, this integration was reflected by inclusion of explicit informatics-related expectations in the professional nurse's position description and performance appraisal tools and processes.

TRANSLATING NURSING INFORMATICS COMPETENCIES TO BEDSIDE PRACTICE

The concept of nursing informatics and the perceived relevance of related competencies presented a challenge for those charged with integration in the organization's culture and nursing practice. Nursing leaders and bedside nurses needed a clear translation to daily practice to move beyond the misperception that informatics competencies were related only to computer literacy skills. Nursing informatics specialists played a key role in translating competencies to bedside practice, highlighting the consequences of ineffective application by providing specific unit-based scenarios. For example, on one nursing unit, the informatics specialist helped staff nurses directly connect the competency of viewing trended electronic documentation data to understanding effectiveness of interventions for their patients' pain management. This translation facilitated acceptance and understanding by demonstrating that informatics competencies are both integral and complementary to achieving clinical expertise. Without informatics competency, even the most expert clinicians may be hampered in practicing to their full potential because they lack the requisite information literacy and information management skills.

The novice-level informatics competencies were defined as basic computer literacy skills including simple navigation in a computer operating system, use of desktop hardware such as keyboarding, troubleshooting skills, use of e-mail tools, and knowledge of the difference between hardware and software. These are demonstrated within the first few weeks of orientation and, at some future date, may become a condition of hire. Practicing bedside nurses are expected to attain informatics competencies at the advanced beginner level within 3 months of hire and at the competent level at 1 year. Proficient and expert levels are considered an expectation of ongoing professional development but are not required for maintaining employment.

APPLYING THE TRANSLATION—AN EXAMPLE

The following example illustrates how one informatics competency—demonstrates use of systems tools for structured data entry—was defined, stratified, and translated from the advanced beginner through expert level. This competency is defined as a computer literacy skill at the advanced beginner level but transforms to an information management skill at the expert level and is redefined to reflect the practice expectations (Table 1).

The advanced-beginner-level nurse should be able to demonstrate the basic use of the appropriate clinical system tools to collect and document clinical care including admission data, vital signs, physical assessment, plan of care, medication administration, intravenous line administration, and so on. The focus is on developing the computer literacy skills for basic navigation and use of the tool.

At the competent level, the computer literacy skill begins the transformation to an information management skill.

Table 1

Nurse Development Linkages to Nursing Informatics Concepts

Benner Level	Benner Definition	Data-Wisdom Thread	Competency Example
Novice	Learning tools and thinking abstractly about nursing practice	Data	Computer literacy skill: demonstrates basic skills for navigation in Windows Information literacy/management skill: describes patients' rights as they pertain to computerized information management
Advanced beginner	Beginning to apply know-how and clinical judgment	Data information	Computer literacy skill: demonstrates use of system tools for structured data entry Information literacy/management skill: accesses computer-stored data to support critical thinking about patient situation and management
Competent	Has facility to use tools and easons through problems typical to familiar patient populations	Data information knowledge for familiar patients	Computer literacy skill: demonstrates consistent use of application optimization through use of advanced functionality features Information literacy/management skill: locates and uses multiple sources of data that are relevant to the patient to interpret findings and improve clinical decision making
Proficient	Has facility of all practice tools and experience base and recognizes patterns of patient presentation	Data information knowledge	Computer literacy skill: demonstrates intermediate use of word processing, spreadsheets, and presentation software tools to support committee, quality, or research activities Information literacy/management skill: locates, interprets, and integrates data and information for understanding; uses data and statistical reports for unit-based research and practice evaluation
Expert	Able to orchestrate teams and seek improvements for systems and practice	Data information knowledge wisdom for familiar patients	Computer literacy skill: demonstrates advanced use of word processing, spreadsheets, and presentation software tools to support committee, quality, or research activities Information literacy/management skill: role models integration of clinical data systems and development of practice wisdom; demonstrates mastery of tools to facilitate critical thinking and recognize patterns in patient presentation or response

The computer literacy skill becomes *demonstrates consistent use of application optimization through use of advanced functionality features*, as the nurse discovers more effective navigation and functionality that as a novice (new employee) would be perceived as overwhelming because of the multiplicity of system tools the nurse is required to learn upon joining the organization. The information management–related competency is defined as *demonstrates use of system applications for structured data entry at a level consistent with policy or clinical practice guidelines*. This implies that the expectation is beyond understanding the basics of a new system tool. The competent-level nurse should be able to demonstrate consistent documentation practices and use of the system tools to assist with admission and discharge processes, as well as develop and manage individualized care plans for familiar patient populations. It is about managing patient information as an integral part of daily practice and clinical decision making.

The proficient and expert levels are more difficult to distinguish. The competency has fully transformed to one of information management. The proficient nurse should be able to interpret and integrate data and information for understanding, demonstrated by using the tools to present

a patient case study. The expectation is that the data and statistical reports are utilized for unit-based research and practice evaluation. The expert nurse role models integration of clinical data systems and development of practice wisdom by demonstrating best practices related to information systems in daily practice and mentoring peer development. The nurse at this level is actively seeking data and statistical reports to support clinical decision making and evaluation of unit practice for target patient populations.

The organization is now seeing new graduate nurses enter practice at the novice level in the clinical domain, but at the advanced beginner level related to many informatics competencies. Coexisting in the work environment are nurses who see themselves as experts—but from a solely clinical perspective. Despite their long tenure at the organization, these clinically expert nurses may be practicing at the advanced beginner or competent level related to informatics competencies. Until the organization's recent focused work linking informatics competencies to practice, they had been expected to adopt and integrate information technologies and tools in their daily work without the same level of support offered for clinical skill acquisition.

CREATING SUPPORT STRUCTURES AND PROCESSES FOR COMPETENCY ATTAINMENT

In 2007, the organization initiated tailored support structures and processes to address the informatics learning needs of nurses practicing at differing levels. Traditional approaches to deliver education to large groups of nurses were ineffective for informatics training. Instead, informatics content was woven into the introduction of clinical content or related initiatives. A specific approach was adopted to develop informatics competencies for two broad groups of nurses in the work environment—the clinically novice nurse at the informatics advanced beginner level and the clinically expert nurse at the informatics advanced beginner or borderline competent level.

During orientation, each new nurse now receives classroom education for computer literacy skills and introduction to nursing informatics concepts. The instructor reviews the specific advanced beginner and competent-level informatics competencies and sets the expectation that competency achievement is a professional nursing responsibility for practice.

Preceptors play a crucial role in coaching the new nurse. The preceptors now incorporate the informatics learning objectives into daily practice and weekly evaluations. The new nurse is expected to use the clinical tools to share a patient story with the preceptor and clinical educator on a weekly basis. As the orientation progresses, the nurse should be able to use the clinical information system online reviews to tell a patient story from time of admission through current point in their hospitalization. This approach allows the preceptor and evaluators to review the development of informatics competencies related to both computer literacy skills (eg, navigation in the clinical system) and information management, as well as to identify appropriate application of critical-thinking patterns related to practice guidelines/protocols for familiar patient populations. The goal is to seamlessly integrate informatics competencies with practice.

Two months after orientation, a nurse informatics specialist conducts a brief competency assessment to identify learning objectives that will ensure successful attainment of the informatics competent level by the end of the nurse's first year of practice at the organization. Nursing leadership then uses the performance appraisal process to evaluate informatics competency development at 6 months and in 1 year. After the first year in practice, nurses demonstrate integration of informatics with practice through a professional development portfolio such as a clinical promotion program and annual performance reviews.

To support ongoing development, informatics nurses provide unit-based education for small groups and personalized elbow-to-elbow sessions at the bedside where the nurse can easily apply the new learning to an actual clinical scenario. Independent study learning modules have also been developed and are available online through the organization's intranet. The informatics nurses also leverage opportunities to reinforce informatics concepts and skills during clinical practice team meetings by using the tools to review data and guide discussion. This is a powerful method that directly engages bedside nurses in real-time learning and knowledge transfer as they discuss clinical practice and consider use of data transformed to information and knowledge and applied in the clinical setting with wisdom.

For incumbent, clinically expert nurses, use of the informatics competencies affords the opportunity to identify gaps in current practice expectations and competency levels. At the organization, this clinically expert group had experienced a relatively slow immersion in use of technologies in the clinical environment until a recent explosion of new complex tools occurred. Implementation of the informatics competency definitions and supporting structures has provided an opportunity to engage the incumbent nurse in developing informatics skills critical to their continued success and application of clinical wisdom. Often these nurses demonstrate a solid foundation of informatics skills but have unique knowledge gaps, depending on when the clinical system was introduced in the organization. Incumbent nurses as a group have presented the single biggest challenge to the nurse informatics specialist charged with assessing learning needs and providing educational opportunities, as the knowledge gaps are varied and quite individualized per nurse or nursing unit. The efforts to

support this important nursing group cannot be understated or their relevance underestimated.

SUMMARY

The organization's recognition that nursing informatics competencies are an integral part of clinical practice was the first step in a journey to successfully introduce, develop, and assimilate those competencies into its processes and support structures for nurses. Translation of nursing informatics concepts and their direct correlation to practice was instrumental in shaping staff nurse perceptions and recognition of their professional accountability for informatics competencies. Nursing leaders believe that the success of this organizational transformation stemmed from that crucial process of connecting nursing informatics concepts to clinical practice. Nurses now think about recording patient data to inform decision making or guide quality improvement, rather than simply charting the care delivered. The relevance of this work has become visible and tangible.

Professional nurses are knowledge workers, and the abundant quantity of patient information they manage will only continue to grow. Use of healthcare information technologies will also continue to grow—requiring the need to continually refine and creatively find effective ways to help nurses adapt to evolving informatics requirements. This article has presented one organization's early work in the journey to explicitly link informatics competencies directly with bedside nursing practice. Nursing cannot afford to wait. Professional bedside nurses must attain and maintain a level of informatics competency that can serve as the bedrock to their practice, strengthening their clinical decision making, enhancing the patient experience, and helping to improve health outcomes.

REFERENCES

1. Department of Health and Human Services, Health Information Technology, Office of the National Coordinator. Background. http://www.hhs.gov/healthit/onc/background/. Accessed July 28, 2008.
2. American Medical Informatics Association. Building the work force for health information transformation. http://www.ahima.org/emerging_issues/Workforce_web.pdf. Accessed July 28, 2006.
3. Hersh W. Who are the informaticians? What we know and should know. *J Am Med Inform Assoc*. 2005;13:166–170.
4. Pravikoff DS, Tanner AB, Pierce ST. Readiness of U.S. nurses for evidence-based practice: many don't understand or value research and have had little or no training to help them find evidence on which to base their practice. *Am J Nurs*. 2005;105(9):40–51.
5. Skiba D. Preparing for evidence-based practice: revisiting information literacy. *Nurs Educ Perspect*. 2005;26(5):310–311.
6. Barton AJ. Cultivating informatics competencies in a community of practice. *Nurs Adm Q*. 2005;29(4):323–328.
7. Booth RG. Educating the future eHealth professional nurse. *Int J Nurs Educ Scholarsh*. 2006;3(1):1–10.
8. Desjardins KS, Cook SS, Jenkins M, Bakken S. Effect of an informatics for evidence-based practice curriculum on nursing informatics competencies. *Int J Med Inform*. 2005;74:1012–1020.
9. McNeil BJ, Elfrink VI, Beyea S, Pierce S, Bickford C. Computer literacy study: report of qualitative findings. *J Prof Nurs*. 2006;22(1):52–59.
10. McNeil BJ, Elfrink VI, Bickford CJ, et al. Nursing information technology knowledge, skills, and preparation of student nurses, nursing faculty, and clinicians: a US survey. *J Nurs Educ*. 2003;42:341–349.
11. McDowell DE, Ma X. Computer literacy in baccalaureate nursing students during the last 8 years. *Comput Inform Nurs*. 2007;25(1):30–36.
12. Greiner AC, Knebel E, eds. *Health Professions Education: A Bridge to Quality*. Washington, DC: The National Academies Press; 2003.
13. National League for Nursing, Task Group on Informatics Competencies. http://www.nln.org/getinvolved/AdvisoryCouncils_TaskGroups/informatics_final.htm. Accessed July 21, 2008.
14. American Association of Colleges of Nursing. *The Essentials of Baccalaureate Education for Professional Nursing Practice*. http://www.aacn.nche.edu/education/pdf/BaccEssentials08.pdf. Accessed March 1, 2009.
15. American Association of Colleges of Nursing. *The Essentials of Doctoral Education for Advanced Nursing Practice*. http://www.aacn.nche.edu/DNP/pdf/Essentials.pdf. Accessed May 11, 2008.
16. American Association of Colleges of Nursing. White paper on the education and role of the clinical nurse leader. February 2007. http://www.aacn.nche.edu/Publications/WhitePapers/ClinicalNurseLeader07.pdf. Accessed May 11, 2008.
17. American Nurses Association. *Scope and Standards of Nursing Informatics Practice*. Washington, DC: American Nurses Publishing; 2001.
18. Staggers N, Gassert CA, Curran C. *Results of a Delphi Study to Determine Informatics Competencies for Nurses at Four Levels of Practice: Final Master List of Nursing Informatics Competencies*. http://nursing.utah.edu/informatics/competencies.pdf. Accessed March 1, 2008.
19. Staggers N, Gassert CA, Curran C. A Delphi study to determine informatics competencies for nurses at four levels of practice. *Nurs Res*. 2002;51(8):383–390.
20. Curran CR. Informatics competencies for nurse practitioners. *AACN Clin Issues*. 2003;14(3):320–330.
21. Westra B, Delaney CW. Informatics competencies for nursing and healthcare leaders. AMIA 2008 Symposium Proceedings. http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2655955. Accessed March 15, 2009.
22. Technology Informatics Guiding Education Reform. *The TIGER Initiative—Evidence and Informatics Transforming Nursing: 3-Year Action Steps Toward a 10-Year Vision*. http://www.tigersummit.com. Accessed April 22, 2007.
23. Oregon Nurse Leadership Council (ONLC) Education Committee. *Core Competencies for the Nurse, Practical Nurse and Nurse Assistive Personnel*. http://www.oregoncenterfornursing.org/documents/asstpersonnelcompetencies1.pdf. Accessed July 28, 2008.
24. Nelson R. Major theories supporting health care informatics. In: Englebardt SP, Nelson R., eds. *Health Care Informatics: An Interdisciplinary Approach*. St Louis, MO: Mosby; 2002.
25. Benner P. *From Novice to Expert: Excellence and Power in Clinical Nursing Practice*. Menlo Park, CA: Addison Wesley; 1984.
26. Snyder-Halpern R, Corcoran-Perry S, Naravan S. Developing clinical practice environments supporting the knowledge work of nurses. *Comput Nurs*. 2001;19(1):17–23.