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Nursing Informatics Competencies: Implications for Safe and Effective Practice

Hayes Greer

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Nursing Informatics Competencies: Implications for Safe and Effective Practice

Dr. Sharie Falan, Bronson School of Nursing

Dr. Juanita Manning-Walsh, Bronson School of Nursing

Dr. Bernard Han, Business Information Systems

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Hayes Greer

Western Michigan University: Bronson School of Nursing

Abstract

The purpose of this thesis is to examine the implications and availability of nursing informatics competencies, and to address the current state of informatics competency guidelines and assessment tools. To possess competence in nursing informatics, one must possess the ability to obtain, store, retrieve, and communicate data, information, knowledge, and wisdom, which is essential to nursing practice. Nurses must be educated and competent in nursing informatics in order to exhibit safe and effective nursing practice. Many various lists and guidelines exist to address the distinct competencies that nurses must possess; however, very few resources are available to assess the degree to which one is competent in a specific area. Being able to identify which areas of nursing informatics competencies need further education is highly beneficial and constructive in the advancement of nursing practice. Possessing a tool that assesses how competent an individual is in nursing informatics ultimately improves outcomes of nursing practice and increases the safety and effectiveness of patient care.

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Nursing Informatics Competencies: Implications for Safe and Effective Practice

Introduction

Informatics competencies are essential for nursing practice, and are critical to providing safe and effective patient care. It is estimated that approximately 3,000,000 nurses are working in the United States where communication using information systems is expected. As a profession that depends on the use of technology, the need for appropriate collegiate and continuing education programs in nursing with a focus on informatics competency is crucial to the development and maintenance of effective practice.

The purpose of this thesis is to address the current state of informatics competency tools. This thesis also provides insight into the implications of developing tools that not only assess and identify the areas of informatics competencies that need further education, but also discusses the amount of education needed in the identified areas.

Nursing practice is continuously changing, and the need for appropriate competencies to address specific areas of nursing are essential to the provision of safe and effective care. Among the most important components of patient care are communication, clinical decision making, and patient safety. The practice of nursing is based on the collection, storage, retrieval and use of data, information, and knowledge. Nurses must be competent in these areas in order to provide safe and effective patient care.   Often times, technologies are used in practice to help with the management of information and clinical decision making. The development, implementation, and use of technology is integral to the practice of nursing. However, the use of technology in practice creates new educational needs for nurses in regards to possessing knowledge, behavior, and skills for practice. It is important that nursing professionals and other healthcare providers are educated and competent in the proper use of technology as it applies to

the various disciplines in healthcare. To be competent is to possess specific behaviors, knowledge, skills, and capacity within defined areas (Merriam Webster, 2012; Cronenwett et al, 2007; Nagelsmith, 1995). Nurses, especially, must possess competence in nursing practice to provide safe and effective care.

A critical area of nursing competencies is that of Nursing Informatics, which can be defined as possessing the appropriate knowledge, behavior, and skills required for nurses to collect, store, retrieve, and process information. In order for nurses to effectively manage patient care, they must understand how to appropriately manage information; thus, possessing informatics competencies is elemental to practicing as a professional nurse. Many lists and guidelines exist to identify specific informatics competencies needed for nurses to provide effective patient care. However, very few tools exist to assess and identify how competent an individual is and the specific competencies that require further education.

Nursing Practice: A Background

Nursing practice encompasses a health care discipline derived from the concept that nurses are care providers who design, manage, and coordinate care, and are members of a profession. Nursing practice, founded on the concepts of knowledge, theory, and research, is progressively evolving, focused on promoting health and wellness, providing health care, and reducing risks for adverse health outcomes (American Association of Colleges of Nursing, 2008). As a profession, the practice of nursing is based upon specific standards of care, where care is addressed through the nursing process: assessment, diagnosis, planning, implementation, and evaluation.

Nurses are required to collect, store, and retrieve data and information, in order to synthesize knowledge and use wisdom to guide nursing care. Critically important to handling

data and information, effective communication must be exercised at the professional level in order to achieve safe patient care. Though nursing practice is built upon specific set standards of care, the way that nursing care is provided is ever changing, primarily through the development and integration of technology (Nagelsmith, 1995).

Framework

The nursing informatics framework guides how data, information, knowledge, and wisdom are stored, retrieved, and utilized in nursing practice. Nurses must obtain data, convert it into contextualized information, which is interpreted using knowledge, and then must use wisdom to make decisions based on this knowledge and process. Without the essential competencies of nursing practice, and competency in the tools that nurses use, this process is inhibited. Acquiring informatics skills and demonstrating those competencies facilitates nurses to practice using their specialized knowledge. Nurses must understand how to access the right information at the right time: how to retrieve, store, and utilize information in order to make the correct decisions. Fundamentally, this is the core of communication.

Communication

Communication by definition, the act of transmitting or exchanging information or opinions, can be applied directly to the healthcare profession in regards to providing patient services (Casey & Wallis, 2011; Merriam Webster, 2012; Nadzam, 2009). This exchange of information can be accomplished by many means, including verbal communication, non-verbal communication (body language, attitude, or tone of the exchange), and written communication (Nadzam, 2009).

The importance of effective communication is applicable to multiple professions, occupations, and areas of expertise. Car computers must effectively communicate with the four

separate wheels of a car in an all-wheel drive system to avoid malfunction in operation. Firemen must communicate with one another when assisting in the evacuation of a burning apartment complex to ensure that the tenants are evacuated efficiently and effectively. The military must communicate in combat in order to safely enter a hostile zone when completing a mission. In the discipline of aviation, it has been noted that 70% of accidents among commercial airline flights have resulted from failures in communication (Leonard, Graham & Bonacum et al, 2004).

Communication is essential to the concept of human interaction, and health care providers must effectively communicate patient information with one another in order to ensure that patient safe care is provided (Anthony & Preuss, 2002; Leonard, Graham & Bonacum et al, 2004; Nadzam, 2009). For effective communication to exist, it is not only important that information is communicated accurately, but also that information is communicated in a timely manner (Casey & Wallis, 2011; Nadzam, 2009). Effective communication is imperative to patient safety, and communication failures are recognized as one of the most common causes of patient harm (Anthony & Preuss, 2002; Leonard, Graham & Bonacum et al, 2004; Nadzam, 2009). The implications for engaging in effective communication are substantial and directly related to positive outcomes in providing safe patient care (Casey & Wallis, 2011; Leonard, Graham & Bonacum, 2004; Nadzam, 2009).

Communication of patient information influences clinical decision-making, and, respectively, the outcomes of the chosen decisions. Decision-making may simply be defined as selecting between multiple alternatives. Clinical decision-making in nursing includes making choices in patient care and how patient care is managed (Banning, 2007). This process becomes most effective through experience, evidence-based practice, and clinical support. When applied to nursing, the Intuitive Humanist model of decision-making exemplifies the nurse's capacity to

make appropriate decisions based on the relationship between experience and knowledge, as the practicing nurse transitions from novice to expert (Benner, 1984, Young, 1987, et al Banning, 2007). Utilizing appropriate knowledge and communicating accurate information is a key component to providing patient safe care. Without accurate information, one could not ensure that optimal or best actions are being taken with the respective patient. To better ensure accuracy of information, many tools have been developed in the healthcare field. With the development and proper use of these tools, members of the healthcare team are able to make more appropriate judgments with patient care, aiding in the clinical decision-making process.

Breakdowns in communication can result from a number of barriers experienced in the health care setting. In regards to the health care team, a specific tool was developed as a result of historic repeated instances of a communication barrier related to differences in language use: the Situation Background Assessment Recommendation (SBAR) tool (Casey & Wallis, 2011; Leonard, Graham & Bonacum et al, 2004; Nadzam, 2009). The SBAR tool is a valuable tool for nurses because it enables them to provide concise information about a patient and the patient's situation to other health care providers, and especially to physicians (Casey & Wallis, 2011; Leonard, Graham & Bonacum et al, 2004). Through training and experience, nurses are taught to use narrative or descriptive language to explain a situation to physicians, while physicians expect action based language during report, and want subjective information about the root of the problem (Nadzam, 2009). As addressed with the SBAR tool, the nurse-physician relationship was more subject to communication breakdowns before the development of the tool (Leonard et al, 2004). The SBAR tool was developed in order to assist in augmenting the efficacy of communication between nurses and physicians in a health care team approach to providing safe patient care (Casey & Wallis, 2011).

Another common communication barrier is related to decreased workplace cohesiveness. When nurses do not work well together or are not used to working together, communication becomes less effective; timely and accurate transfer of information relies heavily upon effective human interaction. A combination of the nursing shortage and increased number of temporary staff nurses has decreased the cohesiveness of some healthcare teams. This barrier decreases the effectiveness of communication, ultimately resulting in increased errors and inadvertent patient harm (Anthony & Preuss, 2002).

There are serious implications for communicating in an accurate, timely, and effective manner. Optimal communication among members of a health care team ultimately reduces possible errors and adverse events related to patient care (Anthony & Preuss, 2002; Casey & Wallis, 2011). When information is not transferred accurately in a complete manner within a timely period, the value of the information decreases, resulting in information decay (Anthony & Preuss, 2002). New information, in turn, must be collected and synthesized for effective decision making to take place (2002). If staff members are able to communicate effectively, that is by actively sharing accurate and concise information, the quality of patient care can be better ensured. This increases the continuity of care, enabling higher quality of patient care for all patients and clients in need (Casey & Wallis, 2011).

The amount of information that is communicated electronically in the hospital setting is immense, and provides relevance to the importance of effective communication. According to a study conducted on two hospital campuses, an average of approximately 65,000 notes were communicated electronically each week. This amount of communicated notes gives substance to just how important communication is in a setting that relies so heavily on the process and transfer of electronic information (Vawdrey, 2008). Through the emergence of electronic forms

of communication in healthcare, transferring patient information and data has become more

efficient, with increased potential for accuracy and validity of information. A prime example is

the development of the Electronic Health Record (EHR).

Use of Technology

The use of many types of technologies in healthcare, and specifically in nursing, has

become a key component to providing patient care. As an integral element to health care,

technology used within the nursing profession varies widely, and requires numerous skills for the

utilization of specific technologies. Technology used daily by nursing personnel may include,

but is not limited to, IV pumps, blood pressure machines, ventilators, naso/oropharyngeal suction

devices, wound vacs, bladder scanners, ultrasound machines, glucose monitoring kits, barcode

scanners, and computerized provider order entry systems (CPOE) and the EHR. Bedside

monitors also assist nurses in the process of data collection, with input into the EHR.

The EHR, a type of electronic system, has become integral for managing all aspects of

patient information. In fact, the EHR facilitates the utilization of the patient history, laboratory

information, treatment plans, medications, and many other aspects of patient care (Carter, 2008).

Electronic systems directly assist nurses in organizing data and information into presentable

formats, from which knowledge and wisdom can be synthesized, all pertinent toward patient care

(2008). The facilitation and use of information communication via electronic systems positively

affects the process of clinical decision making, thereby increasing the opportunity for more

accurate, timely, and effective use of knowledge and wisdom in the nurse's decision-making

process in patient care. In terms of facilitating information communication, the EHR is a

comprehensive system that electronically enables the collection, storage, retrieval, and sharing of

patient data and information (2008). EHRs support healthcare personnel, clinicians, and

administrators with using and sharing more complete, accurate, and timely data (2008). While integrating alerts, reminders, decisional support, electronic references, and many other features, EHRs have become elemental in the provision of patient care (2008).

The proper use of technology enables the reduction in human error by providing congruency, giving the nurse multiple reference points for patient care throughout the decision making process. EHRs and CPOEs assist with effective communication between health care personnel, particularly in terms of communication between physicians and nurses. While technology is often thought of as being used at the bedside for direct patient care, clinical managers and nurse executives use administrative systems that facilitate staffing needs, as well as financial and resource management.

In the evolving healthcare field, it is fundamental that nurses' needs are addressed in terms of technology. Competence in information and technology is essential not only for bedside nurses, but is also important for clinical managers and executives. The implementation of technology in health care requires the development of specific behavior, knowledge, and skills to articulate the needs of the individuals using the technology.

Competence

As previously discussed, competence may be simply defined as the possession of behavior, knowledge, skill, and/or capacity (American Association of Colleges of Nursing, 2008; Merriam-Webster, 2012; Cronenwett, 2007, Nagelsmith, 1995). Consequences to competence within the scope of nursing include safe care and safe practice, the ability to create and implement appropriate interventions, and knowing one's limitations: knowing when to ask for assistance (American Association of Colleges of Nursing, 2008). The interaction of one's knowledge, experience, environment, and motivation shapes the development of competency

within the personal domain, depending on the profession in which one works.

Competence as a concept of nursing was formally addressed in The National Nursing Syllabus for England and Wales in the year 1923 (Bradshaw, 2000). Competence dates back to the era of Florence Nightingale, and became defined through her establishment of nursing practice standards, and the need for nurses to have the knowledge, behaviors, and skills to meet those standards. From the 1870's to the 1970's, nursing competence was related to four elements of nursing education. These four areas include the development of the nurse's moral character, the development of knowledge and skills pertinent to patient care (and relevant to available technology), learning by example, and the development of professional relationships with both colleagues and patients (2000). Present nursing competences act to address not only the knowledge, skills, and behaviors required of nursing professionals, but also to address the evolving practice of nursing, congruent with the advancement of technology.

In the profession of nursing, the definition of competence as behavior, knowledge, and skills applies, but also includes the concept of value, attitudes, critical thinking, and clinical decision making (Swendsen Boss, 1985; Nagelsmith 1995). Competence in an operational sense includes the scope of application of skills, self-efficacy, autonomy, and authority, all adjacent to behavior, knowledge, and skills (Butler 1978; Nagelsmith, 1995). Competence as a concept of nursing is necessary to nursing practice in addressing and managing effective care. The development of specific competencies that demonstrate the requirements and standards of nursing practice are integrated directly into nursing education. Competencies pertinent to nursing practice might include those focused on technical skills, assessment and intervention skills, communication skills, critical thinking, patient safety, management, leadership, teaching, and informatics (Cronenwett et al, 2007; Lenburg, 1999). As electronic systems and technology

related to information collection, storage, retrieval, and communication are integrated more extensively into the profession of nursing, specific competencies must be developed to address the need for the respective education.

Multiple organizations exist to create and address standards for competencies. The American Association of Colleges of Nursing (AACN) oversees the BSN essentials. The American Nurses Credentialing Center (ANCC) is involved in the certification and credentialing of informatics as it applies to the nursing profession. The initiative that addresses nursing informatics competency is known as Technology Informatics Guiding Education Reform (TIGER). In 2004, the TIGER initiative was formed to improve education, the delivery of care, and nursing practice through the integration of health information technology (Gugerty, Delaney & Dulong, 2012). The initiative addresses the topics of basic computer competencies, information literacy, information management, and implementation strategies (2012).

Nursing informatics competence ranges from simple clinical skills to complex application based knowledge. Competence in nursing informatics can be defined as the knowledge, behavior, and skills required for nurses to collect, store, retrieve, and process and use information (Gugerty, Delaney & Dulong, 2012). Nursing informatics is facilitated through the use of technology, and competence in this technology is required for effective nursing practice.

With the integration of technology and information science into the field of nursing, there is an increased need for the existence of nursing informatics competencies; thus, nursing informatics competence is a key element to the professional nurse's body of knowledge. As technology is integrated further into the process of information communication, the need to address the coordination of safe and effective care through the transfer of information is imperative to the nursing practice (Abdrbo, 2008; Cronenwett et al, 2007). Without the

existence of informatics standards and competencies, the utilization of information technology

and communication would be ineffective in the health care setting, imposing risks on patient

safety.

A More Detailed Look at Competency

As noted previously, competence in nursing informatics is linked to safe patient care. The

development of informatics competence by healthcare professionals is elemental to reducing or

preventing medical errors, providing a safer environment for patients in need of care (Bakken et

al, 2003; Bakken et al, 2004). In a pre- and post- implementation study focused on competencies

in nursing informatics, it was found that increased competence ultimately resulted in increased in

quality and effectiveness of communication and patient care (Bakken, 2003).

Nursing informatics competency is an imperative element to nursing practice, especially

in the provision of care. Most new graduates of baccalaureate (BSN) nursing programs enter the

profession of nursing with some background in nursing informatics. However, nurses who were

not formally educated in nursing informatics or are not technologically or computer savvy may

lack adequate competence in nursing informatics, inhibiting the ability to provide safe and

effective patient care. In a survey conducted in 2006 of 559 nurses, it is reported that

approximately 25% of the nurses had not received any information technology (IT) training

within the previous year. The implications relating to the percentage of IT training that is

lacking are augmented by the fact that 44% of the survey group stated that they were obligated to

use IT skills for three or more hours per day (CDW Healthcare, 2006, as cited in Gugerty, 2007).

Though the nurses in the study may be highly experienced and familiar with nursing as a

profession, the evolving practice of nursing has changed because of the integration of

technology. This has resulted in increasing demands for continuing education in regards to

informatics in nursing.

The demands for informatics competencies have had a substantial impact on both education and training for healthcare workers. As previously noted, education and training are fundamental for healthcare employees, especially nurses, with the education bridging the technological gap between these new graduates and the seasoned healthcare professional. Bringing relevance to the demand for informatics education and competence, approximately 54% of healthcare employees lack the knowledge and skills to be competent in the application of informatics in the provision of healthcare (Gugerty, 2007).

Many baccalaureate prepared student nurses who enter the nursing profession today may have had a course in nursing informatics, and have developed basic nursing informatics competencies. Many of these new graduates have competencies in technology and experience with computers as key elements of their generation. However, many new graduates also may lack appropriate and required competencies of nursing informatics that are developed through experience and continuing education to ensure safe patient care. Some nurses who have been in the profession for many years must rely on continuing education to address the topic of nursing informatics competence, and may not be exposed to the best educational opportunities.

In an effort to address the education issues related to nursing informatics competence, many informatics competency lists and guidelines have been developed. Most of these lists and guidelines only identify the specific areas and topics that need to be addressed; very few are able to give depth to precisely how much education needs to be provided to nurses in the areas identified.

Specific Competency Lists and Guidelines

Staggers, Gassert, & Curran provide a list of recommended required informatics competencies according to four different levels of practice, including the beginning nurse, the experienced nurse, the informatics specialist, and the informatics innovator (2002). The list of competencies varies according to the nurse's level of practice. As the nurse transitions from beginner to innovator, the list of recommended required competencies increases congruently with the depth of knowledge required for effective practice. The areas of informatics competencies include computer skills, informatics knowledge, informatics skills, research, practice, and education (2002). The informatics specialist level of practice is most emphasized within the this study, and the importance of competence within the informatics innovator level is insufficiently discussed. In Staggers et al., there is an inability to assess *how much* education is needed in each of the specific informatics competency areas. For example, as noted in the appendix, Staggers et al. merely lists out a competency based on the specific area: [nurses must be able to] construct data structures and maintain data sets (2002).

Lenburg provides a list of eight core competencies essential to nursing practice, including the competency skills of assessment and intervention, communication, critical thinking, human caring and relationship, management, leadership, teaching, and knowledge integration (1999). Within the communication skills competency, the sub-skill of computing skills is briefly discussed, and only the relationship to clients, searching for information, and professional responsibilities are addressed in relation to computing skills (1999). Informatics is not addressed as a core competency; this is significant because of the magnitude of technology integration and information communication within nursing today.

In an aforementioned article by Cronenwett et al, specific nursing competencies are defined by the Quality and Safety Education for Nurses (QSEN) faculty of an advisory board (2007). The QSEN faculty members developed a list of recommended competencies that should be required for all nurses to provide effective patient safe care (2007). The QSEN identified the following categories of competencies as necessary for nursing practice: patient centered care, teamwork and collaboration, evidence based practice (EBP), quality improvement (QI), safety, and informatics (2007). Within the area of informatics competencies, only three topics are addressed, including knowledge, skills, and attitudes. The list of competencies, in its entirety, formulated by the QSEN faculty is a beneficial tool for assisting in the identification of existing competencies, and those that are lacking. However, the section on informatics is insufficient in addressing the critical implications for nursing informatics competencies. These authors list competencies but do not address "the depth" of the skills nor how much education is needed in specific areas that tend to be lacking.

In a Delphi study on nursing informatics competencies, Hart provides a list of recommended required competencies (2010). Hart separates the professional nurse into two levels of practice (beginning nurse and experienced nurse), and delineates informatics competencies according to the level of practice (2010). According to Hart's list, a nurse is only either a beginner or experienced, and either possesses the competency or does not. In congruence to the list provided by Staggers et al, Hart's list includes the competencies of computer skills, informatics skills, and informatics knowledge; however, competencies of research, practice, and education are not addressed. The list provided by Hart does not allow for the assessment or evaluation of competency level to determine the degree to which an individual possesses competence.

In congruence with the list provided by the QSEN faculty, the competencies discussed in

Westra's study are not related to the nurse's level of practice. This list is quite similar to the list

provided by Hart (2010) as the competencies addressed include computer skills, informatics

knowledge, and informatics skills (2008). Both Hart and Westra outline the specific

competencies of data access, communication, systems, date issues, and education, though some

other areas differ (2002; 2008). This list is useful in determining whether or not an individual

possesses a specific competency; however, Westra's list does not allow for one's degree or level

of competence within a specific area to be assessed or evaluated.

As noted previously, TIGER seeks to utilize the integration of informatics to improve

education, the delivery of care, and nursing practice (Gugerty, Delaney & Dulong, 2012). The

Technology Informatics Guiding Education Reform (TIGER) initiative provides a list of

essential informatics competencies for practicing nurses. The list of informatics competencies

specifically includes the areas of basic computer competencies, information literacy, and

information management (2012). Within the area of basic computer competencies, a broad and

variable amount of recommended competencies is listed. Some competencies include

understanding hardware and software, understanding various forms of electronic communication

(emailing, instant messaging, blogging), understanding security and operating systems, using the

Internet, and many more. Within the area of information literacy, many competencies are again

listed, some of which include knowledge of information needed, effectiveness of information

access, and evaluating outcomes of information use. The area of information management

includes such competencies as understanding the importance of health information systems,

understanding informatics in regards to patient care, understanding policy and procedure, and

possessing user skills. The competencies provided in the TIGER initiative simply make up a list

or a set of guidelines. The list does not address at what level the nurse practices (user, modifier, or innovator). Thus, upon referencing the list, one can only state whether or not a nurse exhibits a specific competency. The list does not allow for comprehensive assessment or evaluation of the degree to which an individual is competent in regards to a specific competency.

Kaminski, for example, developed a framework that identifies specific categories of skills with which nurses should be able to demonstrate competencies (2012). Her framework includes a list of competencies set at the user, modifier, and innovator levels of nursing, which nurses and students can use to indicate their skills. Kaminski's Nursing Informatics Competence self-assessment tool enables one to assess and identify whether a skill is present or not. However, the self-assessment tool does not describe "how much" of the skill the nurse possesses. For example, within the user level area, one competency is that the nurse demonstrates word processing skills. Simply being able to type a word document is different from the ability to input graphs, tables and so forth.

Conclusion

As illustrated above, it can be noted that the authors have varying perspectives about nursing informatics competencies. The depth to which informatics competencies are addressed varies greatly among the authors. The differences and similarities between the authors are exemplified in the appendix. For example, Lendburg and Cronenwett include informatics competencies as a small part of nursing competencies as a whole, while Staggers, Hart, Westra, TIGER, and Kaminski all address nursing informatics competencies only, and in greater depth. Of all of the authors, Kaminski is the only author whose framework is also a self-assessment tool, which is highly beneficial to both educators and practicing nurses.

Implications for Nursing

Possessing a tool that can assist nursing informatics educators with competency assessments is beneficial. It is constructive and effective to be able to identify where education is needed in regards to competence, but it is extremely valuable to be able to identify the quantity and depth to which the education is needed. Utilizing a survey tool based on a self reporting/self rating scale would allow nurses to move away from a mere dichotomist response of yes or no in regards to possessing competence to identifying how skillful they rate themselves in specific competency areas. For example, if an individual is identified as possessing no skill in a skill such as word processing, it is then known that the identified area requires focus and improvement through education. However, the focus of improvement will likely be different for someone who is experienced or proficient with word processing. This is extremely beneficial to educators because they can customize education opportunities for nurses and students. By addressing the depth of need, or the degree to which, educators are better able to assist nurses in achieving a higher level of effective practice, positively influencing patient safe care and improved outcomes in nursing practice.

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APPENDIX

Article	Competency Areas and Examples	References
Staggers	Computer skills: Uses sources of data that relate to practice and care	Staggers, N., Gassert, C., & Curran, C. (2001). Informatics competencies for nurses at four levels of practice. *The Journal of Nursing Education*, *40* (7), 303-16.
	Informatics knowledge: Recognizes the use and/or importance of nursing data for improving practice	
	Informatics skills: Constructs data structures and maintains data sets	
	Research: develops innovative and analytic techniques for scientific inquiry in nursing informatics	
Lenburg	Computing Skills: related to client's, agencies, other authorities	Lenburg, C. (1999). The Framework, Concepts and Methods of the Competency Outcomes and Performance Assessment (COPA) Model. *Online Journal of Issues in Nursing*. 4 (2).
	Computer Skills: related to information search and inquiry	
	Computer Skills: related to professional responsibilities	

Cronenwett	Knowledge: Identify essential information that must be available in a common database to support patient care	Cronenwett, L., Sherwood, G., Barnsteiner, J., Disch, J., Johnson, J., Mitchell, P., Sullivan, D. T., et al. (n.d.). Quality and Safety Education for Nurses. *Nursing Outlook*, *55*(3), 122-31.
	Skills: Navigate the EHR	
	Attitudes: Value technologies that support clinical decision making, error prevention, and care coordination	
Hart	Computer Skills: Accesses, enters, and retrieves data used locally for patient care	Hart, M. (2010). A Delphi Study to Determine Baseline Informatics Competencies for Nurse Managers. *Computer Informatics Nursing,* 28 (6), 364-370.
	Informatics Knowledge: Describes patients' rights as they pertain to computerized information management	
	Informatics Skills: Performs basic trouble-shooting in applications	
Westra	Computer Skills: Access Data/Information – navigating systems	Westra, B., Delaney, C. (2008). Informatics Competencies for Nursing and Healthcare Leaders. *AMIA 2008 Symposium Proceedings.* 804-808.
	Informatics Knowledge: Data Issues – data quality	

issues

Informatics Skills: Implementation/Management: improve the use of informatics within nursing practice

TIGER	Basic Computer Competencies: Understand the term Information and Communication Technology (ICT)	Gugerty, B., Delaney, C., DuLong, D. (2012). The TIGER Initiative, Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative. *Technology Informatics Guiding Education Reform.* 1-33.
	Information Literacy: perceive gaps in information retrieved and determine whether the search should be refined.	
	Information Management: Manage health information to provide decision support for standard assessments	

Kaminski   User Level Competencies: Accesses, enters and   Kaminski, J. (2012). Nursing Informatics Competencies: Self
retrieves data related to client care via available   – Assessment. Retrieved from http://nursing-
hospital or nursing information systems   informatics.com/niassess/index.html.

Modifier Level Competencies: applies technology
support to provide evidenced based practice

Modifier Technical Competencies: synthesizes data
from more than one source and applies to practice

Modifier Utility Competencies: accesses and utilizes
multiple information sources for gathering evidence
for clinical decision making

Modifier Leadership Competencies: participates in
evulation of information systems in practice settings

Innovator Level Competencies: manipulates and
enhances nursing data sets

Innovator Technical Competencies: proficiency in
diverse computer application programs

Innovator Utility Competencies: independently
seeks learning initiatives to stay abreast of
technological developments

Innovator Leadership Competencies: participates in
patient instructional program development