# INFORMATICS AND FACULTY INTRAPROFESSIONAL ASSESSMENT AND GAP ANALYSIS OF CURRENT INTEGRATION OF INFORMATICS COMPETENCIES IN A BACCALAUREATE NURSING PROGRAM

By

Chito Arcos Belchez, MSN, RN-BC

University of Kansas School of Nursing



Submitted to the School of Nursing and The Graduate Faculty of the University of Kansas in partial fulfillment of the requirements for the degree of Doctor of Nursing Practice.

LaVerne Manos, DNP, RN-BC

_____

Faculty Project Committee, Chair

Wanda Bonnel, PhD, RN, GNP-BC, ANEP

_____

Faculty Project Committee, Co-Chair

_____

Faculty Project Committee, Co-Chair

November 12, 2019

_____

Date Project Proposal Accepted

The DNP Project committee for Chito Arcos Belchez certifies that this is the approved version of the following DNP Project:

INFORMATICS AND FACULTY INTRAPROFESSIONAL ASSESSMENT AND GAP ANALYSIS OF CURRENT INTEGRATION OF INFORMATICS COMPETENCIES IN A BACCALAUREATE NURSING PROGRAM

LaVerne Manos, DNP, RN-BC

_____

Chair

Wanda Bonnel, PhD, RN, GNP-BC, ANEP

_____

Co-Chair

Date Approved:

April 4, 2019

## Abstract

**Background:** In its effort to improve patient safety and quality in the U.S. healthcare system, the Institute of Medicine (IOM) called for the integration of health information technology and informatics in the education of healthcare professionals, especially nurses (IOM, 2001, 2003, 2012; National League for Nursing, 2008). Despite this recommendation, the integration of clinical informatics in nursing education has been slow and inconsistent, leaving gaps in the knowledge and skills that future nurses need to use clinical informatics competencies effectively in a variety of healthcare settings.

**Purpose:** This quality improvement project had three aims: (1) to assess the current state of informatics competency integration in the baccalaureate program; (2) to identify gaps in teaching informatics competencies in the curriculum; and (3) to present the gap analysis and clinical informatics coverage gap/needs assessment related to informatics competencies of the American Association of Colleges of Nursing (AACN) *Essentials of Baccalaureate Education for Professional Nursing Practice*, Quality and Safety Education for Nurses (QSEN), and Technology Informatics Guiding Education Reform (TIGER).

**Method:** A nursing informatics competency checklist worksheet was created based on the competencies outlined by the AACN, QSEN, and TIGER. This worksheet was completed by faculty and an informatician to assess the current state of integration of informatics competencies in the curriculum. Gaps between the two assessments were analyzed.

**Results:** The informatician survey showed coverage of 94% of the competencies, while the faculty member survey showed coverage of 82%. There were three major findings: (1) coverage of informatics competencies related to basic computer literacy, clinical information literacy, and health information literacy was adequate; (2) competencies associated with the history and

evolution of nursing informatics were underdeveloped in the curriculum; and (3) there were inadequate opportunities to develop and have students apply informatics competencies explicitly in most of the courses.

**Conclusions:** Based on evidence, the nursing informatics competency checklist can be used as a guide in assessing and evaluating current undergraduate curricula and determining how nursing informatics competencies are integrated in nursing programs. The gap analysis helped faculty highlight areas of strength and identified deficiencies in informatics competency development within the program. The project lays the foundation for further work on applied assignments in the baccalaureate program. Additionally, a next phase of a curricular quality improvement project can include developing and integrating a comparable set of informatics competencies in other prelicensure nursing undergraduate, such as the associate degree program, RN to BSN completion and graduate programs. Results suggest that further education is required in the field of teaching informatics through additional training workshops and continuing education opportunities for faculty.

Table of Contents

## Introduction

National organizations have proposed a new healthcare system with greater emphasis on the use of health information technology (HIT) to improve patient safety, improve quality of care, and decrease cost. As part of the Affordable Care Act, the Health Information Technology for Economic and Clinical Health Act was enacted to foster adoption, implementation, and meaningful use of HIT (Office of the National Coordinator for Health Information Technology, 2015). HIT plays a significant role in quality of care, patient safety, healthcare costs, and outcomes.

In 2001, the Institute of Medicine (IOM) recommended the use of HIT and clinical informatics to make the delivery of care safe and efficient (IOM, 2001). The IOM's (2003) report, *Health Professions Education: A Bridge to Quality,* endorsed informatics competencies as one of the five core goals for all healthcare professionals' education. In addition, *Health IT and Patient Safety: Building Safer Systems for Better Care* (IOM, 2012) established recommendations on how HIT and patient safety can be utilized in both the public and private sectors. These initiatives have encouraged the integration of clinical informatics in the healthcare professional's practice and transformation in health professional education by adding clinical informatics competencies to meet the needs of a changing healthcare system (Manos, Connors, Warren, & Stenner, 2017).

Several nursing organizations and nursing leaders have supported the inclusion of HIT and clinical informatics in nursing education. The National League for Nursing (NLN) and the Technology Informatics Guiding Educational Reform (TIGER, 2009) initiative have encouraged the integration of information technologies into nursing education. The American Association of Colleges of Nursing (AACN, 2008) and American Nurses Association (ANA, 2001) are among

the nursing organizations that have established recommendations and guidelines to incorporate informatics competencies into nursing education (McNeil et al., 2003; Thompson & Skiba, 2008; Spencer, 2012). In 2008, AACN described information management and application of patient care technologies as essential skills that must be incorporated into the baccalaureate nursing program.

Despite these guidelines and recommendations, gaps remain in nursing curricula in terms of integration of informatics competencies. The aims of the project were to assess the current state of the integration of informatics competencies in the baccalaureate program and identify gaps in teaching informatics competencies in the baccalaureate curriculum. Results of the project provided a gap analysis and proposed improvements in the curriculum.

**Background**

Healthcare informatics has transformed healthcare and nursing practice by increasing patient safety, improving healthcare equality, and reducing healthcare cost through integration of best practices in the delivery of care and management of healthcare data. Informatics is one of the core competencies in nursing practice and is essential to the preparation of the future nursing workforce (Boykins, 2014). Teaching nurses, nursing students, and other healthcare providers about the effective and ethical use of technology is indicated in the ANA's (2008) *Scopes and Standards of Nursing Informatics*. Nursing graduates from all levels are expected to use information systems and technology in improving patient care delivery. Nursing informatics specialists as educators can provide leadership within the academic setting to support the integration of informatics competencies in nursing education (AACN, 2006). Nursing educators therefore must understand competencies for informatics to make "nursing informatics an integral part of nursing curricula and to stimulate research" (AACN, 2006, p. 40).

The AACN (2008) *Essentials for Baccalaureate Education for Professional Nursing* has identified knowledge management with use of technology and application of patient care technology as skills needed by baccalaureate generalist nurses and has incorporated informatics competencies as an essential element of a nursing program (see Appendix A). Informatics competencies in nursing were also defined by two initiatives: TIGER and QSEN. The TIGER (2009) initiative formulated a vision of informatics as a core competency to improve education, the delivery of care, and nursing practice through the integration of HIT (see Appendix B). This initiative addressed the topics of basic computer competencies, information literacy, information management, and implementation management (Gugerty, Delaney, & DuLong, 2012). Specific informatics competencies were also defined by the QSEN faculty advisory board (Appendix C) (American Association of Colleges of Nursing, 2016). The QSEN project was initiated to help nursing faculty address the IOM's recommendations to improve the education of health professionals by emphasizing evidence-based practice, quality improvement approaches, and informatics and developed a list of recommended competencies for all nurses to provide safe and effective patient care (Cronenwett et al., 2007). The AACN, TIGER, and QSEN groups were credited with developing competencies in many areas, including patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. These competencies were based on the IOM's recommendation to assist in developing nurses with the competencies required to provide quality and safety in the healthcare setting (Cronenwett et al., 2007).

As the use of HIT increases, the demand for healthcare providers equipped with the necessary knowledge and skills for managing healthcare information also increases. The rapid progression of technology has continued to influence education and nursing practice and calls for

a new kind of knowledge and skills in informatics (Jeon et al., 2016; Rajalahti & Saranto, 2012). The increasing number of people with chronic diseases, along with the challenges of decreasing healthcare costs, has created a demand for nurses and healthcare providers to utilize HIT in education, clinical settings, and population-based health to manage and educate patients (Knight & Shea, 2014). To meet this demand, it is imperative that future nurses and nursing students have the right knowledge, skills, and preparation in informatics. The role of HIT has become an absolute necessity in nursing education and practice (Cheeseman, 2011).

With technology now used at the point of care, there is general agreement that nurses need to understand technology, as well as greater demand for informatics education. Many professional organizations have asserted that the nursing workforce must be prepared to work with HIT and be proficient in informatics to implement safer and more efficient care delivery approaches. Informatics and safety competencies are significantly correlated with patient safety and need to be incorporated in the nursing curriculum (Abdrdo, 2015; ANA, 2008; IOM, 2003). To accomplish this, every nursing student must be able to demonstrate competencies in informatics to promote safe and evidence-based nursing care.

The development of informatics competencies for the baccalaureate program is necessary and vital to the preparation of our future nursing workforce. Current nursing academic programs must continually institute changes to prepare and equip the future nursing workforce with the right skills and knowledge so they can meet the needs of the complex healthcare environment. Although informatics competencies have been determined, evidence on the impact of informatics competencies on individuals, organizations, and patient care is scarce (Green, Hardie, Dohan, & Tan, 2015). Many authors and organizations recommend that healthcare professionals develop knowledge and skills in computer literacy, information literacy, and the use of information

technologies and that these competencies be integrated in nursing curricula (NLN, 2008). Even with these recommendations, there is still minimal implementation of these recommendations even though healthcare technology has continued to expand and become highly complex, with the amount of information to be processed continuing to grow exponentially. The continued result of minimal implementation of informatics competencies can lead to unprepared future generations of nurses lacking informatics competencies. This can have implications for patient safety and lead to poor quality of care delivery in healthcare settings.

Teaching nurses and nursing students about the effective use of information technology is essential for the optimal use of informatics solutions in nursing practice. Nursing faculty will need to develop understanding of informatics competencies and learn how to integrate informatics competencies at the baccalaureate level that will have a positive influence on students' learning experience (Hebda & Calderone, 2010). Nurses are expected to have the skills necessary to practice in technologically advanced healthcare settings and perform tasks that require informatics competencies to care for patients safely and efficiently (De Gagne, Bisanar, Makowski, & Neumann, 2012). Integrating informatics and technology in nursing education is vital in accomplishing this task.

**Significance**

With changes in healthcare delivery and efforts to improve care access, quality, and cost effectiveness, HIT and informatics must be a high priority in nursing education. Baccalaureate programs must prepare new nurses for current and future HIT practice (Fetter, 2009). Significance of this project includes its demonstration of the importance of informatics in the preparation of nursing students for practice. Successful completion of a baccalaureate nursing program signifies entry to practice as a licensed nurse and ability to provide safe, quality care to

patients. Integrated into the complex nature of nursing practice is HIT and its implications for patient safety and quality while focusing on evidence-based practice.

Additional significance of this project includes that it addresses integration of informatics competencies at the baccalaureate level as a component in meeting current accreditation standards. This quality improvement project contributes to the existing body of knowledge within the domain of informatics competencies by focusing on the aspect of informatics competency gaps in a baccalaureate program. Specifically, it reviewed what the competencies are and how are they being taught in the curriculum, which adds to the literature on teaching informatics in the undergraduate curriculum. Additionally, investigating faculty knowledge of informatics competencies may lead to development of assessment and educational tools for faculty related to teaching informatics.

The activity of assessing the current state of clinical informatics competencies and their level of integration in a baccalaureate nursing program provides a competency gaps/needs assessment and serves as a guide in curriculum development. This quality improvement project helped the project director meet the requirements of two Essentials of the AACN (2006) *Essentials of Doctoral Education for Advanced Nursing Practice:* Essential II*,* Organizational and Systems Leadership for Quality Improvement and System Thinking; and Essential IV, Information Systems Technology and Patient Care Technology for the Improvement and Transformation of Healthcare.

**Purpose and Problem Statement**

Clinical informatics is the application of informatics and information technology to deliver healthcare services regardless of the healthcare professional group involved (American Medical Informatics Association, 2018a). Knowledge and skills in clinical informatics are

essential for the preparation of the baccalaureate generalist nurse. Nursing students should be able to demonstrate competencies in clinical informatics to ensure a safe and efficient care delivery approach (AACN, 2008; IOM, 2003; NLN, 2008). The ANA, NLN, TIGER initiative, and AACN all have recommended that nursing graduates must be able to demonstrate informatics competencies and have called for the integration of informatics into the curricula (AACN, 2008; ANA, 2008; De Gagne et al., 2011; Hunter, McGonigle, & Hebda, 2013; NLN, 2008).

This project involved an assessment and gap analysis of the current state of integration of informatics competencies in a baccalaureate nursing program. Despite established informatics guidelines, some informatics competencies are still not covered in the nursing curriculum, primarily in baccalaureate programs (Hart, 2008; Hunter et al., 2013). The lack of uniformity in informatics education causes an uneven preparedness of nursing graduates, thus negatively impacting their competency level and their use of health information technology (HIT). Teaching nursing students knowledge and skills in information and patient care technology is an essential component of the baccalaureate nursing curriculum, yet current evidence has shown that progress in the integration of informatics competencies in the baccalaureate nursing curricula is still lagging (De Gagne et al., 2011; Hunter et al., 2013).

New graduate nurses reported that the informatics education they received was inconsistent, their instructors demonstrated incomplete understanding of informatics, and the skills taught in these classes did not transfer well to the workplace. The inconsistency and deficiency in clinical informatics skills in both new graduate and experienced nurses not only puts patients at risk for suboptimal care, but also places additional stresses on nurses who are

expected to demonstrate improved patient outcomes by using health information systems (Bembridge, Levett-Jones, & Jeong, 2011).

To date, there is very little evidence in the literature assessing informatics competencies and the need for specific informatics competencies in baccalaureate nursing education (Choi & De Martinis, 2013). Contributing to the problem is nursing faculty members' limited informatics knowledge, unfamiliarity with nursing informatics competencies. and lack of awareness of the concepts to teach in informatics, in addition to the shortage of faculty informaticians with a foundational education or knowledge to teach informatics (Carter-Templeton, Patterson, & Russel, 2009; Dixon & Newlon, 2010; Pilarski, 2011). Literature indicates that nursing faculty members' lack of background in informatics can be a barrier to students acquiring necessary informatics skills prior to entering professional practice (Curran, 2008). The lack of knowledge and skills of faculty related to informatics has been identified as a significant issue affecting patient care (Boykins, 2014). Nursing informatics competencies and patient safety competencies are significantly correlated. Informatics, an important component of patient safety practices, is seriously needed (Abdrbo, 2015).

The purpose of this evidence-based quality improvement project was to assess and identify gaps in the current state of informatics competencies integration in a baccalaureate program and propose improvements. This activity was conducted using the competencies identified in the AACN *Essentials*, the TIGER initiative, and QSEN. Upon completion of this project, this prelicensure nursing program can begin to address gaps of informatics competencies in the curriculum.

The project examined how competencies are integrated in the curriculum through three steps:

1. Assess the current state of informatics competency integration in the baccalaureate program.
    - Obtain faculty members' review of the level or degree to which the current curriculum covers informatics competencies recommended by AACN, TIGER, and QSEN.
    - Obtain information on faculty members integration of informatics competencies in the curriculum.
2. Identify gaps in teaching informatics competencies in the baccalaureate curriculum.
    - Obtain an informatician's review of how informatics competencies are integrated in the curriculum.
    - Analyze faculty members' and the informatician's informatics competency evaluation of the current curriculum and identify gaps in the curriculum.
3. Create a gap analysis and needs assessment from the combined faculty and informatician assessment.

## Literature Review

An integrative review of the literature was conducted to gain a better understanding of the barriers that have an impact on the full integration of informatics competencies in baccalaureate nursing education. This comprehensive literature search was conducted using several databases including CINAHL, PubMed, BioSemantics, and Google Scholar using the key terms *nursing informatics competencies, baccalaureate nursing students, undergraduate students, nursing informatics undergraduate curriculum,* and *nursing education*. To be included in the review, the articles had to meet several criteria: contain a description of a nursing informatics (NI) competency, discuss informatics competencies specific to baccalaureate nursing education, be a peer-reviewed article published between 2006 and 2017, and be written in English. Fifteen articles were identified that met the criteria; they are summarized in Appendix D. The areas explored included the definition of informatics, the integration of informatics in nursing education, students' perceptions of informatics competencies, nursing faculty's knowledge about informatics, and clinical agencies' perceptions of students' informatics competencies. After reviewing the literature for each major area, this chapter presents a summary of the relevant literature and discusses the conceptual framework that guided the study.

### Definition of Nursing Informatics

NI can be a complex topic for those involved in nursing education programs to understand, communicate, and integrate into the curriculum. Because NI is an abstract concept, there is a tendency to focus on the more tangible aspect of technology (Weiner & Trangenstein, 2009). The multiplicity of definitions and lack of clarity around the definition of NI and its core components by various agencies have the potential to create difficulties in integrating informatics in the curriculum (Larson, 2017).

There is wide variability in terms of the scientific approach for defining NI competency concepts (Carter-Templeton et al., 2009). The American Nurses Association's (ANA) *Scope and Standards of Nursing Informatics Practice* defined NI as a specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, and knowledge in nursing practice (ANA, 2008). Meanwhile, the American Medical Informatics Association (2018b) defined NI as the science and practice that integrates nursing, its information and knowledge, and their management with information and communication technologies to promote the health of people, families, and communities worldwide. Although there are similarities between these two definitions, variability in interpretation can create confusion among various stakeholders.

Dixon and Newlon's (2010) study articulated the need for a universally accepted definition of informatics and a shared understanding of an informatics core curriculum. Their study showed a need for more emphasis on the definition and scope of informatics, as well as a step-by-step approach to guide informatics integration efforts within the nursing program. The complex language in the definition of informatics can create confusion among students and faculty. Understanding how students and faculty view clinical informatics can contribute to the continuous dialogue in the integration of informatics into the nursing curriculum. The American Medical Informatics Association (2018a) regarded the concept of clinical informatics as the application of informatics and information technology essential to the delivery of healthcare services regardless of the health professional group involved, whether nurse, physician, dentist, or other healthcare professional. This definition is more fitting in terms of preparing nursing students and other healthcare professionals with its emphasis on the varied topics of clinical informatics, "ranging from clinical decision support to visual images (e.g. radiological,

pathological, dermatological, ophthalmological, etc.); from clinical documentation to provider entry systems; and from system design to system implementation and adoption issues" (American Medical Informatics Association, 2018a, para. 3). This definition also encompasses the topics of basic computer competencies, information literacy, and knowledge of information management (Gugerty et al., 2012).

**Informatics Competencies in Nursing Education**

The American Association of Colleges of Nursing (AACN), which provides guidance for nursing education, has identified informatics competencies essential for the baccalaureate, generalist nurse that need to be integrated in the curriculum. Nurses need to be well prepared with informatics skills in conjunction with the other criteria set forth by the AACN *Essentials* (AACN, 2008; Trangenstein & Weiner, 2006). NI competencies are the acceptable level of knowledge, skills, and competencies necessary to complete and manage healthcare information (Gugerty et al., 2012; Hunter et al., 2013). Even with the most recent research on curricular initiatives to improve students' informatics competencies, outcomes are not entirely promising (McDowell & Ma, 2007; Omes & Gassert, 2007). Research findings indicated that lack of exposure to formal informatics education leaves a gap in the knowledge and skills required for nurses in today's workforce, where health information technology plays a significant role in the healthcare system (Hwang & Park, 2011; Nagle et al., 2014; Pilarski, 2011).

Literature demonstrated that integration of informatics in the nursing curriculum remains a challenge, and there is limited research on how to effectively teach and incorporate informatics in formal baccalaureate nursing education (Flood, Gasiewicz, & Delpier, 2010; Hwang & Park, 2011). A review of 12 nursing programs in the Kansas City metropolitan area showed that only two offered a course with a focus on informatics (Belchez, 2016). Similarly, Hart (2008)

identified gaps in U.S. informatics competencies, concluding that progress has been slow and that the current nursing workforce is not ready for evidence-based practice interventions due to nurses' lack of research-related knowledge and computer skills.

Several studies have found that a major gap remains in preparing nurses with the necessary knowledge and skills to use informatics tools in healthcare delivery. According to DeGagne et al. (2012), "lack of consensus between computer, technology, and informatics literacy" (p. 667) was present in the nursing curriculum. The authors recommended that basic computer skills must be a prerequisite for new nursing students, and informatics knowledge and skills must be attained prior to completing a BSN degree to prepare graduates for the technologically advanced workforce (DeGagne et al., 2012). One study reported that out of 266 baccalaureate and higher nursing programs surveyed in the U.S., approximately half only required students to have basic computer word processing skills and less than one-third addressed core NI competencies (McNeil et al., 2003). These findings reveal a variation in the published literature on informatics competencies in baccalaureate nursing curricula with regards to curriculum content development, presentation, and target students. Without standardization in teaching informatics competencies in nursing baccalaureate curricula, graduate nurses will be ill prepared to utilize information technology, and communication will be ineffective in the healthcare setting, putting patient safety at risk.

**Nursing Students' Perception of Informatics**

Literature has shown that although students have the appropriate knowledge and attitudes regarding technology, the nursing curriculum provides few opportunities for students to demonstrate and be assessed on skills and apply informatics competencies. Graduating baccalaureate nurses were reported to have a moderate level of information technology skills

acquired in the program, as evidenced by their confidence in the use of the internet, basic skills in word processing, and email systems operation (McDowell & Ma, 2007). However, students were found to have lower skills in care documentation, valuing informatics knowledge, technological skill development, and data entry competencies (Fetter, 2009). These studies concluded that current NI education in baccalaureate programs is lacking in areas necessary for nursing professionals to use evidence-based practice and collect accurate clinical data. Educators need to ensure that graduates are leaving the program equipped with experiences that incorporate the use of databases, spreadsheets, and statistical analysis packages (Fetter, 2009; McDowell & Ma, 2007).

Similar findings from other studies demonstrated that nursing students lack important competence in their application of computer skills and understanding of the clinical informatics role. Most nursing education programs do not have the resources to purchase clinical information systems and support their operation (Fetter, 2009). Lack of resources for developing competencies in ensuring data security, analyzing the quality of healthcare-related websites, and searching electronic databases was also noted in several studies (Choi, 2012; Jette, Tribble, Gagnon, & Mathieu, 2010). Another study found that, overall, nursing students have a positive attitude towards technology. Li and Kenward (2006) found that nursing graduates were more likely to feel adequately prepared when nursing programs exposed them to the use of information technology and evidence-based practice. In their study, only 62.1% of nurses felt that they were adequately prepared by their classroom education to use information technology in patient care.

**Nursing Faculty's Knowledge**

Nurse educators are responsible for adequately preparing nursing students to enter the profession competent in NI. Faculty must be proficient and adequately prepared if they are to

teach students to be competent in NI (Larson, 2017). The lack of nurse educators' knowledge and skills in informatics has been a challenge and is considered one of the many hindering forces toward achieving the goal of integrating informatics in the curriculum. While faculty can be considered experts in their fields, most are at the novice or competent level in the use of informatics tools and informatics skills when encountering unfamiliar technology (Nguyen, Zierler, & Nguyen, 2011). The need for faculty to be knowledgeable and skilled in informatics is of great importance. This knowledge level suggests more training is needed so faculty are proficient and competent expert users (McNeil et al., 2005).

There are also misconceptions that exposure to computers equates with informatics education, which can lead faculty to focus on isolated competencies (Omes & Gassert, 2007; Thomas & Skiba, 2008). Some have claimed that informatics is integrated in their curricula and identified the library as the major source of addressing informatics. Many faculty and administrators inappropriately equate information literacy skills with knowledge of informatics (Thompson & Skiba, 2008).

Inconsistent and insufficient content in informatics courses is due to the lack of qualified faculty to design and teach these courses (Hunter et al., 2013). Often, educators with no training, certification, education, or experience teach the topic based on convenience rather than competence (Vottero, 2013). Teaching informatics requires knowledge of the content, experience in the use of informatics skills in clinical practice, and access to health information technology tools for the curriculum (Manos et al., 2017). Currently, nursing faculty members do not have the knowledge and a clear understanding of what informatics is and what informatics competencies undergraduate students might need in their future practice (Dixon & Newlon, 2010). Although nursing faculty members recognize the importance of information technology in the curriculum

and are familiar with various recommended informatics competency guidelines, they remain unaware of what and how to teach these informatics concepts. If faculty have had insufficient opportunities to gain expertise with informatics competencies used in practice, this gap will transfer to current students (McNeil et al., 2005).

Studies reported that educators often have a general knowledge gap about informatics, and there is an incongruity between what NI is and nurse educators' perceptions of it (Carter-Templeton et al., 2009). Survey findings indicated that less than a third of program faculty members were rated as competent to teach NI, and nearly 50% of schools had no plans to offer NI in their curriculum (Madsen, Cummings, Borycki, & Lacroix, 2016).

McNeil et al. (2005) found limited progress in informatics curricula partly because many nursing faculties have a gap in knowledge when preparing nurses to be skilled in information technology and its application to daily practice. In the subsequent analysis of their study, they identified that barriers to curriculum integration include a lack of qualified faculty resources, perceived need, and time. This finding supports earlier reports that nursing faculty are the greatest block to incorporating technology into curricula. There is a need to increase faculty knowledge and understanding of the informatics competencies for beginning nurses.

In addition to lacking experienced faculty, many academic institutions do not have the infrastructure to support the integration of health information technology tools, such as an academic electronic health record, that are essential for informatics competencies in the curriculum (Manos et al., 2017). Developing informatics competence may not be at the top of the agenda for baccalaureate education due to faculty shortages, budget constraints, and increasing job competition from clinical sites (AACN, 2006. Consequently, these factors limit the schools' ability to include informatics in the nursing curriculum. Funding to help faculty achieve the

necessary level of competency in informatics also remains a challenge for nursing leadership (Hunter et al., 2013).

**Clinical Agencies' Perceptions**

Healthcare organizations require faculty and students to have informatics and technology skills to begin the clinical practicum (Fetter, 2009). A survey of students in a baccalaureate program concluded that students received limited exposure to technologies in a clinical setting and to informatics (Omes & Gassert, 2007). In addition, clinical agencies have indicated that there is a lack of consistency in nursing curricula between and within programs. Patient data security is a major concern for clinical agencies, and there is a reluctance to allow access to students due to the cost of training, usage monitoring, and technical support. Research shows that there are risks of serious compromises in privacy and quality of care and medication errors when student access to information systems is denied or limited and not monitored (Institute for Safe Medication Practice, 2007; Thompson & Bell, 2005; Wimberley et al., 2005). The electronic health records used by clinical agencies vary widely, and there is a lack of standardization, compatibility, and interoperability. Multiple vendors developed systems and software products with no standardization. Customizing systems for student and faculty use can be costly and labor intensive. This can create difficulties in developing students' knowledge and skills in informatics in the clinical practice setting.

**Literature Review Summary**

The practice of nursing is based on the collection, storage, retrieval, and use of data, information, and knowledge. New graduate nurses are entering the practice not fully prepared

with informatics competencies and nurses must be competent in these areas in order to provide safe and effective care (Choi & De Martinis, 2013; Fetter, 2009).

Numerous barriers to the integration of informatics into the curriculum and the attainment of informatics competencies were identified in the review of literature. Wide variations in access to informatics and technologies in clinical agencies and inconsistent integration of informatics content into theory and clinical courses were reported as inhibitors of student competency attainment.

Faculty's knowledge, skills, and motivation to integrate informatics competencies into the curriculum were also identified as significant challenges. This review demonstrates the need for additional informatics continuing education to help faculty achieve the necessary level of competency and subsequently evaluate competency. Lack of informatics education and training was revealed to be a significant variable that can impact the knowledge and skills that faculty need to teach nursing students and meet the demands of a highly technologically advanced practice setting.

The review also revealed that informatics competencies are not effectively incorporated in the curriculum. Assessment regarding the nursing students' informatics competencies has been limited to students' use of online resources and digital literacy. The literature supports the claim that nurses' lack of informatics competencies is not only a threat to patient care quality but is also an educational issue (Fetter, 2009). Abdrdo (2015) recommended that informatics competencies should be incorporated in the baccalaureate curriculum as one of the core courses and not as an elective. The effective use of information technology in patient care is an essential component of the baccalaureate nursing curriculum, yet current literature showed that the integration of NI competencies in the baccalaureate nursing curricula is still underdeveloped.

The literature supports the need for integrating and developing the NI curriculum in all levels of nursing education. Developing a baseline informatics competency for baccalaureate nursing programs is recommended to establish NI skills for the generalist nurse, and those skills can then be built on through continuing education and training in practice settings (Hebda & Calderone, 2010; Vasuki, 2016). Adoption of new knowledge and education for a changing healthcare information system infrastructure requires new nursing faculty skills in informatics, development of an informatics knowledge base, and information management competencies (Kinnunen, Rajalahti, Cummings, & Borycki, 2017).

Healthcare educational institutions must focus on the development of competencies in informatics. This project can serve as a needed exemplar about how to integrate clinical informatics competencies in nursing curricula and a guide for nursing educational programming and course development.

**Conceptual Framework**

The theoretical framework for this project is a gap analysis to formally assess and identify the current state of the baccalaureate curriculum alignment with informatics competencies. Gap analysis is defined as the determination of the difference between current knowledge or practices (what we are doing) and current evidence-based practices (what we should be doing). It begins with the present situation (what is), cross-lists factors required to achieve future objectives (what could be), and highlights gaps that exist and need to be filled. It is a technique for determining the steps to be taken to move toward a desired future state (Institute for Manufacturing, n.d.) and can be done by using simple Excel worksheets or flowcharts (Fater, 2013).

This study addressed whether nursing schools are teaching informatics competencies in the baccalaureate nursing curriculum or not and how these competencies are being taught. Comparison of the curriculum review findings from the faculty and the informatician will create a gap analysis. This analysis offers a clear "gap or need statement" to help identify any deficiencies that need to be overcome. Once gaps are uncovered, it is easier to quantify them and identify the work required to address them.

In addition to using gap analysis, this project relied on the Plan, Do, Study, Act (PDSA) model (Deming, 1998) (Appendix E). Created by Walter Shewhart and known as the Deming cycle, PDSA is considered a scientific method for action-oriented learning (Speroff & O'Connor, 2004) and is used in many approaches to change. The PDSA cycle tests an idea by putting a planned change into effect on a small trial basis and then learning from its impact. Learning from multiple small trials allows new idea to be advanced and implemented with a greater chance of success on a broader scale (Institute for Healthcare Improvement, 2018).

An iteration of PDSA, the Adaptive Action process (Appendix F) allows analysis of patterns to understand the conditions that generate these patterns. With its three steps to collect and analyze data that inform next steps, it becomes an ongoing cycle that can be carried out at all levels of the system (Eoyang & Holladay, 2018). Like PDSA, Adaptive Action is a continuous quality improvement model (Deming, 2000). It is a simplified, systematic process for gaining valuable learning and knowledge to continually improve a product, process, or service.

Adaptive Action introduces a simple, common-sense process to guide individuals and organizations into reflective action based on three questions:

- *What?* For this project, addressing the *what* involved gathering pertinent data and evidence to develop a picture of the underlying dynamics of the current status—the

patterns that are evident and what is known about their impact on the system. Current informatics competency requirements in the baccalaureate curriculum were assessed and the scholarly literature reviewed to provide the scope of the problem. The AACN (2008) *Essentials*, Technology Informatics Guiding Education Reform (TIGER) initiative (TIGER, 2009), and Quality and Safety Education for Nurses (QSEN) knowledge, skills, and abilities competencies (AACN, 2016) were reviewed. A framework was developed for understanding the significance of informatics, exploring patterns, identifying key conditions that shape the current situation, and determining if there is evidence of a gap in NI competencies for the baccalaureate nursing program.

- *So what?* The current state of informatics competencies and how they are integrated in the baccalaureate curriculum was analyzed using the informatics competencies matrix. Results from the assessment were analyzed to determine whether there is a gap between the current baccalaureate curriculum and the recommended informatics competencies and gap between faculty and informatician assessments.
- *Now what?* The findings from the gap analysis, literature review, and informatics specialist evaluation can be used to develop a baccalaureate nursing curriculum that aligns with the recommended clinical informatics competency standards.

## Methods

This section explains the project plan, including the setting, project design, and procedures for data collection and data analysis. This section then describes the curriculum mapping approach and the development of the tool to examine how the informatics competencies from the American Association of Colleges of Nursing (AACN) *Essentials* (AACN, 2008), Quality and Safety Education for Nurses (QSEN; AACN, 2016), and Technology Informatics Guiding Education Reform (TIGER) initiative (TIGER, 2009) are integrated in the baccalaureate curriculum.

Curriculum mapping has been utilized by nurse educators to assess course content in aligning bachelor's and associate degree programs (Landry et al., 2011). This tool is commonly used in teaching and learning environments to examine course content, program alignment, pedagogy, and assessment. Mapping also provides transparency of curriculum content and is a tool for program development (Harden, 2001; Holycross, 2006; MacNeil & Hand, 2014).

The major benefits of using a matrix grid to conduct curriculum mapping were noted by Heinrich, Karner, Gaglione, and Lambert (2002) when they tracked major concepts. Mapping identifies gaps and duplication of curriculum content (Uchiyama & Radin, 2009). The model helps orient new faculty by providing a visual representation of the entire curriculum, showing the interrelatedness of courses, subject matter, and essential content (Davenport, Spath, & Blauvelt, 2009). It also provides an opportunity for faculty to develop curricula or examine a topic or area of interest, such as nursing informatics (NI).

The NI competencies matrix was used to demonstrate how the competencies are operationalized in the baccalaureate curriculum. The mapping activity was concerned with "what" and "how" informatics competencies are being taught and the measures used to

determine if students are achieving the learning outcomes. This technique allowed for the elements of a baccalaureate curriculum to be pulled apart, examined, collated, and entered into the mapping worksheet. Results from this mapping activity can help align the operational curriculum with the planned curriculum and provide visual representations of all parts of the curriculum, showing the relationships among those parts (Harden, 2001).

## Setting

The project was conducted at a university in the Midwest within the traditional baccalaureate prelicensure nursing program. The baccalaureate program has more than 300 full-time and part-time students in the traditional baccalaureate nursing program, an online RN-to-bachelor's of science in nursing (BSN) completion program, and a new partnership program with state community colleges where students stay at their local community college while pursuing both an associate's degree in nursing and BSN. The baccalaureate program uses a concept-based curriculum approach, which consists of five concepts known as the Baccalaureate Big Five. These concepts are nursing across the lifespan, professional identity/communication, population health, leadership, and evidence-based practice/quality improvement (Godfrey & Martin, 2016) (Appendix G). In addition to its undergraduate options, the school offers a master's in science in nursing, a doctorate of nursing practice, and a doctorate of philosophy in nursing. The school is accredited by the American Association of Colleges of Nursing and recently received redesignation as a Center for Excellence by the National League for Nursing.

## Project Design

This project contained two parts. The first part was a literature review and systematic synthesis of the evidence. The literature review provided better understanding of the barriers that

have implications for the integration of informatics competencies in nursing education. The second part of the project involved curriculum mapping to determine the current state of integration of informatics competencies in the curriculum. The AACN *Essentials*, QSEN, and TIGER informatics competencies were used as the framework to map out informatics competencies in the baccalaureate curriculum.

**Procedure**

The project was presented to the author's committee members and approved as an evidence-based quality improvement project. The author collaborated with undergraduate faculty members for the assessment of informatics competencies in the curriculum. The crosswalk of AACN *Essentials*, QSEN knowledge, skills, and abilities (KSAs), and TIGER informatics competencies developed by Clancy (2017b) (Appendix H) was used with permission (Appendix I) to develop a worksheet matrix (Appendix J) to identify current informatics competencies embedded in the courses and potential gaps. The worksheet was administered by the author and sent to the faculty by email in the request for their participation (see Appendix K).

The following step-by-step approach was used in conducting the school of nursing curriculum assessment:

- Faculty members completed the NI competencies matrix checklist relevant to their course to show how the competencies mapped to the curriculum.
- The informatician reviewed course syllabi to determine informatics competencies covered in the courses using the same matrix checklist worksheet.
- The informatician assessed NI competency coverage of the courses based on his review and the evaluation of faculty members' curriculum informatics competency mapping.

Data were tabulated and analyzed.

**Nursing Informatics Competency Crosswalk and Matrix**

The AACN *Essentials*, TIGER, and QSEN informatics competencies all share common characteristics of computer technology, information literacy, and information management competencies (Larson, 2017). Clancy (2017b) illustrated these similarities with a crosswalk of NI competencies (Appendix H). Furthermore, Clancy (2017a) used the crosswalk to develop a sample guideline for a prelicensure course in NI. The guideline and other resources are available for use by educators through the National Nursing Informatics Deep Dive Program at the University of Minnesota (https://www.nursing.umn.edu/outreach/nursing-informatics-education-and-resources/nursing-educators/online-teaching-resources). This guideline was modified and renamed the core NI competencies matrix checklist.

This worksheet was used in the assessment and evaluation process, emphasizing a practical hands-on approach for reviewing informatics competencies in the curriculum. The checklist maps the informatics competencies found in various courses throughout the curriculum. It has five columns as follows (see Appendix J):

1. Informatics competencies indicated in the AACN *Essentials*, QSEN KSAs, and TIGER.
2. Sample content of concepts taught in the curriculum that align with and meet informatics competencies.
3. The number and title of the course within the curriculum.
4. A response (yes or no) on whether competencies are being taught in the course.
5. Exemplars of how competencies are taught in the current courses.

## Results

The purpose of this evidence-based quality improvement project was to examine and evaluate how nursing informatics (NI) competencies were integrated in the baccalaureate program. The project assessed the current level of integration of informatics competencies and conducted a gap analysis using the curriculum mapping approach. The NI competency checklist was derived from the crosswalk of NI competencies developed by Clancy (2017b) based on the American Association of Colleges of Nursing (AACN) *Essentials* (AACN, 2008), Quality and Safety Education for Nurses (QSEN; AACN, 2016), and Technology Informatics Guiding Education Reform (TIGER) initiative (TIGER, 2009). The checklist (see Appendix J) was used to map out informatics competencies in the baccalaureate nursing program. The project was conducted by assessing a baccalaureate nursing program in one school located in the Midwest.

Respondent faculty were asked to verify whether competencies listed in the checklist were being taught in their respective courses, including learning activities aligned with competencies in the course. The informatician reviewed the same courses using the same checklist and compared the results with the faculty survey to determine gaps of competencies in the program. The tool used a scale of 0 to 1, with 0 representing *competency not indicated in the course* and 1 representing *competency present and being taught in the course.*

### Faculty Survey Results

Faculty reviewed the presence of competencies in their course by examining syllabi, course content in Blackboard, class learning activities, PowerPoint presentations, lecture notes, assignments, and other resources used in class. Course exemplars indicated how NI competencies were being taught in the class and the type of learning activities involved.

Results from the faculty evaluation are presented in a tabulated format in Appendix L. Six out of the nine course faculty responded to the survey request. Two of the courses not reviewed by faculty related to students' clinical practicum and capstone experience. From the collection of all the survey results, faculty assessment identified informatics competencies that were introduced, developed, and taught in the curriculum. Overall, results from faculty respondents showed that out of 34 competencies, 28 (82%) were covered within three major courses in the program. These three courses were Nursing 327, Communication and Technology with 28 (82%), Nursing 335, Quality Improvement, with 28 competencies (82%); and Nursing 471/476, System Leadership, with 25 competencies (79%).

Also, competencies that fall under the clinical information domains were evident in the clinical courses, Nursing 331/332, Basic Assessment and Therapeutic Intervention with 5 competencies (15%). Nursing 475/477/480, Clinical Capstone and Practicum Experience were not assessed by assigned faculty. Several competencies were identified by faculty as integrated in the course through a number of learning opportunities. These competencies directly relate to students' skill demonstration and application to clinical areas.

Faculty rated the clinical information literacy and health information literacy competencies as predominantly present in the curriculum. These competencies were clearly delineated in several courses, indicated by multiple learning exemplars both in the classroom and in the clinical practice setting. Several competencies that were not covered were related to knowledge management (2.2) and the history and evolution of NI (2.4, 3.2). The survey also revealed areas of weakness in competencies related to the definitions, theories, and concepts of NI (3.5), standardized terminologies (4.3), participation in evaluating information systems in practice settings (6.4), documentation and responding to decision supports and alerts (5.4, 5.10),

and knowledge of how technology and information systems are related to decision support and the quality and safety of patient care (6.2).

Analysis of the faculty surveys suggested that the current state of integration of informatics competencies into the baccalaureate program was inadequate. Based on the faculty results, three findings emerged: (a) competencies associated with basic computer skills were inadequate; (b) there were inadequate learning opportunities for foundational informatics competencies that cover the theory, history, and concepts of NI, including knowledge management; and (c) coverage of clinical informatics and health information literacy was adequate.

**Informatician Survey Result**

Using the same approach and the same NI competency checklist, the informatician reviewed nine major courses in the program by looking at the syllabi, course content materials available in the learning management system, and class presentations to determine NI competencies covered in the course. Survey results showed that the level of integration of informatics competencies in the baccalaureate curriculum was adequate; most of the AACN, TIGER, and QSEN competencies required for the baccalaureate curriculum were present (see Appendix M).

Overall, the informatician indicated that 31 of 34 core NI competencies (94%) were integrated in one course in the curriculum, Nursing 332 which covers communication and healthcare information. The course is considered the standalone informatics course in the program. The eight remaining major courses in the program covered from 41% to 94% of the competencies.

Two strengths of the curriculum were noted. First, the clinical informatics competency domain was clearly delineated in the program. Learning exemplars demonstrated the use of information technology in classroom learning activities, the simulation lab, and clinical settings. Second, health information management competencies were embedded in several classroom didactic courses. Examples of evidence-based practice skills application included journal club literature reviews and scholarly writing exercises. These learning activities exposed students to up-to-date and relevant information and communication technology in practice and enabled students to meet higher levels of NI competencies.

Areas of weakness in the curriculum included the lack of learning opportunities related to the following competencies: knowledge management (2.2), history and evolution of NI (2.4, 3.1, 3.2), concepts and theories of NI (3.1, 3.5), standardized terminologies (4.3), and how technology and information management are related to decision support and the quality and safety of patient care (6.2)

Thus, the informatician's survey showed areas where NI competencies were explicitly taught in the courses and identified gaps in student learning and the teaching of informatics in the nursing program. The survey indicated that the current program complies with national standards for the use of information and communication technologies in nursing as indicated in the AACN, QSEN, and TIGER informatics competencies.

**Comparison of Results and Gap Analysis**

Table 1 summarizes the number of NI competencies incorporated into each course as documented by the faculty members and the informatician. There was a total of 32 of 34 (94%) possible matches between the survey and the NI crosswalk from the informatician survey while 28 of 34 (82%) possible matches with the faculty survey (Table 1). The table shows a wide gap

between the two ratings, with the informatician noting a higher number of competencies (94%) than the faculty members (82%).

Table 1
*Competency Ratings by Course of Faculty Members Compared with the Informatician*

| Overall competency survey results | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum |
|---|---|---|---|---|---|---|---|---|---|
| Faculty | 28 (82%) | 28 (82%) | 27 (79%) | 9 (27%) | 5 (15%) | 6 (18%) | 0 | 0 | 0 |
| Informatician | 32 (94%) | 31 (94%) | 29 (85%) | 20 (58%) | 15 (44%) | 14 (41%) | 16 (48%) | 19 (58%) | 24 (70%) |

A similar discrepancy is shown when comparing results by competency, as shown in Table 2. Comparison of expected competencies with the faculty and the informatician shows that there is a discrepancy in most of the courses in the curriculum.

Table 2
*NI Competency Crosswalk by Course Comparing Faculty Members and Informatician*

| NI Competency Domains *(From AACN Essentials, QSEN, and TIGER nursing informatics competencies combined)* | Faculty: Total inclusions among six courses | Informatician: Total inclusions among nine courses | Difference |
|---|---|---|---|
| 1. Demonstrate basic understanding and use of computer technologies and skills that support nursing knowledge work, healthcare delivery, and the advancement of nursing knowledge, learning, and service. | 12 | 30 | -18 |
| 2. Appreciate and value nursing knowledge work, informatics literacy, and the role of emerging technologies in the advancement of nursing science and the delivery of high-quality, safe nursing care within the context of a learning health system. | 10 | 18 | -8 |
| 3. Explain the nurse's role in supporting and engaging people in the adoption, use, and meaningful evaluation of technologies and resources that promote health and prevent diseases. | 17 | 22 | -5 |
| 4. Understand the use of clinical information systems (CIS) and the electronic healthcare records (EHR) to support decisions and document nursing value in service of healthcare's triple aim: improved patient experience, improved health of populations, and healthcare cost reduction. | 16 | 28 | -12 |
| 5. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice. | 35 | 60 | -25 |
| 6. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers. | 13 | 28 | -15 |
| 7. Discuss future trends and issues related to nursing knowledge and informatics literacy to support the advancement of practice, education, and research. | 6 | 14 | -8 |

Basic computer literacy competency was one area where differences were evident between faculty ratings and the informatician rating (Table 3). Although students' basic computers skills are typically not assessed before they enter the program, it is expected that they already possess this set of knowledge and skills. Most faculty members assume that students

have knowledge of computer devices and applications; thus, faculty did not teach that element and marked the competency as not present. The informatician indicated that the corresponding competencies had already been met based on the assumption that most students coming in to the program had basic computer literacy skills. The greatest number of matches between faculty members and the informatician were in the domains of clinical information literacy and health information management literacy.

Table 3
*Basic Computer Competencies: Faculty and Informatician*

| Competency | Faculty | Informatician |
|---|---|---|
| 1.1. Demonstrate knowledge of basic computer competencies. | 50% | 100% |
| 1.2. Differentiate between different computer parts. | 50% | 100% |
| 1.3. Identify a variety of software applications used for productivity and patient care applicability. | 50% | 100% |
| 1.4. Demonstrate knowledge of major operating systems. | 50% | 33.3% |

*Note.* Values represent percentage of six courses for faculty and nine courses from the informatician believed to cover the competency.

This analysis also raises the question of the ideal number of opportunities needed to achieve competencies. For example, demonstrating skills in using patient care technologies, information systems, and communication devices that support nursing care domains were indicated to have adequate coverage across the current curriculum. At the same time, the curriculum was found to be deficient in competencies associated with the fundamentals of NI. Competencies related to knowledge management (2.2), history and evolution of NI (2.4, 3.1, 3.2), concepts and theories of NI (3.1, 3.4), standardized terminologies (4.3), and how technology and information management are related to decision support and the quality and safety of patient care (6.2) were not apparent in the program. These competencies received some of the lowest scores from both faculty members and the informatician.

## Gap Analysis

While the comparison section above shows differences between the evaluation of the faculty and the evaluation of the informatician, both evaluations concerned the existing course content. To complete a gap analysis, it is necessary to consider the question of whether, overall, the current curriculum matched the ideal curriculum—that is, whether it covered the elements that the AACN, QSEN, and TIGER listed. Table 4 lists the number of subcompetencies from the crosswalk that faculty members and the informatician indicated were present in at least one course (NURS 327).

Table 4
*Subcompetencies Included in NURS 327 Course by Faculty and Informatician*

| Competency | Faculty | Informatician |
|---|---|---|
| 1. Demonstrate the basic understanding and use of computer technologies and skills that support nursing knowledge work, healthcare delivery, and the advancement of nursing knowledge, learning, and service. | 4/4 (100%) | 4/4 (100%) |
| 2. Appreciate and value nursing knowledge work, informatics literacy, and the role of emerging technologies in the advancement of nursing science and the delivery of high-quality, safe nursing care within the context of a learning health system. | 2/4 (50%) | 4/4 (100%) |
| 3. Explain nurses' role in supporting and engaging people in the adoption, use, and meaningful evaluation of technologies and resources that promote health and prevent diseases. | 5/6 (83%) | 5/6 (83%) |
| 4. Understand the use of clinical information systems (CIS) and electronic healthcare records (EHR) to support decisions and document nursing value in service healthcare's triple aim: improved patient experience, improved health of populations, and healthcare cost reduction. | 5/5 (100%) | 5/5 (100%) |
| 5. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice. | 10/10 (100%) | 10/10 (100%) |
| 6. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers. | 4/4 (100%) | 4/4 (100%) |

| | | |
|---|---|---|
| 7. Discuss future trends and issues related to nursing knowledge and informatics literacy to support the advancement of practice, education, and research. | 2/2 (100%) | 2/2 (100%) |

As shown, only one or two competencies, depending on the evaluator, were never included in the curriculum. However, this analysis raises the question of the ideal number of opportunities needed to achieve competencies. Inclusion in one course may be sufficient if that inclusion goes into depth on the topic; at the same time, cursory discussion of a specific subcompetency in several courses may not be enough for students to master it.

## Discussion

The primary purpose of this evidence-based quality improvement project was to assess the current state of integration of nursing informatics (NI) competencies in the baccalaureate program of a Midwestern nursing school. The American Association of Colleges of Nursing (AACN) *Essentials* (AACN, 2008), the Technology Informatics Guiding Education Reform (TIGER) initiative (TIGER, 2009), and the Quality and Safety Education for Nurses (QSEN) informatics competencies (AACN, 2016) were used as an evidence-based tool to determine the alignment and integration of these competencies in the baccalaureate program. By assessing the curriculum using a course mapping method, the project provided insights about the current state of informatics practice and teaching in the nursing program.

The gap analysis demonstrated significant deficiencies in several competencies, namely the history and evolution of NI, knowledge management, and standardized terminologies. While there were adequate learning opportunities in the areas of clinical information literacy skills and health information management, content related to foundational informatics was underdeveloped. Learning activities in areas of foundational informatics could not be easily identified in the curricular materials, although on closer examination were embedded in one of the courses as an introductory learning module. Learning activities were not clearly articulated in the courses, and this needs to be addressed in future curriculum development.

In summary, the analysis identified existing strengths of the curriculum and areas needing improvement in informatics curriculum development. There were three major findings:

1. Coverage of informatics competencies related to basic computer literacy, clinical information literacy, and health information literacy was adequate.

2. Competencies associated with the history and evolution of NI were underdeveloped in the curriculum.
3. There were inadequate opportunities to develop and incorporate informatics competencies explicitly in most of the courses.

**Implications**

The process and outcomes of this project have implications for nursing and other health profession's education. First, findings indicated that there is room for improvement in the program regarding the integration of foundational NI competencies. It is evident that clinical informatics competencies and skill sets and the application of informatics in nursing education, including practice, are still not explicitly understood in the industry (McGonigle, Hunter, Spies, & Hebda, 2014). Many baccalaureate-prepared nurses who enter the profession today may have taken courses that are aligned with technical informatics competencies. However, many of these students will graduate lacking the appropriate knowledge and understanding of the required fundamental competencies in clinical informatics. Previous studies indicated that graduate nurses are not adequately prepared to use information technology when they enter practice (Miller et al., 2014). Foundational informatics competencies that include the history and evolution of NI, knowledge management, and standardized terminologies need to be addressed in future curriculum development.

The project also addresses an ongoing concern since the implementation of TIGER, QSEN, and AACN competencies: the lack of procedures and assessment for determining informatics competencies present in the baccalaureate curriculum. To plan for the integration of informatics competencies in the curriculum, baseline assessments should be established to determine gaps and alignment of competencies and teaching and learning conditions (Choi,

2012). Utilizing the NI competency checklist will enable nursing prelicensure academic institutions to identify gaps, align the curriculum with appropriate competencies, and better understand skill sets for nursing students.

The survey highlighted the importance of clinical practicum placements, direct patient care activities, and simulation learning opportunities in strengthening and consolidating NI competencies in the current curriculum. The gap analysis helped the faculty highlight areas of strength and identified deficiencies in informatics competency development within the program. Content redundancy was also apparent with this approach. The gap analysis process brought together the informatician and faculty to discuss expectations of entry-level nurses and provided clear expectations regarding knowledge and skills needed with clinical informatics. Based on the structure, process, and outcomes of this project, colleagues within the program have begun to consider using the same approach to assess alignment of other competencies required in the baccalaureate program.

Results of the gap analysis need to be interpreted within the context of several limitations. The project was conducted in one school, and the author designed and analyzed the survey results. The author happens to teach three of the major courses in the curriculum and has a background in informatics. Several factors also need to be considered before assessing a curriculum using a gap analysis approach. The first is awareness of the labor-intensive nature of collecting data. It is time consuming to systematically review all course materials, and the process is dependent on faculty colleagues providing these materials in a timely fashion. The use of competency-guided curricula has the potential to decrease content duplication and content saturation.

## Conclusion

This effort was significant in identifying and presenting NI as a rapidly growing discipline for students, practicing nurses, and educators. The project demonstrated how informatics competencies using the AACN, QSEN, and TIGER as a framework can be used as an organizing framework for teaching the knowledge and skills needed by all nurses and nursing students. The NI competency checklist can be used as a guide in assessing and evaluating current undergraduate curricula and determining how NI competencies are integrated in nursing programs.

Furthermore, results presented in this project can be used in the development of courses using the clinical informatics competencies checklist as a framework for a standalone course or threaded throughout the curriculum, tailored to undergraduate nursing students and other healthcare professions. Many education and informatics experts have called for informatics content integration throughout the curricula and not only in a single course (Barton, 2005; Connor, Weaver, Warren, & Miller, 2002; TIGER, 2009).

The project lays the foundation for further work on applied assignments in the baccalaureate program. Additionally, a next phase of a curricular quality improvement project can include developing and integrating a comparable set of informatics competencies in other prelicensure nursing undergraduate, such as the associate degree program, RN to BSN completion and graduate programs. The process used in this project can also be utilized in developing and integrating other sets of competencies, as indicated by accreditation standards in any health profession curriculum. Possessing a tool that can assist educators with informatics competency assessment and curriculum alignment is beneficial. It is effective and efficient to be able to identify what competencies are needed in a baccalaureate program.

This effort supported the changes needed in healthcare profession education to promote clinical informatics and prepare a healthcare workforce capable of practicing in the current complex healthcare environment where health information technology is always in flux. This project has the potential to provide nursing and other health profession faculty with an example of how to integrate evidence-based informatics competencies in the curriculum and promote information literacy, information management, and patient care technologies in healthcare profession education at all levels. This finding could be a representation of what has been noted in the literature, namely faculty's lack of knowledge in integrating informatics competencies in the curriculum.

Finally, results suggest that further education is required in the field of teaching informatics through additional training workshops and continuing education opportunities for faculty. Creation of an instructor tool to facilitate use of new learning and teaching activities has potential to provide the necessary means for including clinical informatics competencies even when faculty may not be well versed in clinical informatics content. NI can be integrated in mainstream nursing education and practice with available support in faculty education and development, curriculum change, leadership initiatives, and standard development.

## References

Abdrbo, A. (2015). Nursing informatics competencies among nursing students and their relationship to patient safety competencies. *CIN: Computers, Informatics, Nursing, 33*(11), 506-514. doi: 10.1097/CIN.0000000000000197

American Association of Colleges of Nursing. (2006). *The essentials of doctoral education for advanced nursing practice*. Washington, DC: Author.

American Association of Colleges of Nursing. (2008). *The essentials of baccalaureate education for professional nursing practice*. Washington, DC: Author.

American Association of Colleges of Nursing. (2016). Quality and safety education for nurses (QSEN). Retrieved from http://www.aacn.nche.edu/qsen/home

American Medical Informatics Association. (2018a). Informatics areas: Clinical informatics. Retrieved from https://www.amia.org/applications-informatics/clinical-informatics

American Medical Informatics Association. (2018b). Nursing Informatics Working Group: Nursing informatics. Retrieved from https://www.amia.org/programs/working-groups/nursing-informatics

American Nurses Association. (2008). *Nursing informatics: Scope and standards of practice*. Silver Spring, MD: Author.

Barton, A. (2005). Cultivating informatics competencies in a community of practice. *Nursing Administration Quarterly, 29,* 323-329.

Belchez, C. (2016). *Integrating nursing informatics competencies in the nursing education curriculum*. [Presentation] Kansas City, KS: University of Kansas School of Nursing.

Bembridge, E., Levett-Jones, T., & Jeong, S. (2011). The transferability of information and communication technology skills from university to workplace: A qualitative descriptive study. *Nursing Education Today*, *31*, 245-252. doi: 10.1016/j.nedt.2010.020

Boykins, A. (2014). Core communication competencies in patient centered care. *The ABNF Journal, 25*(2), 40-45.

Carter-Templeton, H., Patterson, R., & Russel, C. (2009). An analysis of published nursing informatics competencies. *Studies in Health Technology and Informatics*, *146*, 540-545.

Cheeseman, A. (2011). Are you prepared for the digital era? *Neonatal Network, 30*(4), 263-266. doi: 10.1891/0730-0832.30.4.263

Choi, J. (2012). Comparative assessment of informatics competencies in three undergraduate programs. *Online Journal of Nursing Informatics, 16*(2), 1-8.

Choi, J., & De Martinis, J. (2013). Nursing informatics competencies: Assessment of undergraduate and graduate nursing students. *Journal of Clinical Nursing*, *22*(13-14), 1970-1976. doi: 10.1111/jocn.12188

Clancy, T. (2017a). Integrating AACN essentials, QSEN KSA's, and TIGER competencies for nursing informatics: Sample outline for prelicensure course in nursing informatics. Retrieved from https://www.nursing.umn.edu/sites/nursing.umn.edu/files/sampleoutline_prelicensurecourseinnursinginformatics.pdf

Clancy, T. (2017b). Crosswalk: AACN Essentials, QSEN KSA's and TIGER competencies. Retrieved from https://www.nursing.umn.edu/sites/nursing.umn.edu/files/crosswalk-aacn-essentials-qsen-ksas-and-tiger-competencies.pdf

Connor, H., Weaver, C., Warren, J., & Miller, K. (2002). An academic-business partnership for advancing clinical informatics. *Nursing Education Perspectives, 23,* 228-233.

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

Curran, C. R. (2008). Faculty development initiatives for the integration and informatics competencies and point-of-care technologies in undergraduate nursing education. *Nursing Clinics of North America, 43,* 523-533.

Davenport, N., Spath, M., & Blauvelt, M. (2009). A step-by-step approach to curriculum review. *Nurse Educator, 34*(4), 181-185.

De Gagne, J., Bisana, W., Makowski, J., & Neumann, J. (2012). Integrating informatics into the BSN curriculum: A review of literature. *Nurse Education Today, 32*(6), 675-682. doi:10.1016/j.nedt.2011.09.003

Deming, W. E. (1998). A system of profound knowledge. In T. Siesfeld, J. Cefola, & D. Neef (Eds.), *The economic impact of knowledge* (pp. 161-174). Woburn, MA: Butterworth-Heinemann.

Deming, W. E. (2000). *The new economics for industry, government, education* (2nd ed.). Cambridge, MA: MIT Press.

Dixon, B., & Newlon, C. (2010). How do future nursing educators perceive informatics? Advancing the nursing informatics agenda through dialogue. *Journal of Professional Nursing, 26*(2), 82-90.

Eoyang, G., & Holladay, R. (2018). Adaptive action: Leveraging uncertainty in your organization. *The System Thinker*. Retrieved from https://thesystemsthinker.com/adaptive-action-leveraging-uncertainty-in-your-organization/

Fater, K. (2013). Gap analysis: A method to assess core competency development in the curriculum. *Nursing Education Research, 34*(2), 101-105.

Fetter, M. (2009). Graduating nurses' self-evaluation of information technology competencies. *The Journal of Nursing Education, 48*(2), 86-90. doi: 10.3928/014834-20090201-05

Flood, L., Gasiewicz, N., & Delpier, T. (2010). Integrating information literacy across BSN curriculum. *The Journal of Nursing Education, 49*(2), 101-104. doi: 10.3928/0148434-20091023-01.epib 2010.

Godfrey, N. & Martin, D. (2016). Breakthrough thinking in nursing education: The baccalaureate big 5. The Journal of Nursing Administration. 46. 7/8. Pp. 393-399. doi: 10.1097/NNA.0000000000000364.

Green, M., Hardie, T., Dohan, M., & Tan, J. (2015). Measuring the impact of nursing informatics competencies on decision satisfaction: Theoretical model and direction for new research. *CONF-IRM 2015 Proceedings,* 12. Retrieved from https://aisel.aisnet.org/confirm2015/12

Gugerty, B., Delaney, C., & DuLong, D. (2012). *The TIGER initiative: Informatics competencies for every practicing nurse: Recommendation from the TIGER Collaborative*. Technology Informatics Guiding Education Reform. Retrieved from http://s3.amazonaws.com/rdcms-himss/files/production/public/FileDownloads/tiger-report-informatics-competencies.pdf

Harden, R. (2001). Curriculum mapping: A tool for transparent and authentic teaching and learning. *Medical Teacher, 23*(2), 123-137. doi: 10.1080/01421590120036547

Hart, M. (2008). Informatics competency and development within the US nursing population workforce: A systematic literature review. *CIN: Computers, Informatics, Nursing, 26*(6), 320-331.

Hebda, T., & Calderone, T. (2010). What nurse educators need to know about the TIGER initiative. *Nurse Educator, 35*(2), :56-60. doi: 10.1097/NNE.0b013e3181ced83d

Heinrich, C., Karner, K., Gaglione, B., & Lambert, L. (2002). Order out of chaos: The use of a matrix to validate curriculum integrity. *Nurse Educator, 27*(3), 136-140.

Holycross, J. (2006). Curriculum mapping—an essential tool for curriculum development. *The Journal of Physical Assistant Education, 17*(4), 61-64.

Hunter, K., McGonigle, D., & Hebda, T. (2013). The integration of informatics content in baccalaureate and graduate nursing education: A status report. *Nurse Educator, 38*(3), 110-113. doi: 10.1097.NNE.0b013e31828dc292

Hwang, J., & Park, H. (2011). Factors associated with nurses' informatics competency. *CIN: Computer, Informatics, Nursing, 29*(4), 256-262.

Institute for Healthcare Improvement. (2018). Plan-do-check-act. Retrieved from http://www.ihi.org/resources/Pages/HowtoImprove/ScienceofImprovementTestingChanges.aspx

Institute for Manufacturing. (n.d.). Gap analysis. Retrieved from www.ifm.eng.cam.ac.uk/research/dtools/gap-analysis/

Institute for Safe Medication Practice. (2007). Error-prone conditions that lead to student-related errors. *Medication Safety Alerts, 12,* 21. Retrieved from http://www.ismp.org/resources/error-prone-conditions-lead-student-nurse-related-errors

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century*. Washington, DC: The National Academies Press.

Institute of Medicine. (2003). *Health professions education: A bridge to quality*. Washington, DC: The National Academies Press. Retrieved from http://www.nationalacademies.org/hmd/Reports/2003/Health-Professions-Education-A-Bridge-to-Quality.aspx

Institute of Medicine. (2012). *Health IT and patient safety: Building safer systems for better care*. Washington, DC: The National Academies Press. Retrieved from https://www.nap.edu/catalog/13269/health-it-and-patient-safety-building-safer-systems-for-better

Jeon, E., Kim, J., Park, H., Lee, J., Kim, J., Jin, M., . . . Yim, S. (2016). Current status of nursing informatics education in Korea. *Healthcare Informatics Research, 22*(2), 142-150.

Jette, S., Tribble, D., Gagnon, J., & Mathieu, L. (2010). Nursing students' perceptions on their resources toward the development of competencies in nursing informatics. *Nurse Educator Today, 30*(8), 742-775. doi: 10.1016/j.nedt.2010.01.016

Kinnunen, U., Rajalahti, E., Cummings, E., & Borycki, E. (2017). Curricula challenges and informatics competencies for nurse educators. In J. Murphy, W. Goossen, & P. Weber (Eds.), *Forecasting informatics competencies for nurses in the future of connected health* (pp. 41-48). Washington, DC: IOS Press. doi: 10.3233/978-1-61499-738-2-41

Knight, E., & Shea, K. (2014). A patient-focused framework integrating self-management and informatics. *Journal of Nursing Scholarship, 46*(2), 91-97. doi:10.111/jnu.12059

Landry, G., Alameida, M. D., Orsolini-Hain, L., Renwanz Boyle, A., Privé, A., Chien, A., . . . Leong, A. (2011). Responding to demands to change nursing education: Use of curriculum mapping to assess curricula content. *Journal of Nursing Education, 50*(10), 587-590.

Larson, L. (2017). *Perceptions and experiences of baccalaureate nursing program leaders related to nursing informatics*. Unpublished doctoral dissertation, University of Kansas School of Nursing, Kansas City, KS.

Li, S., & Kenward, K. (2006). A national survey of nursing education and practice of newly licensed nurses. *Journal of Nursing Administration's Healthcare, Law, Ethics, and Regulations, 8*(4), 110-115.

MacNeil, C., & Hand, T. (2014). Examining occupational therapy education through faculty engagement in curriculum mapping and pedagogical reflection. *American Journal of Occupational Therapy, 68*(Supplement 2), S12-S22. doi:10.5014/ajot.2014.012286

Madsen, I., Cummings, E., Borycki, E., & Lacroix, P. (2016). Developing a framework for teaching nursing informatics internationally. *Studies in Health Technology and Information, 225,* 783-785.

Manos, E. L., Connors, H., Warren, J., & Stenner, T. (2017). Informatics in the curriculum for healthcare professionals. In R. Nelson & N. Staggers (Eds.), *Health informatics: An interprofessional approach* (pp. 499-513). St. Louis, MO: Elsevier.

McDowell, D., & Ma, X. (2007). Computer literacy in baccalaureate nursing students during the last 8 years. *Computers, Informatics, Nursing, 25*(1), 30-36.

McGonigle, D., Hunter, K., Spies, C., & Hebda, T. (2014). Why nurses need to understand nursing informatics. AORN Journal. 100(3). 324-327 https://doi.org/10.1016/j.aorn.2014.06.012

McNeil, B., Elfrink, V., Bickford, C., Pierce, S., Beyea, S., Averill, C., & Klappenbach, C. (2003). Nursing information technology knowledge, skills, and preparation of student

nurses, nursing faculty, and clinicians: A US survey. *The Journal of Nursing Education, 42*(8), 341-349.

McNeil, B., Elfrink, V., Pierce, S., Beyea, S., Bickford, C., & Averill, C. (2005). Nursing information knowledge and competencies: A national survey of nursing education programs in the United States. *International Journal of Medical Informatics, 74,* 1021-1030.

Miller, L., Stimely, M., Matheny, P., Pope, M., McAtee, R., & Miller, K. (2014). Novice nurse preparedness to effectively use electronic health records in acute care setting: Critical informatics knowledge and skill gaps. *Online Journal of Nursing Informatics, 18*(2). Retrieved from http://www.himss.org/novice-nurse-preparedness-effectively-use-electronic-health-records-acute-care-settings-critical

Nagle, L., Crosby, N., Frisch, N., Borycki, E., Donelle, L., Hannah, K., & Shaben T. (2014). Developing entry-to-practice nursing informatics competencies for registered nurses. *Studies in Health Information Technology and Informatics, 201,* 356-363.

National League for Nursing. (2008). *Preparing the next generation of nurses to practice in a technology-rich environment: An informatics agenda* [Position Statement]. Retrieved from http://www.nln.org/docs/default-source/professional-development-programs/preparing-the-next-generation-of-nurses.pdf?sfvrsn=6

Nguyen, D., Zierler, B., & Nguyen, H. (2011). A survey of nursing faculty needs for training in use of new technologies for education and practice. *Journal of Nursing Education, 50*(4). doi: 10.3928/01484834.20101130-06

Office of the National Coordinator for Health Information Technology. (2015). Hospitals participating in the CMS EHR incentive programs. Retrieved from

http://dashboard.healthit.gov/quickstats/pages/FIG-Hospitals-EHR- Incentive-Programs.php

Omes, L., & Gassert, C. (2007). Computer competencies in a BSN program. *Journal of Nursing Education, 46*(2), 75-78.

Pilarski, T. (2011). Where is nursing informatics in undergraduate nursing education? *CJNI: Canadian Journal of Nursing Informatics, 5*(4). Retrieved from http://cjni.net/journal/?p=1041

Rajalahti, E., & Saranto, K. (2012). Nursing informatics competences still challenging nurse educators. *Studies in Health Technology and Informatics, 180,* 944-948.

Spencer, J. (2012). Integrating informatics in undergraduate nursing curricula: Using the QSEN framework as a guide. Journal of Nursing Education. 51(12). 697-701. https://doi.org/10.3928/01484834-20121011-01

Speroff, T., & O'Connor, G. (2004). Study design for PDSA quality improvement research. *Quality Management in Healthcare, 13*(1), 17-32.

Staggers, N., Gassert, C., & Curran, C. (2001). Informatics for nurses at four levels of practice. *Journal of Nursing Education*. 40.7. 303-316.

Technology Informatics Guiding Education Reform. (2009). *TIGER informatics competencies collaborative final report.* Retrieved from http://www.tigersummit.com/

Thompson, B., & Skiba, D. (2008). Informatics in the nursing curriculum: A national survey of nursing informatics requirements in nursing curricula. *Nursing Education Perspective*, *29*(5), 312-317.

Thompson, P., & Bell, P. (2005). Abuse of technology in clinical settings. *Nurse Educator, 32*(4), 145-146.

Trangenstein, P., & Weiner, E. (2006). Meeting the informatics needs of today's nursing students. *Studies in Health Technology and Informatics, 122,* 205-210.

Uchiyama, K., & Radin, J. (2009). Curriculum mapping in higher education: A vehicle for collaboration. *Innovative Higher Education, 33*(4), 271-280. doi: 10.1007/s10755-008-9078-8

Vasuki, R. (2016). The importance and impact of nursing informatics competencies for baccalaureate nursing students and registered nurses. *IOSR Journal of Nursing and Health Science, 5*(1), 20-25.

Vottero, B. (2013). Teaching informatics to pre-licensure, RN-to-BSN and graduate level students. *Nurse Educator, 42*(5 Suppl. 1), S22-S26. doi: 10.1097/NNE.0000000000000414

Weiner, E. E., & Trangenstein, P. A. (2009). The emerging role of educational informatics. *Studies in Health Technology and Informatics*, *146*, 567-571.

Wimberley, P., Isaacson, J., Walden, D., Wiggins, N., Miller, R., & Stacy, A. (2005). HIPAA and nursing education: How to teach in a paranoid healthcare environment. *Journal of Nursing Education, 44,* 489-492.

## Appendix A:

## The Essentials of Baccalaureate Education for Professional Nursing Practice

Essential IV: Information Management and Application of Patient Care Technology

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

*Note.* From *The Essentials of Baccalaureate Education for Professional Nursing Practice* by American Association of Colleges of Nursing, 2008, Washington, DC.

# Appendix B:

## Nursing Informatics Competencies from

## Technology Informatics Guiding Education Reform

| 1. Basic Computer Competency | | |
|---|---|---|
| **1.1 Hardware** | | |
| | *1.1.1. Concepts* | |
| | 1.1.1.1 | Understand the term hardware. |
| | 1.1.1.2 | Understand what a personal computer is. Distinguish between desktop, laptop (notebook), tablet PC in terms of typical users. |
| | 1.1.1.3 | Identify common handheld portabledigital devices like: personal digital assistant (PDA), mobile phone, smartphone, multimedia player and know their main features. |
| | 1.1.1.4 | Know the main parts of a computer like: central processing unit (CPU), types of memory, hard disk, common input and output devices. |
| | 1.1.1.5 | Identify common input/output ports like: USB, serial, parallel, network port, FireWire. |
| | *1.1.2 Computer Performance* | |
| | 1.1.2.1 | Know some of the factors that impact on a computer's performance like: CPU speed, RAM size, graphics card processor and memory, the number of applications running. |
| | 1.1.2.2 | Know that the speed (operating frequency) of the CPU is measured in megahertz (MHz) or gigahertz (GHz). |
| | *1.1.3 Memory and Storage* | |
| | 1.1.3.1 | Know what computer memory is: RAM (random-access memory), ROM (readonly memory) and distinguish between them. |
| | 1.1.3.2 | Know storage capacity measurements: bit, byte, KB, MB, GB, TB. |
| | 1.1.3.3 | Know the main types of storage media like: internal hard disk, external hard disk, network drive, CD, DVD, USB flash drive, memory card, online file storage. |
| | *1.1.4 Input, Output Devices* | |
| | 1.1.4.1 | Identify some of the main input devices like: mouse, keyboard, trackball, scanner, touchpad, stylus, joystick, web camera (webcam), digital camera, microphone. |
| | 1.1.4.2 | Know some of the main output devices like: screens/monitors, printers, speakers, headphones. |
| | 1.1.4.3 | Understand some devices are both input and output devices like: touch screens. |
| **1.2 Software** | | |
| | *1.2.1 Concepts* | |
| | 1.2.1.1 | Understand the term software. |
| | 1.2.1.2 | Understand what an operating system is and name some common operating systems. |
| | 1.2.1.3 | Identify and know the uses of some common software applications: word processing, spreadsheet, database, presentation, e-mail, web browsing, photo editing, computer games. |
| | 1.2.1.4 | Distinguish between operating systems software and applications software. |
| | 1.2.1.5 | Know some options available for enhancing accessibility like: voice recognition software, screen reader, screen magnifier, on-screen keyboard. |

**1.3 Networks**

*1.3.1 Network Types*

| | |
|---|---|
| 1.3.1.1 | Understand the terms local area network (LAN), wireless local area network (WLAN), wide area network (WAN). |
| 1.3.1.2 | Understand the term client/server. |
| 1.3.1.3 | Understand what the Internet is and know some of its main uses. |
| 1.3.1.4 | Understand what an intranet, extranet is. |

*1.3.2 Data Transfer*

| | |
|---|---|
| 1.3.2.1 | Understand the concepts of downloading from, uploading to a network. |
| 1.3.2.2 | Understand what transfer rate means. Understand how it is measured: bits per second (bps), kilobits per second (kbps), megabits per second (mbps). |
| 1.3.2.3 | Know about different Internet connection services: dial-up, broadband. |
| 1.3.2.4 | Know about different options for connecting to the Internet like: phone line, mobile phone, cable, wireless, satellite. |
| 1.3.2.5 | Understand some of the characteristics of broadband: always on, typically a flat fee, high speed, higher risk of intruder attack. |

**1.4 ICT in Everyday Life**

*1.4.1 Electronic World*

| | |
|---|---|
| 1.4.1.1 | Understand the term Information and Communication Technology (ICT). |
| 1.4.1.2 | Know about different Internet services for consumers like: e-commerce, ebanking, e-government. |
| 1.4.1.3 | Understand the term e-learning. Know some of its features like: flexible learning time, flexible learning location, multimedia learning experience, cost effectiveness. |
| 1.4.1.4 | Understand the term teleworking. Know some of the advantages of teleworking like: reduced or no commuting time, greater ability to focus on one task, flexible schedules, reduced company space requirements. Know some disadvantages of teleworking like: lack of human contact, less emphasis on teamwork. |

*1.4.2 Communication*

| | |
|---|---|
| 1.4.2.1 | Understand the term electronic mail (email). |
| 1.4.2.2 | Understand the term instant messaging (IM). |
| 1.4.2.3 | Understand the term Voice over Internet Protocol (VoIP). |
| 1.4.2.4 | Understand the term Really Simple Syndication (RSS) feed. |
| 1.4.2.5 | Understand the term web log (blog). |
| 1.4.2.6 | Understand the term podcast. |

*1.4.3 Virtual Communities*

| | |
|---|---|
| 1.4.3.1 | Understand the concept of an online (virtual) community. Recognize examples like: social networking websites, Internet forums, chat rooms, online computer games. |
| 1.4.3.2 | Know ways that users can publish and share content online: web log (blog), podcast, photos, video and audio clips. |
| 1.4.3.3 | Know the importance of taking precautions when using online communities: make your profile private, limit the amount of personal information you post, be aware that posted information is publicly available, be wary of strangers. |

| | | |
|---|---|---|
| | *1.4.4 Health* | |
| | 1.4.4.1 | Understand the term ergonomics. |
| | 1.4.4.2 | Recognize that lighting is a health factor in computer use. Be aware that use of artificial light, amount of light, direction of light are all important considerations. |
| | 1.4.4.3 | Understand that correct positioning of the computer, desk and seat can help maintain a good posture. |
| | 1.4.4.4 | Recognize ways to help ensure a user's wellbeing while using a computer like: take regular stretches, have breaks, use eye relaxation techniques. |
| | *1.4.5 Environment* | |
| | 1.4.5.1 | Know about the option of recycling computer components, printer cartridges and paper |
| | 1.4.5.2 | Know about computer energy saving options: applying settings to automatically turn off the screen/monitor, to automatically put the computer to sleep, switching off the computer. |
| **1.5 Security** | | |
| | *1.5.1 Identity/Authentication* | |
| | 1.5.1.1 | Understand that for security reasons a user name (ID) and password are needed for users to identify themselves when logging on to a computer. |
| | 1.5.1.2 | Know about good password policies like: not sharing passwords, changing them regularly, adequate password length, adequate letter and number mix. |
| | *1.5.2 Data Security* | |
| | 1.5.2.1 | Understand the importance of having an off-site backup copy of files. |
| | 1.5.2.2 | Understand what a firewall is. |
| | 1.5.2.3 | Know ways to prevent data theft like: using a user name and password, locking computer and hardware using a security cable. |
| | *1.5.3 Viruses* | |
| | 1.5.3.1 | Understand the term computer virus. |
| | 1.5.3.2 | Be aware how viruses can enter a computer system. |
| | 1.5.3.3 | Know how to protect against viruses and the importance of updating antivirus software regularly. |
| **1.6 Law** | | |
| | *1.6.1 Copyright* | |
| | 1.6.1.1 | Understand the term copyright. |
| | 1.6.1.2 | Know how to recognize licensed software: by checking product ID, product registration, by viewing the software licence. |
| | 1.6.1.3 | Understand the term end-user license agreement. |
| | 1.6.1.4 | Understand the terms shareware, freeware, open source. |
| | *1.6.2 Data Protection* | |
| | 1.6.2.1 | Identify the main purposes of data protection legislation or conventions: to protect the rights of the data subject, to set out the responsibilities of the data controller. |
| | 1.6.2.2 | Identify the main data protection rights for a data subject in your country. |
| | 1.6.2.3 | Identify the main data protection responsibilities for a data controller in your country. |

**2.1 Operating System**

*2.1.1 First Steps*

| | |
|---|---|
| 2.1.1.1 | Start the computer and log on securely using a user name and password. |
| 2.1.1.2 | Restart the computer using an appropriate routine. |
| 2.1.1.3 | Shut down a non-responding application. |
| 2.1.1.4 | Shut down the computer using an appropriate routine. |
| 2.1.1.5 | Use available Help functions. |

*2.1.2 Setup*

| | |
|---|---|
| 2.1.2.1 | View the computer's basic system information: operating system name and version number, installed RAM (random- access memory). |
| 2.1.2.2 | Change the computer's desktop configuration: date & time, volume settings, desktop display options (color settings, desktop background, screen pixel resolution, screen saver options). |
| 2.1.2.3 | Set, add keyboard language. |
| 2.1.2.4 | Install, uninstall a software application. |
| 2.1.2.5 | Use keyboard print screen facility to capture a full screen, active window. |

*2.1.3 Working with Icons*

| | |
|---|---|
| 2.1.3.1 | Identify common icons like those representing: files, folders, applications, printers, drives, recycle bin/wastebasket/trash. |
| 2.1.3.2 | Select and move icons. |
| 2.1.3.3 | Create, remove a desktop shortcut icon, make an alias. |
| 2.1.3.4 | Use an icon to open a file, folder, application. |

*2.1.4 Using Windows*

| | |
|---|---|
| 2.1.4.1 | Identify the different parts of a window: title bar, menu bar, toolbar or ribbon, status bar, scroll bar. |
| 2.1.4.2 | Collapse, expand, restore, resize, move, close a window. |
| 2.1.4.3 | Switch between open windows. |

---

**2.2 File Management**

*2.2.1 Main Concepts*

| | |
|---|---|
| 2.2.1.1 | Understand how an operating system organizes drives, folders, files in a hierarchical structure. |
| 2.2.1.2 | Know devices used by an operating system to store files and folders like: hard disk, network drives, USB flash drive, CD-RW, DVD-RW. |
| 2.2.1.3 | Know how files, folders are measured: KB, MB, GB. |
| 2.2.1.4 | Understand the purpose of regularly backing up data to a removable storage device for off-site storage. |
| 2.2.1.5 | Understand the benefits of online file storage: convenient access, ability to share files. |

*2.2.2 Files and Folders*

| | |
|---|---|
| 2.2.2.1 | Open a window to display folder name, size, location on a drive. |
| 2.2.2.2 | Expand, collapse views of drives, folders. |
| 2.2.2.3 | Navigate to a folder, file on a drive. |
| 2.2.2.4 | Create a folder and a further subfolder. |

*2.2.3 Working with Files*

| | |
|---|---|
| 2.2.3.1 | Identify common file types: word processing files, spreadsheet files, database files, presentation files, portable document format files, image files, audio files, video files, compressed files, temporary files, executable files. |
| 2.2.3.2 | Open a text editing application. Enter text into a file, name and save the file to a location on a drive. |

| | |
|---|---|
| 2.2.3.3 | Change file status: read-only/locked, read-write. |
| 2.2.3.4 | Sort files in ascending order by name, size, type, date modified. |
| 2.2.3.5 | Recognize good practice in folder, file naming: use meaningful names for folders and files to help with recall and organization. |
| 2.2.3.6 | Rename files, folders. |
| *2.2.4 Copy, Move* | |
| 2.2.4.1 | Select a file, folder individually or as a group of adjacent, non-adjacent files, folders. |
| 2.2.4.2 | Copy files, folders between folders and between drives. |
| 2.2.4.3 | Move files, folders between folders and between drives. |
| *2.2.5 Delete, Restore* | |
| 2.2.5.1 | Delete files, folders to the recycle bin/wastebasket/trash. |
| 2.2.5.2 | Restore files, folders from the recycle bin/wastebasket/trash. |
| 2.2.5.3 | Empty the recycle bin/wastebasket/trash |
| *2.2.6 Searching* | |
| 2.2.6.1 | Use the Find tool to locate a file, folder. |
| 2.2.6.2 | Search for files by all or part of file name, by content. |
| 2.2.6.3 | Search for files by date modified, by date created, by size. |
| 2.2.6.4 | Search for files by using wildcards: file type, first letter of file name. |
| 2.2.6.5 | View list of recently used files. |
| **2.3Utilities** | |
| *2.3.1 File Compression* | |
| 2.3.1.1 | Understand what file compression means. |
| 2.3.1.2 | Compress files in a folder on a drive. |
| 2.3.1.3 | Extract compressed files from a location on a drive. |
| *2.3.2 Anti-Virus* | |
| 2.3.2.1 | Understand what a virus is and the ways a virus can be transmitted onto a computer. |
| 2.3.2.2 | Use anti-virus software to scan specific drives, folders, files. |
| 2.3.2.3 | Understand why anti-virus software needs to be updated regularly. |
| **2.4 Print Management** | |
| *2.4.1 Printer Options* | |
| 2.4.1.1 | Change the default printer from an installed printer list. |
| 2.4.1.2 | Install a new printer on the computer. |
| *2.4.2 Print* | |
| 2.4.2.1 | Print a document from a text editing application. |
| 2.4.2.2 | View a print job's progress in a queue using a desktop print manager. |
| 2.4.2.3 | Pause, re-start, delete a print job using a desktop print manager. |
| **3.1 Using the Application** | |
| *3.1.1 Working with Documents* | |
| 3.1.1.1 | Open, close a word processing application. Open, close documents. |
| 3.1.1.2 | Create a new document based on default template, other available template like: memo, fax, agenda. |
| 3.1.1.3 | Save a document to a location on a drive. Save a document under another name to a location on a drive. |
| 3.1.1.4 | Save a document as another file type like: text file, Rich Text Format, template, software specific file extension, version number. |
| 3.1.1.5 | Switch between open documents. |

**7.1 The Internet**

*7.1.1 Concepts/Terms*

| | |
|---|---|
| 7.1.1.1 | Understand what the Internet is. |
| 7.1.1.2 | Understand what the World Wide Web (WWW) is. |
| 7.1.1.3 | Define and understand the terms: Internet Service Provider (ISP), Uniform Resource Locator (URL), hyperlink. |
| 7.1.1.4 | Understand the make-up and structure of a web address. |
| 7.1.1.5 | Understand what a web browser is and name different web browsers. |
| 7.1.1.6 | Know what a search engine is. |
| 7.1.1.7 | Understand the term Really Simple Syndication (RSS) feed. Understand the purpose of subscribing to an RSS feed. |
| 7.1.1.8 | Understand the term podcast. Understand the purpose of subscribing to a podcast. |

*7.1.2 Security Considerations*

| | |
|---|---|
| 7.1.2.1 | Know how to identify a secure web site: https, lock symbol. |
| 7.1.2.2 | Know what a digital certificate for a web site is. |
| 7.1.2.3 | Understand the term encryption. |
| 7.1.2.4 | Know about security threats from web sites like: viruses, worms, Trojan horses, spyware. Understand the term malware. |
| 7.1.2.5 | Understand that regularly updated anti-virus software helps to protect the computer against security threats. |
| 7.1.2.6 | Understand that a firewall helps to protect the computer against intrusion. |
| 7.1.2.7 | Know that networks should be secured by user names and passwords. |
| 7.1.2.8 | Identify some risks associated with online activity like: unintentional disclosure of personal information, bullying or harassment, targeting of users by predators. |
| 7.1.2.9 | Identify parental control options like: supervision, web browsing restrictions, computer games restrictions, computer usage time limits. |

**7.2 Using the Browser**

*7.2.1 Basic Browsing*

| | |
|---|---|
| 7.2.1.1 | Open, close a web browsing application. |
| 7.2.1.2 | Enter a URL in the address bar and go to the URL. |
| 7.2.1.3 | Display a web page in a new window, tab. |
| 7.2.1.4 | Stop a web page from downloading. |
| 7.2.1.5 | Refresh a web page. |
| 7.2.1.6 | Use available Help functions. |

*7.2.2 Settings*

| | |
|---|---|
| 7.2.2.1 | Set the web browser Home Page/Start page. |
| 7.2.2.2 | Delete part, all browsing history. |
| 7.2.2.3 | Allow, block pop-ups. |
| 7.2.2.4 | Allow, block cookies. |
| 7.2.2.5 | Delete cache/temporary Internet files. |
| 7.2.2.6 | Display, hide built-in toolbars. |

*7.2.3 Navigation*

7.2.3.1 Activate a hyperlink.

7.2.3.2 Navigate backwards and forwards between previously visited web pages.

7.2.3.3 Navigate to the Home page.

*7.2.4 Bookmarks*

7.2.4.1 Bookmark a web page. Delete a bookmark.

7.2.4.2 Display a bookmarked web page.

7.2.4.3 Create, delete a bookmark folder.

7.2.4.4 Add web pages to a bookmark folder.

**7.3 Using the Web**

*7.3.1 Forms*

| | |
|---|---|
| 7.3.1.1 | Complete a web-based form using: text boxes, drop-down menus, list boxes, check boxes, radio buttons. |
| 7.3.1.2 | Submit, reset a web-based form. |

7.3.2 Searching

| | |
|---|---|
| 7.3.2.1 | Select a specific search engine. |
| 7.3.2.2 | Carry out a search for specific information using a keyword, phrase. |
| 7.3.2.3 | Use advanced search features to refine a search: by exact phrase, by excluding words, by date, by file format. |
| 7.3.2.4 | Search a web based encyclopedia, dictionary. |

**7.4 Web Outputs**

*7.4.1 Saving Files*

| | |
|---|---|
| 7.4.1.1 | Save a web page to a location on a drive. |
| 7.4.1.2 | Download files from a web page to a location on a drive. |
| 7.4.1.3 | Copy text, image, URL from a web page to a document. |

*7.4.2 Prepare and Print*

| | |
|---|---|
| 7.4.2.1 | Prepare a web page for printing: change printed page orientation, paper size, printed page margins. |
| 7.4.2.2 | Preview a web page. |
| 7.4.2.3 | Choose web page print output options like: entire web page, specific page(s), selected text, number of copies and print. |

**7.5 Electronic Communication**

*7.5.1 Concepts/Terms*

| | |
|---|---|
| 7.5.1.1 | Understand the term e-mail and know its main uses. |
| 7.5.1.2 | Understand the make-up and structure of an e-mail address. |
| 7.5.1.3 | Understand the term short message service (SMS). |
| 7.5.1.4 | Understand the term Voice over Internet Protocol (VoIP) and know its main benefits. |
| 7.5.1.5 | Understand the main benefits of instant messaging (IM) like: real-time communication, knowing whether contacts are online, low cost, ability to transfer files. |
| 7.5.1.6 | Understand the concept of an online (virtual) community. Recognize examples like: social networking websites, Internet forums, chat rooms, online computer games. |

*7.5.2 Security Considerations*

| | |
|---|---|
| 7.5.2.1 | Be aware of the possibility of receiving fraudulent and unsolicited email. |
| 7.5.2.2 | Understand the term phishing. Recognize attempted phishing. |
| 7.5.2.3 | Be aware of the danger of infecting the computer with a virus by opening an unrecognized e-mail message, by opening an attachment. |
| 7.5.2.4 | Understand what a digital signature is. |

*7.5.3 E-mail Theory*

7.5.3.1 Understand the advantages of e-mail systems like: speed of delivery, low cost, flexibility of using a web-based e-mail account in different locations.

7.5.3.2 Understand the importance of network etiquette (netiquette) like: using accurate and brief descriptions in e-mail message subject fields, brevity in e-mail responses, spell checking outgoing e-mail.

7.5.3.3 Be aware of possible problems when sending file attachments like: file size limits, file type restrictions (for example, executable files).

7.5.3.4 Understand the difference between the To, Copy (Cc), Blind copy (Bcc) fields.

**7.6 Using e-mail**

*7.6.1 Send an e-mail*

7.6.1.1 Open, close an e-mail application. Open, close an e-mail.

7.6.1.2 Create a new e-mail.

7.6.1.3 Enter an e-mail address in the To, Copy (Cc), Blind copy (Bcc) fields.

7.6.1.4 Enter a title in the Subject field.

7.6.1.5 Copy text from another source into an e-mail.

7.6.1.6 Insert, remove a file attachment.

7.6.1.7 Save a draft of an e-mail.

7.6.1.8 Use a spell checking tool and correct spelling errors.

7.6.1.9 Send an e-mail, send an e-mail with a low, high priority.

*7.6.2 Receiving e-mail*

7.6.2.1 Use the reply, reply to all function.

7.6.2.2 Forward an e-mail.

7.6.2.3 Save a file attachment to a location on a drive and open the file.

7.6.2.4 Preview, print a message using available printing options.

*7.6.3 Enhancing Productivity*

7.6.3.1 Add, remove message inbox headings like: sender, subject, date received.

7.6.3.2 Apply a setting to reply with, without original message insertion.

7.6.3.3 Flag an e-mail. Remove a flag mark from an e-mail.

7.6.3.4 Identify an e-mail as read, unread. Mark an e-mail as unread, read.

7.6.3.5 Display, hide built-in toolbars. Restore, minimize the ribbon.

7.6.3.6 Use available Help functions.

**7.7 e-mail Management**

*7.7.1 Organize*

7.7.1.1 Search for an e-mail by sender, subject, e-mail content.

7.7.1.2 Sort e-mails by name, by date, by size.

7.7.1.3 Create, delete an e-mail folder.

7.7.1.4 Move e-mails to an e-mail folder.

7.7.1.5 Delete an e-mail.

7.7.1.6 Restore a deleted e-mail.

7.7.1.7 Empty the e-mail bin/deleted items/trash folder.

*7.7.2 Address Book*

7.7.2.1 Add contact details to an address book. Delete contact details from an address book.

7.7.2.2 Update an address book from incoming e-mail.

7.7.2.3 Create, update a distribution list/mailing list.

[Source: Modified from American Library Association's Information Literacy Competency Standards for Higher Education (2000).]

**Information Literacy Competencies**

All practicing nurses and graduating nursing students will have the ability to:

***1. Knowledge - Determine the nature and extent of the information needed.***

| | |
|---|---|
| 1.1 | Recognize a specific information need |
| 1.2 | Focus and articulate the information need into a researchable question. |
| 1.3 | Understand that the type and amount of information selected is determined in part by the parameters of the need, as well as by the information available. |

***2. Access - Access needed information effectively and efficiently***

| | |
|---|---|
| 2.1 | Recognize the availability of a variety of sources and of assistance with using them. |
| 2.2 | Identify types of information resources in a variety of formats (e.g., primary or secondary, journals, policies and procedures, electronic references) and understand their characteristics. |
| 2.3 | Select types of information resources appropriate to a specific information need. |
| 2.4 | Understand that different information sources and formats require different searching techniques, including browsing. |
| 2.5 | Select the search strategies appropriate to the topic and resource. |
| 2.5 | Understand that various resources may use different controlled vocabularies to refer to the same topic. |
| 2.6 | Use search language appropriate to the source, such as a controlled vocabulary, key words, natural language, author and title searches to locate relevant items in print and electronic resources. |
| 2.7 | Use online search techniques and tools to locate relevant citations and to further refine the search. |
| 2.8 | Understand that the Internet may be a useful resource for locating, retrieving and transferring information electronically. |
| 2.9 | Understand how to use classification systems and their rationale. |

[Source: Modified from American Library Association's Information Literacy Competency Standards for Higher Education (2000).]

---

***3. Evaluate information and its sources critically and incorporates selected information into his or her knowledge base and value system***

3.1 Understand that search results may be presented according to various ordering principles (e.g., relevance ranking, author, title, date, or publisher).

3.2 Assess the number and relevance of sources cited to determine whether the search strategy must be refined.

3.3 Use the components of a citation (e.g., currency, reputation of author or source, format, or elements of a URL) to choose those most suitable for the information need.

3.4 Perceive gaps in information retrieved and determine whether the search should be refined.

3.5 Understand that the Internet may be a useful resource for locating, retrieving and transferring information electronically.

3.6 Use a variety of criteria, such as author's credentials, peer review, and reputation of the publisher, to assess the authority of the source.

3.7 Assess the relevancy of a source to an information need by examining publication date, purpose, and intended audience.

3.8 Recognize omission in the coverage of a topic.

3.9 Distinguish between primary and secondary sources in different disciplines and evaluate their appropriateness to the information need.

3.10 Apply evaluation criteria to all information formats.

3.11 Integrate the new information into existing body of knowledge.

---

***4. Individually or as a member of a group, use information effectively to accomplish a specific purpose***

4.1 Recognize and evaluate documentation for the information source, such as research methodology, bibliography or footnotes.

4.2 Use appropriate documentation style to cite sources used.

4.3 Summarize the information retrieved (e.g., write an abstract or construct an outline).

4.4 Recognize and accept the ambiguity of multiple points of view.

[Source: Modified from American Library Association's Information Literacy Competency Standards for Higher Education (2000).]

| | |
|---|---|
| 4.5 | Organize the information in a logical and useful manner. |
| 4.6 | Synthesize the ideas and concepts from the information sources collected. |
| 4.7 | Determine the extent to which the information can be applied to the information need. |
| 4.8 | Create a logical argument based on information retrieved. |

***5. Evaluate outcomes of the use of information***

| | |
|---|---|
| 5.1 | Describe the criteria used to make decisions and choices at each step of the particular process used. |
| 5.2 | Assess effectiveness of each step of the process and refine the search process in order to make it more effective. |
| 5.3 | Understand that many of the components of an information seeking process are transferable and, therefore, are applicable to a variety of information needs. |
| 5.4 | Understand the structure of the information environment and the process by which both scholarly and popular information is produced, organized and disseminated. |
| 5.5 | Understand the ethics of information use, such as knowing how and when to give credit to information and ideas gleaned from others by appropriately citing sources in order to avoid plagiarism. |
| 5.6 | Respect intellectual property rights by respecting copyright. |
| 5.7 | Understand concepts and issues relating to censorship, intellectual freedom, and respect for differing points of view. |
| 5.8 | Understand the social/political issues affecting information, such as: |

a) privacy

b) privatization and access to government information

c) electronic access to information

d) the exponential growth of information

e) equal access to information

[Source: Modified from the Health Language 7 (HL7) EHRs Functional Model]

## 3. Clinical Information Management Competencies

### Concepts

Verbalize the importance of Health Information Systems to clinical practice

Have knowledge of various types of Health Information Systems and their clinical and administrative uses

### Due Care

Assure Confidentiality of protected patient health information when using Health Information Systems under his or her control

Assure Access Control in the use of Health Information Systems under his or her control

Assure the Security of Health Information Systems under his or her control

### Policy and Procedure

Understand the Principles upon which organizational and professional Health Information System use by healthcare professionals and consumers are based.

### User Skills

Have the User Skills as outlined in direct care component of the HL7 EHRS model (see below: **Using and EHRS, the nurse can:**) , which includes all of the ECDL-Health User Skills of Navigation, Decision Support,

[Source: Modified from the Health Language 7 (HL7) EHRs Functional Model]

**Example Competency Statements: Using an EHR, the nurse can:**

**1.0 Demographic/patient info**

- 1.1 Identify and Maintain a Patient Record
- 1.2 Manage Patient Demographics
- 1.3 Capture Data and Documentation from External Clinical Sources
- 1.4 Capture Patient-Originated Data
- 1.5 Capture Patient Health Data Derived from Administrative and
- 1.6 Interact with Financial Data and Documentation
- 1.7 Produce a Summary Record of Care
- 1.8 Present Ad Hoc Views of the Health Record
- 1.9 Manage Patient History

**2.0 Consents and Authorizations**

- 2.1 Manage Patient and Family Preferences
- 2.2 Manage Patient Advance Directives
- 2.3 Manage Consents and Authorizations

**3.0 Medication Management**

- 3.1 Manage Allergy, Intolerance and Adverse Reaction Lists
- 3.2 Manage Medication Lists
- 3.3 Manage Problem Lists
- 3.4 Manage Immunization Lists
- 3.5 Manage Medication Administration
- 3.6 Manage Immunization Administration
- 3.7 Manage Medication Orders as appropriate for her scope of practice

**4.0 Planning Care**

- 4.1 Interact with Guidelines and Protocols for Planning Care
- 4.2 Manage Patient-Specific Care and Treatment Plans
- 4.3 Interact with Clinical Workflow Tasking
- 4.4 Interact with Clinical Task Assignment and Routing
- 4.5 Interact with Clinical Task Linking
- 4.6 Interact with Clinical Task Tracking

**5.0 Order/Results Management**

- 5.1 Manage Non-Medication Patient Care Orders
- 5.2 Manage Orders for Diagnostic Tests
- 5.3 Manage Orders for Blood Products and Other Biologics
- 5.4 Manage Referrals
- 5.5 Manage Order Sets
- 5.6 Manage Results

**6.0 Care Documentation**

- 6.1 Manage Patient Clinical Measurements
- 6.2 Manage Clinical Documents and Notes
- 6.3 Manage Documentation of Clinician Response to Decision Support Prompts
- 6.4 Generate and Record Patient-Specific Instructions

[Source: Modified from the Health Language 7 (HL7) EHRs Functional Model]

| Example Competency Statements: Using an EHR, the nurse can: | |
|---|---|
| **7.0** | **Decision Support** |
| 7.1 | Manage Health Information to Provide Decision Support for Standard Assessments |
| 7.2 | Manage Health Information to Provide Decision Support for Patient Context- Driven assessments |
| 7.3 | Manage Health Information to Provide Decision Support for Identification of Potential Problems and Trends |
| 7.4 | Manage Health Information to Provide Decision Support for Patient and Family Preferences |
| 7.5 | Interact with decision Support for Standard Care Plans, Guidelines, and Protocols |
| 7.6 | Interact with decision Support for Context-Sensitive Care Plans, Guidelines, and Protocols |
| 7.7 | Manage Health Information to Provide Decision Support Consistent Healthcare |
| 7.8 | Management of Patient Groups or Populations |
| 7.9 | Manage Health Information to Provide Decision Support for Research Protocols Relative to Individual Patient Care |
| 7.10 | Manage Health Information to Provide Decision Support for Self-Care |
| 7.11 | Interact with decision support for Medication and Immunization Ordering as appropriate for her scope of practice |
| 7.12 | Interact with decision Support for Drug Interaction Checking |
| 7.13 | Interact with decision Support for Patient Specific Dosing and Warnings |
| 7.14 | Interact with decision Support for Medication Recommendations |
| 7.15 | Interact with decision Support for Medication and Immunization Administration |
| 7.16 | Interact with decision Support for Non-Medication Ordering |
| 7.17 | Interact with decision Support for Result Interpretation |
| 7.18 | Interact with decision Support for Referral Process |
| 7.19 | Interact with decision Support for Referral Recommendations |
| 7.20 | Interact with decision Support for Safe Blood Administration |
| 7.21 | Interact with decision Support for Accurate Specimen Collection |
| **8.0** | **Notifications** |
| 8.1 | Interact with decision support that Presents Alerts for Preventive Services and Wellness |
| 8.2 | Interact with decision Support for Notifications and Reminders for Preventive Services and Wellness |
| 8.3 | Manage Health Information to Provide Decision Support for Epidemiological |
| 8.4 | Investigations of Clinical Health Within a Population. |
| 8.5 | Manage Health Information to Provide Decision Support for Notification and Response regarding population health issues |
| 8.6 | Manage Health Information to Provide Decision Support for Monitoring Response |
| 8.7 | Notifications Regarding a Specific Patient's Health |
| 8.8 | Access Healthcare Guidance |
| **9.0** | **Facilitating Communications** |
| 9.1 | Facilitate Inter-Provider Communication |
| 9.2 | Facilitate Provider -Pharmacy Communication |
| 9.3 | Facilitate Communications Between Provider and Patient and/or the Patient Representative |
| 9.4 | Facilitate Patient, Family and Care Giver Education |
| 9.5 | Facilitate Communication with Medical Devices |

*Note.* From *Informatics Competencies for Every Practicing Nurse: Recommendations from the TIGER Collaborative,* by The TIGER Initiative (2009). Retrieved from http://s3.amazonaws.com/rdcms-himss/files/production/public/FileDownloads/tiger-report-informatics-competencies.pdf

# Appendix C:

## Informatics Competencies from Quality and Safety Education for Nurses

| Definition: Use information and technology to communicate, manage knowledge, mitigate error, and support decision-making. | | |
|---|---|---|
| **Knowledge** | **Skills** | **Attitudes** |
| Explain why information and technology skills are essential for safe patient care | Seek education about how information is managed in care settings before providing care<br>Apply technology and information management tools to support safe processes of care | Appreciate the necessity for all health professionals to seek lifelong, continuous learning of information technology skills |
| Identify essential information that must be available in a common database to support patient care<br>Contrast benefits and limitations of different communication technologies and their impact on safety and quality | Navigate the electronic health record<br>Document and plan patient care in an electronic health record<br>Employ communication technologies to coordinate care for patients | Value technologies that support clinical decision-making, error prevention, and care coordination<br>Protect confidentiality of protected health information in electronic health records |
| Describe examples of how technology and information management are related to the quality and safety of patient care<br>Recognize the time, effort, and skill required for computers, databases, and other technologies to become reliable and effective tools for patient care | Respond appropriately to clinical decision-making supports and alerts<br>Use information management tools to monitor outcomes of care processes<br>Use high quality electronic sources of healthcare information | Value nurses' involvement in design, selection, implementation, and evaluation of information technologies to support patient care |

*Note.* From "Quality and Safety Education for Nurses," by L. Cronenwett et al., 2007, *Nursing Outlook, 55,* p. 129. Copyright 2007 by Mosby Inc.

# Appendix D:

## Literature Review Summary Table

| Citation | Design | Sample/ Setting | Data Collection | Key Findings | Limitations | Other Important Notes/Information |
|---|---|---|---|---|---|---|
| Abdrbo, 2015 | Descriptive cross-sectional design | Convenience sample of 154 (99 nursing students and 55 interns) | The nursing students and interns completed the Self-Assessment of Nursing Informatics Competencies and Patient Safety Competencies Self-Evaluation questionnaire. | Nursing informatics competencies and patient safety competencies were significantly correlated except for clinical informatics role both with patient safety knowledge and attitude. | Use of subjective, self-reported measurements may not reflect participants' actual competencies, and convenience sampling to recruit participants limits generalizability of results. | These results provided feedback to adjust and incorporate informatics competencies in the baccalaureate program. Authors recommended making the nursing informatics course a core course, not an elective course, in the curriculum. |
| Carter-Templeton, Patterson, & Russell, 2009 | Literature review | A literature search using the terms "informatics competencies" and "nursing informatics competencies" via PubMeb and CINAHL | The search captured 37 articles; however, only six met the inclusion criteria. These six competency lists were reviewed for audience, sample size, design, categories used to classify competencies, and operational examples of competencies. | There is variation among published informatics competencies in regard to content, presentation, and audience. | | A general list of competencies that can be utilized by nurses at all levels is needed. Then nurses could operationalize and measure the skills, knowledge, and attitudes necessary to execute safe and effective nursing care in today's healthcare setting. |
| Choi & De Martinis, 2013 | Descriptive survey design | 289 nursing students | Data were collected using a 30-item Self-Assessment of Nursing Informatics Competencies Scale. An email was sent to students using a LISTSERV mailing list that had a link to the survey, demographic questions, and an online consent form on Survey Monkey. | Undergraduate and graduate students were competent in three subscale areas: basic computer knowledge and skills, clinical informatics attitude, and wireless device skills. Graduate students reported slightly higher mean competency scores than did undergraduates in three subscales: clinical informatics role, clinical informatics attitude, and wireless device skills. | | Results help nurse educators determine specific informatics content that needs more focus and suggest ways to integrate competencies into existing curriculum or informatics courses. Because of similarities in informatics competencies between undergraduates and graduates in this study, with small mean score differences, further studies are suggested to compare the groups. |
| Choi, 2012 | Self-assessment questionnaire | Students at one school in three tracks: traditional prelicensure, RN to BSN, and accelerated BSN | The Sell-Assessment of Nursing Informatics Competencies Scale (SANICS) was used to examine informatics competencies. | Both the RN-to-BSN students and accelerated BSN students ranked themselves competent in informatics, although the traditional prelicensure population rated itself higher in basic computing tasks. Students in all tracks reported a lack of | Self-reporting | |

| Citation | Design | Sample/ Setting | Data Collection | Key Findings | Limitations | Other Important Notes/Information |
|---|---|---|---|---|---|---|
| | | | | competence in applied computer skills and the clinical informatics role. | | |
| De Gagne, Bisanar, Makowski, & Neumann, 2012 | Literature review | Previous and current literature on health information education in nursing curriculum | Nineteen published studies between 2000 to 2010 on health information education were included. | Four overarching themes emerged: (a) lack of consensus on health information education; (b) impact on patient care outcomes; (c) faculty development through organizational collaboration; and (d) global disparities in health information education. | | There is a need for further research and leadership to promote understanding and awareness of health information education in the undergraduate nursing curriculum and its impact on patient care outcomes. |
| Dixon & Newlon, 2010 | Simulation study | Doctoral nursing students | Using an online collaboration tool, students were asked to create a plan for integrating informatics into a simulated undergraduate nursing program. The goal of this small simulation study was to examine how future nursing educators perceived informatics and its core elements. | Doctoral nursing students did not have a clear idea about what informatics is or what informatics competencies undergraduate nursing students might need. Although most believed an undergraduate curriculum should teach computer skills, only a few identified information literacy skills, such as privacy and security of health information, as important for beginning nurses. Students identified only a handful of competencies believed important by major informatics initiatives. | | Although limited, findings articulate the need for a universally accepted definition of informatics and a shared understanding of an informatics core curriculum. |
| Fetter, 2009 | Survey based on the 43 novice nurse competencies that serve as the foundation for the ANA's Nursing Informatics: Scope and Standards of Practice (2001) | Graduating baccalaureate nurses | Students rated their personal skill level on each competency as 0 (no experience), 1 (minimal skill), 2 (some/moderate skill), or 3 (good skills/ competent). Open-ended questions gathered student perceptions regarding theory and clinical courses, hardware and software requirements and skills, and general comments. | Students were most confident in Internet, word processing, and systems operations skills and rated themselves lowest on care documentation and planning, valuing informatics knowledge, skills development, and data entry competencies. Exposure to the latest informatics systems was a priority. Students wanted fair access to informatics and technology-rich clinical settings; more realistic informatics and technology simulations; enthusiastic and capable faculty; and better hardware, software, and literature-searching support in agencies, classrooms, laboratories, and residences. | | Nursing programs, clinical agencies, and policy makers need to recognize that students are advancing beyond acquiring informatics skills to integrating health information literacy into practice. To facilitate current and future skills attainment and innovation, nursing informatics education and evaluation must keep pace. |

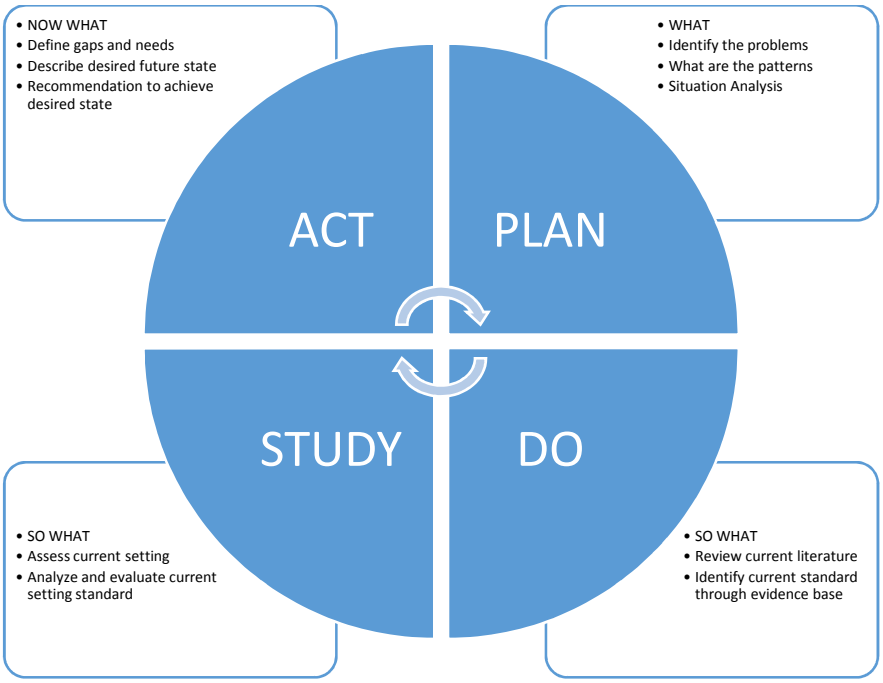
| Citation | Design | Sample/ Setting | Data Collection | Key Findings | Limitations | Other Important Notes/Information |
|---|---|---|---|---|---|---|
| Hart, 2008 | Systematic literature review | Literature relevant to informatics competency and education in the U.S. clinical setting | Seventeen eligible research studies in clinical nursing from 1999 to 2006 were examined. | Computer and information nursing competencies were not effectively defined until 2002, and clinical assessment regarding informatics components was predominantly limited between 1999 and 2006 to attitudes and use of online resources. There is a significant gap in the literature, and the current U.S. nursing workforce is not ready for evidence-based practice due to lack of knowledge and computer skills in approach towards research. The need remains for nursing job-specific competency development, development of evaluation tools for informatics competency components, and guidelines for education and evaluation of these competencies in clinical environments. | | Establishing baseline informatics competency is vital to the advancement of the healthcare delivery system. |
| Hunter, McGonigle, & Hebda, 2013 | Report | The top 24 online schools of nursing | School websites were reviewed for information on programs and courses offered in each program. Notes were made of any informatics-related courses and their descriptions. | Six of the 24 schools had no informatics content at any level. Among the remaining schools, 10 listed informatics content at the baccalaureate level, nine at the master's level, and four at the doctoral level. One school had content at all three levels. Only four schools offered a focus on nursing informatics. | | The integration of informatics content in nursing education is still lagging behind. |
| Jette, Tribble, Gagnon, & Mathieu, 2010 | Descriptive correlational study carried out through mail survey | Nursing students in the province of Quebec | A total of 131 college-level nursing students were randomly surveyed with a mail questionnaire designed to describe their perceptions about their internal and external resources in nursing informatics. | Nursing students perceived moderately high availability of internal and external resources necessary to ensure "knowledge to act" in nursing informatics. They lacked knowledge on use of spreadsheet programs, presentation software, and courseware; data security; analysis of the quality of a health-related website; and searches of electronic scientific databases. | | Even if nursing students have access to a computer and the Internet at home and are competent using informatics in nursing, they still lack important resources for developing competencies in nursing informatics. The authors recommended that faculties and colleges focus on these elements. |
| Li & Kenward, 2006 | Survey | Administrators of 410 nursing programs and 7,497 | Administrator survey asked questions related to elements of | Most nurses reported that their education adequately prepared them to perform | | The findings broaden understanding of the relationships between |

| Citation | Design | Sample/ Setting | Data Collection | Key Findings | Limitations | Other Important Notes/Information |
|---|---|---|---|---|---|---|
| | | RN and LPN graduates of respondent programs | education in the program, and graduate survey asked questions related to the adequacy of educational preparation for practice, difficulty with current client care assignments, and other professional and practice issues. | many, but not all, essential functions examined. Nearly 20% of RNs and 18% of LPNs reported difficulty with client care assignments. Inadequate preparation in several nursing functions pre-dicted difficulty with patient care assignments. Graduates were more likely to feel adequately prepared when nursing programs taught use of information technology and evidence-based practice; integrated pathophysiology and critical thinking throughout the curriculum; taught content related to the care of client populations as independent courses; and had more faculty teaching both didactic and clinical components of the curriculum. | | educational elements and preparedness of new nurses for practice. |
| McDowell & Ma, 2007 | Survey | A total of 411 students on admission and 429 students on graduation from a baccalaureate nursing program, | Self-reported nursing informatics competence, using the Gassert/McDowell Computer Literacy Survey, at admission and graduation was analyzed from 1997 to 2005, comparing trends and differences between admission and graduation. T | Informatics competence increased significantly during the 8-year period, both on admission and graduation, for experience with word processing, electronic mail, and Internet. Areas of less experience that did not increase significantly were use of spreadsheets, databases, and statistical programs. The nursing informatics competencies established for beginning nurses included databases, spreadsheets, word processing, presentation graphics, and keyboard skills. | | Nursing education programs may not be providing beginning nurses with the tools needed to effectively and efficiently work in the technology-rich healthcare arena. |
| Nguyen, Zierler, & Nguyen, 2011 | Descriptive, cross-sectional survey | A total of 193 faculty members from nursing schools in the western U.S. | A survey assessed nursing faculty's perceived knowledge, skills, and needs for training in the use of technologies for nursing education and practice. | Respondents were novice to competent users and used distance learning, informatics, and computer fundamentals frequently. They suggested that more training is needed to increase their knowledge level to proficient and expert users. Financial and technical support is needed for faculty's training and education. | Imprecise and overlapping operational definitions and meanings of the terms *informatics* and *distance learning* | Clarification of terms would be helpful in developing course content and training workshops and when planning and developing course content. |

| Citation | Design | Sample/ Setting | Data Collection | Key Findings | Limitations | Other Important Notes/Information |
|---|---|---|---|---|---|---|
| Omes & Gassert, 2007 | Survey | A baccalaureate nursing program | A tool was developed to evaluate course syllabi based on the categories of informatics competencies for the beginning nurse described by Staggers et al. (2001, 2002). Four matrices were produced to represent each semester. | Students in the BSN program had some exposure to informatics but limited exposure to technologies in the clinical setting. Although evidence of learning experiences related to computer skills was present, students were not routinely exposed to computerized systems. No syllabi included evidence that addressed informatics knowledge competencies. The study concluded that students received limited informatics exposure. | Assessment of course syllabi alone made it difficult to assess students' exposure to the use of multimedia presentations, understanding and use of systems, and informatics knowledge. | Findings support earlier reports that nursing faculty are the greatest block to incorporating technology into curricula. In addition to increasing faculty skill and comfort in the use of available computerized systems, there is a need to increase faculty knowledge and understanding of the nursing informatics competencies that relate to beginning nurses. It may be necessary to add criteria related to computer informatics practice to faculty evaluations. |
| Staggers, Gassert, & Curran, 2002 | Delphi study | Expert U.S. informatics nurse specialists | After a comprehensive literature review and item consolidation, an expert panel defined initial competencies. Subsequently, a three-round Delphi study validated the items. | Of the initial 305 competencies proposed, 281 competencies achieved ≥80% agreement for both importance as a competency and appropriateness for the correct practice level. Five competencies were rejected. Six competencies were considered valid, but the appropriate level of practice could not be agreed upon. Thirteen competencies did not reach any consensus after the three Delphi rounds. | | The Delphi study had a high participation rate, demonstrating the level of interest and need. Only 24 of the initial 305 competencies were not validated. Respon-dents raised the question of whether computer skills should be considered infor-matics competencies. This study was the first to span four levels of nurses, create competencies for both entry-level and experienced informatics nurse specialists, and examine the categories of computer skills, informatics knowledge, and informatics skills. |

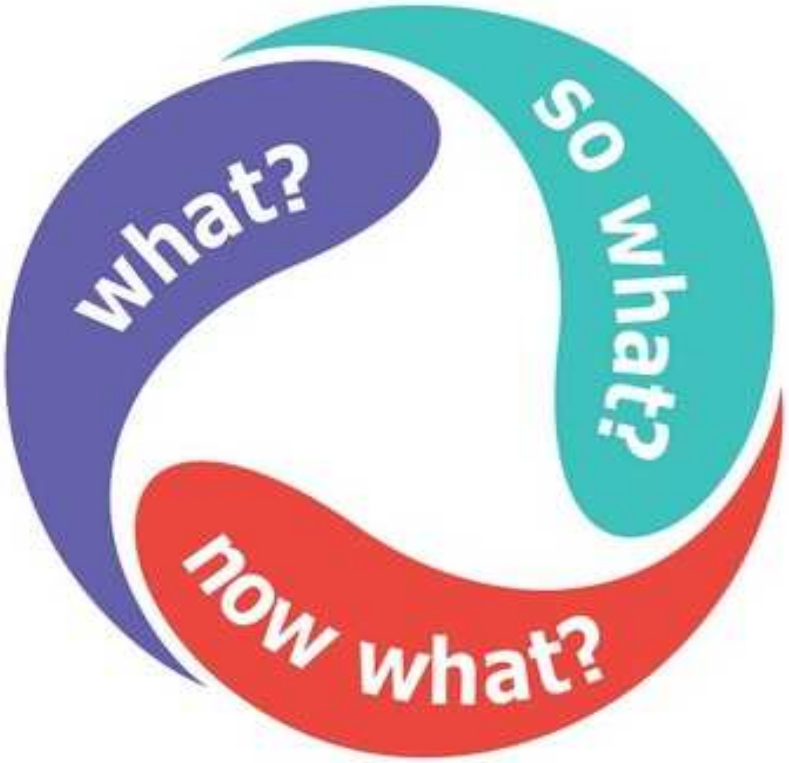
# Appendix E:

## The Plan-Do-Study-Act Model



**Appendix F:**

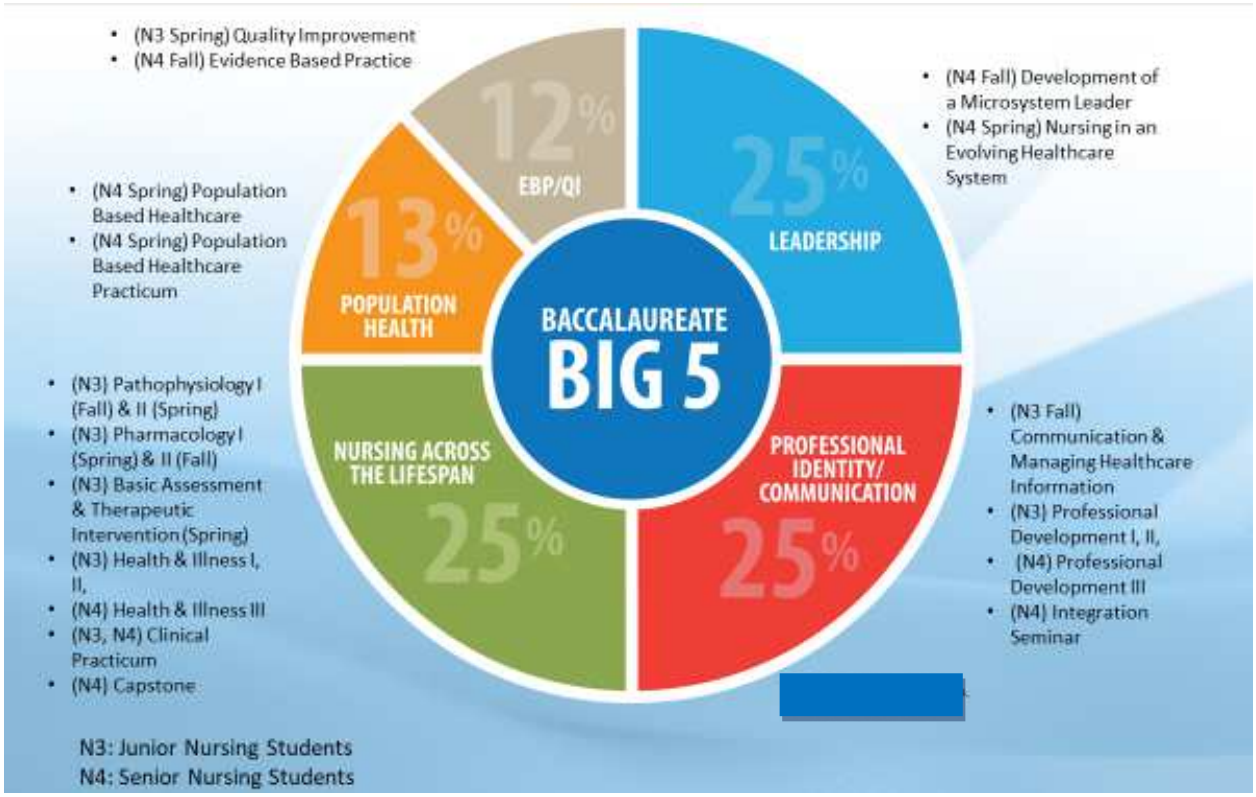
**Adaptive Action**




*Note.* From Human Design Dynamic Institute, 2016.

## Appendix G:

## Baccalaureate Curriculum at the Study Site



# Appendix H:

## Crosswalk of Competencies

| # | AACN | Definitions | AACN Sample Content | TIGER Competencies | QSEN Knowledge | QSEN Skills | QSEN Attitudes |
|---|---|---|---|---|---|---|---|
| 1 | Demonstrate skills in using **patient care technologies**, **information systems**, and **communication devices** that support safe nursing practice. | **Patient Care Technologies**<br>• Computers, printers<br>• IV smart pumps.<br>• Bar coded medication management systems,<br>• Pulse oximeters,<br>• Automated blood pressure and pulse<br>• Monitoring equipment (ECG, arterial blood pressure, respirations)<br>• Automated temperature<br>• Defibrillators<br>**Communication Devices**<br>• Smart phones, hands free mobile communication devices (Vocera), tablets (iPads) | Computer skills that may include basic software, spreadsheet, and healthcare databases.<br><br>Use of patient care technologies (e.g., monitors, pumps, computer-assisted devices. | **Basic Computer Competencies**.<br>1.1 Hardware<br>1.2 Software<br>1.3 Networks<br>1.4 Information and communication technology<br>2.1 Oper. systems<br>2.2 File Mgt<br>2.3 Utilities<br>2.4 Print Mgt<br>3.1 Applications<br>7.1 The Intranet<br>7.2 Browser<br>7.3 Using the Web<br>7.4 Web outputs | Explain why information and technology skills are essential for safe patient care | Seek education about how information is managed in care settings before providing care | Appreciate the necessity for all health professionals to seek lifelong, continuous learning of information technology skills |
| 2 | Understand the use of **CIS (clinical information systems**) to document interventions related to achieving nurse sensitive outcomes. | **Clinical Information Systems**<br>Electronic health records in:<br>• Acute care<br>• Ambulatory care<br>• Skilled nursing care<br>• Home and community health systems<br>• Public health systems<br>Applications to manage care.<br>• Provider order entry<br>• Clinical documentation (assessment, care planning, other)<br>• Results reporting<br>• Bar coded medication administration (BCMA)<br>• Electronic medication administration record (eMar)<br>• Ancillary systems (pharmacy, lab, radiology) | Electronic health records/physician order entry. | **Information Mgt Competencies**<br>1.0 Demographic<br>2.0 Consents<br>3.0 Med Mgt<br>4.0 Planning care<br>5.0 Order results<br>6.0 Care doc. | | Document and plan patient care in an electronic health record.<br><br>Navigate the electronic health record. | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | Advocate for the use of new patient care technologies for safe, quality care | New Patient Technologies<br>• Emobile Health<br>• Telehealth<br>• Patient Engagement/Personal Health Records<br>• Social Media<br>• Predictive analytics and "Big Data"<br>• Robotics<br>• Nano-technology and 3D computing<br>• 3D Printing<br>• Wearable Technology | | | | | |
| 4 | Use **telecommunication technologies** to assist in effective communication in a variety of healthcare settings. | **Telecommunications technologies:**<br>Email,<br>Telehealth<br>• Patient monitoring technologies (virtual assessments, ICU's)<br>• Home sensing devices (weight scale, BP monitor, bed chair, glucose meter, implant monitors, baby monitors, spirometer, medication monitoring, pedometer)<br><br>Patient engagement<br>• Personal health records<br>• Health literacy websites<br>• Social networking | Technology for virtual care delivery and monitoring.<br><br>Information literacy<br><br>Interstate practice regulations (e.g., licensure, telehealth). | **Basic Computer Competencies**<br>1.9 Information and Communication Technology.<br>7.5 Electronic Communication<br>7.6 Using e-mail<br>7.7 e-mail mgt<br><br>Information Mgt Competencies<br>9.0 Facilitating Communications | Contrast benefits and limitations of different communication technologies and their impact on safety and quality | Employ communication technologies to coordinate care for patients. | |
| 5 | Apply **safeguards** and **decision making support tools** embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare | **Safeguards and decision making support (Information Systems)**<br>• *Medication dosing support* (medication pick lists, dosing calculators)<br>• *Order facilitators* (order sets for specific conditions based on evidence based guidelines: pneumonia, adult prosthetic hip replacement, myocardial infraction)<br>• *Point of care alerts* (drug to drug interactions, duplicate therapy, drug allergies, contraindications to specific | Use of technology and information systems for clinical decision-making.<br><br>Technology and information systems safeguards (e.g., patient monitoring, | **Information Mgt Competencies**<br>1.0 Decision Support<br>2.0 Notifications | Describe examples of how technology and information management are related to the quality and safety of patient care | Respond appropriately to clinical decision-making supports and alerts.<br><br>Apply technology and information | Value technologies that support clinical decision-making, error prevention, and care coordination |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 6 | workers.<br><br>Recognize the role of information technology in improving patient care outcomes and creating a safe care environment. | conditions)<br>• *Point of care reminders* (immunizations, cancer screenings, fall prevention, pain management).<br><br>*Information displays* (dashboards of relevant data) | equipment, patient identifications systems, drug alerts, IV systems, and bar-coding. | | | management tools to support safe processes of care. | |
| 7 | Use **standardized terminology** in a care environment that reflects nursing's unique contribution to patient outcomes. | **Standardized terminologies**<br>• Multidisciplinary terminologies (SNOMED-CT, LOINC)<br>• Nursing terminologies (CCC, ICNP, NANDA, NIC, NOC, OS, PNDS | Information management for patient safety. | **Information Literacy**<br>2.9 Understand how to use classification systems and their rationale. | Identify essential information that must be available in a common database to support patient care | Use information management tools to monitor outcomes of care processes | |
| 8 | Evaluate data from all **relevant sources**, including technology, to inform the delivery of care. | Relevant sources<br>• Literature search methods to access, evaluate information, apply to practice and evaluate outcomes | Retrieval information systems, including access, evaluation of data, and application of relevant data to patient care.<br><br>On-line literature searches<br><br>Technological resources for evidence based practice<br><br>Web-based learning and | **Information Literacy Competencies**<br>1.Knowledge<br>2.Access<br>3. Evaluate info.<br>4.Application<br>5.Evaluate Outcomes | | Use high quality electronic sources of healthcare information | |

| | | | online literature searches for self and patient use. | | | | |
|---|---|---|---|---|---|---|---|
| 9 | Apply patient-care technologies as appropriate to address the needs of a diverse patient population. | Diverse patient population<br>• Ethnic/racial<br>• Gender<br>• Cultural<br>• Uninsured/under-insured/homeless<br>• Sexual orientation<br>• Elderly/Adult/<br>• Adolescent/pediatric | | | | | |
| 10<br><br><br><br><br><br>11 | Recognize that redesign of **workflow and care processes** should precede implementation of care technology to facilitate nursing practice.<br><br>Participate in evaluation of information systems in practice settings through policy and procedure development. | **Workflow and Care Processes**<br>• SDLC – Systems Design Life Cycle<br>• Human computer interaction | | | Recognize the time, effort, and skill required for computers, databases and other technologies to become reliable and effective tools for patient care | | Value nurses' involvement in design, selection, implementation, and evaluation of information technologies to support patient care |
| 12 | Uphold ethical standards related to **data security**, **regulatory requirements**, **confidentiality**, and **clients' right to privacy**. | **Data Security, regulatory, confidentiality, right to privacy.**<br>• HIPAA<br>• Copyright laws<br>• Ethical behavior | Ethical and legal issues related to the use of information technology, including copyright, privacy, and confidentiality issues. | **Basic Computer Competency**<br>1.10 Security<br>1.11 Law | | | Protect confidentiality of protected health information in electronic health records |

*Note.* AACN indicates American Association of Colleges of Nursing; QSEN, Quality and Safety Education for Nurses; TIGER, Technology Informatics Guiding Education Reform. From "Crosswalk: AACN Essentials, QSEN KSA's and TIGER competencies," by T. Clancy, 2017. Retrieved from https://www.nursing.umn.edu/sites/nursing.umn.edu/files/crosswalk-aacn-essentials-qsen-ksas-and-tiger-competencies.pdf. Reprinted with permission (see Appendix I).

## Appendix I:

## Permission to Use Competencies Crosswalk and Guideline

From: Thomas Clancy [clanc027@umn.edu]
Sent: Wednesday, June 20, 2018 10:35 AM
To: Taylor-James Gilard; Chito Belchez

Hi Chito,

The Seminar in Nursing Informatics course materials are all free and open to use by anyone. So you have my permission to use this for your project. Taylor can help you register for the course, if you would like, and provide you the Deep Dive website to review any materials. I can also be available for questions till June 30, 2018, feel free to email me.

Thanks Chito,

Tom Clancy

---

June 20, 2018

Dear Dr. Clancy:

My name is Chito Belchez and I am a doctoral student from University of Kansas School of Nursing writing my project paper titled "Integration of Nursing Informatics in Undergraduate Nursing Curriculum: A Gap Analysis" under the direction of my committee chaired by Dr. LaVerne Manos, DNP, RN-BC, who can be reached at (913) 588-1671 or at lmanos@kumc.edu.

I would like to ask your permission to use in my research study the Sample Outline for Prelicensure Course in Nursing Informatics guideline instrument, which is available from the University of Minnesota School of Nursing National Nursing Informatics Deep Dive Program website. I would like to use and print your outline under the following conditions:

- I will use the outline only for my research study and will not sell or use it with any compensated or curriculum development activities.
- I will include the copyright statement on all copies of the tool.
- I will send a copy of my completed project to your attention upon completion of the study.

If these are acceptable terms and conditions, please indicate so by replying to me through e-mail: cbelchez@kumc.edu.

Sincerely,

Chito Belchez

# Appendix J:

## Core Nursing Informatics Competencies Matrix Checklist

| **Core Content Listing**<br>*(From AACN Essentials, QSEN, and TIGER nursing informatics competencies combined)* | **Sample Content** | **Course No. & Title** | **Compe-tencies in the course** | **Exemplars** |
|---|---|---|---|---|
| **1. Demonstrate basic understanding and use of computer technologies and skills that support nursing knowledge work, healthcare delivery, and the advancement of nursing knowledge, learning, and service.** | *Basic computer competencies, hardware/software, networks, operating systems, file management, intranet, browser, web outputs, email management, using apps.* | | Y - Yes; N - No | |
| 1.1. Demonstrate knowledge of basic computer competencies. | | | | |
| 1.2. Differentiate between different computer parts. | | | | |
| 1.3. Identify a variety of software applications used for productivity and patient care applicability. | | | | |
| 1.4. Demonstrate knowledge of major operating systems. | | | | |
| **2. Appreciate and value nursing knowledge work, informatics literacy, and the role of emerging technologies in the advancement of nursing science and the delivery of high-quality, safe nursing care within the context of a learning health system.** | *Nursing informatics theoretical framework: data-information-knowledge-wisdom; knowledge management; systems theory; complexity science; complex adaptive systems; system development life cycle; quality improvement processes (plan-do-study-act).* | | | |
| 2.1. Develop a system thinking and quality improvement mindset that values innovation and the use of evidence in service care. | | | | |
| 2.2. Explore definitions of knowledge, knowledge management, and knowledge complexity. | | | | |
| 2.3. Develop understanding about the relationships between and among data, information, knowledge, learning, performance and meaning, philosophy, and wisdom derived from nursing informatics knowledge. | | | | |
| 2.4. Appreciate the history, evolution, and development of the science of informatics and nursing informatics as a means to support high-quality, safe, efficient, and effective healthcare delivery. | | | | |
| **3. Explain the nurse's role in supporting and engaging people in the adoption, use, and meaningful evaluation of technologies and resources that promote health and prevent diseases.** | *Health informatics, history of nursing informatics, theories, concepts in nursing informatics, nursing informatics standards and performance, professional and accrediting organizations, health literacy, personal health records, social media and social networking, information literacy, literature search methods, online literature searches, technological resources for evidence-based practice, web-based learning.* | | | |
| 3.1. Describe and explain the evolution and development of nursing informatics to support care delivery across healthcare contexts. | | | | |
| 3.2. Recognize the history of the evolution of nursing informatics. | | | | |
| 3.3. Identify major theories of nursing informatics. | | | | |
| 3.4. Identify key health informatics literacy terms and components. | | | | |
| 3.5. Explore current definitions, theories, and concepts in nursing informatics. | | | | |
| 3.6. Evaluate information from a web source for professional education on a health topic. | | | | |

| **Core Content Listing**<br>*(From AACN Essentials, QSEN, and TIGER nursing informatics competencies combined)* | **Sample Content** | **Course No. & Title** | **Compe-tencies in the course** | **Exemplars** |
|---|---|---|---|---|
| **4. Understand the use of clinical information systems (CIS) and the electronic healthcare records (EHR) to support decisions and document nursing value in service of healthcare's triple aim: improved patient experience, improved health of populations, and healthcare cost reduction.** | *Workflow and care processes, human computer interaction, results reporting, computerized physician order entry, provider order entry, clinical documentation, barcoded medication administration, electronic medication administration record, ancillary systems (lab, pharmacy, radiology), nursing standardized terminologies (CCC, ICNP, NANDA, NIC/NOC, PNDS), multidisciplinary terminologies (SNOMEDT-CT, LOINC)* | | | |
| 4.1. Recognize the time, effort, and skill required for computers, databases, and other technologies to become reliable and effective tools for patient care. | | | | |
| 4.2. Identify essential information that must be available in a common database to support patient care. | | | | |
| 4.3. Use standardized terminology in a care environment that reflects nursing's unique contribution to patient outcomes. | | | | |
| 4.4. Value nurses' involvement in the design, selection, implementation, and evaluation of information technologies to support patient care. | | | | |
| 4.5. Value technologies that support clinical decision-making, error prevention, and care coordination. | | | | |
| **5. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice.** | *Patient care technologies (intravenous smart pumps, pulse oximetry, electrocardiogram, blood pressure machine, defibrillators, blood glucose device, barcoded medication administration); electronic health record; medication dosing; order set facilitators; alerts and alarm parameters; point-of-care alerts and reminders; patient information displays (dashboard); telehealth; Vocera; smartphones; home sensing devices; chart audits.* | | | |
| 5.1. Explain why information and technology skills are essential for safe patient care. | | | | |
| 5.2. Recognize the role of information technology in improving patient care outcomes and creating a safe care environment. | | | | |
| 5.3. Recognize that redesign of workflow and care processes should precede implementation of care technology to facilitate nursing practice. | | | | |
| 5.4. Document and plan patient care in an electronic health record. | | | | |
| 5.5. Navigate the electronic health record. | | | | |
| 5.6. Apply patient care technologies as appropriate to address the needs of a diverse patient population. | | | | |
| 5.7. Apply technology and information management tools to support person-centered care and safe processes of care. | | | | |
| 5.8. Use telecommunication technologies to assist in effective communication in a variety of healthcare settings. | | | | |
| 5.9. Contrast benefits and limitations of different communication technologies and their impact on safety and quality. | | | | |
| 5.10. Respond appropriately to clinical decision-making supports and alerts. | | | | |
| **6. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers.** | *Data security, regulations, confidentiality, right to privacy, HIPAA, copyright laws, ethical behaviors.* | | | |
| 6.1. Discuss the influence of policy and ethics in regard to patient engagement, clinical decision support, and the delivery of safe, high-quality care. | | | | |

| **Core Content Listing**<br>*(From AACN Essentials, QSEN, and TIGER nursing informatics competencies combined)* | **Sample Content** | **Course No. & Title** | **Compe-tencies in the course** | **Exemplars** |
|---|---|---|---|---|
| 6.2. Describe examples of how technology and information management are related to decision support and the quality and safety of patient care. | | | | |
| 6.3. Protect confidentiality of protected health information in electronic health records. | | | | |
| 6.4. Participate in evaluation of information systems in practice settings through policy and procedure development. | | | | |
| **7. Discuss future trends and issues related to nursing knowledge and informatics literacy to support the advancement of practice, education, and research.** | *Interprofessional practice collaboration tools, big data and nursing science, learning health system.* | | | |
| 7.1. Advocate for the use of new patient care technologies for safe, quality care. | | | | |
| 7.2. Appreciate the core competencies for interprofessional collaborative practice and education to support safe, effective, high-quality care delivery. | | | | |

## Appendix K:

## Faculty Invitation to Participate

Dear [Name]:

As you all know, I am a University of Kansas School of Nursing student currently in the project phase of my DNP program. My interest is in healthcare informatics, and my project focuses on finding out the level of integration of nursing informatics competencies in our baccalaureate program.

The primary purpose of my project is to determine the state of integration of nursing informatics competencies in the current curriculum. This is a quality improvement project to see how we have integrated the informatics competencies defined by the AACN Essentials, QSEN, and TIGER Initiatives and the level of that integration.

You were identified as a potential participant based on your position as a faculty member in our BSN program. In lieu of this project, I would like to ask your permission to participate in my project by completing the attached informatics checklist spreadsheet. As you prepare for your assigned fall semester course(s), I am hoping that this spreadsheet will not take a lot of your time and can be used as an opportunity for you to review and evaluate what and how nursing informatics competencies are being taught or presented in your course by using the checklist as your guide. You may return the competed checklist to me via email attachment as soon as you have completed your review.

Please contact me at cbelchez@kumc.edu if you have any questions about completing the checklist.

Chito Belchez

# Appendix L:

## Faculty Course Survey Results

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Demonstrate the basic understanding and use of computer technologies and skills that support nursing knowledge work, healthcare delivery, and the advancement of nursing knowledge, learning, and service.** | | | | | | | | | | | |
| 1.1. Demonstrate knowledge of basic computer competencies. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Use of devices (laptop, notebook) in class |
| 1.2. Differentiate between different computer parts. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Reading assignment, textbook |
| 1.3. Identify a variety of software applications used for productivity and patient care applicability. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Cloud, Kahoot, Google Doc, Voalte |
| 1.4. Demonstrate knowledge of major operating systems. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | |
| **2. Appreciate and value nursing knowledge work, informatics literacy, and the role of emerging technologies in the advancement of nursing science and the delivery of high-quality, safe nursing care within the context of a learning health system.** | | | | | | | | | | | |
| 2.1. Develop a systems thinking and quality improvement mindset that values innovation and the use of evidence in service area. | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 5 | 335, CAS; 471/476, systems concepts; 472, evidence-based practice; 485/486, health determinants; 328/334, complexity science; 478, system-based care |
| 2.2. Explore definitions of knowledge, knowledge management, and knowledge complexity. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Lecture, readings |
| 2.3. Develop understanding about the relationships between and among data, information, knowledge, learning, performance and meaning, philosophy, and wisdom derived from nursing informatics knowledge. | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 5 | 335, Intro to nursing informatics framework; 327, DIKW lecture |
| 2.4. Appreciate the history, evolution, and development of the science of informatics, and nursing informatics as a means to support high-quality, safe, efficient, and effective healthcare delivery. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Class lecture |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3. Explain nurses' role in supporting and engaging people in the adoption, use, and meaningful evaluation of technologies and resources that promote health and prevent diseases.** | | | | | | | | | | | |
| 3.1. Describe and explain the evolution and development of nursing informatics to support care delivery across healthcare context. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Class lecture |
| 3.2. Recognize the history of the evolution of nursing informatics. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3.3. Identify major theories of nursing informatics. | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | Lecture, readings |
| 3.4. Identify key health informatics literacy terms and components. | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 5 | Lecture, reading assignment |
| 3.5. Explore current definitions, theories, and concepts in nursing informatics. | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Lecture, reading assignments |
| 3.6. Evaluate information from a web source for professional education on a health topic. | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 5 | SWA, lectures, journal reflections |
| **4. Understand the use of clinical information systems (CIS) and electronic healthcare records (EHR) to support decisions and document nursing value in service healthcare's triple aim: improved patient experience, improved health of populations, and healthcare cost reduction.** | | | | | | | | | | | |
| 4.1. Recognize the time, effort, and skill required for computers, databases, and other technologies to become reliable and effective tools for patient care. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lecture, readings, discussion board |
| 4.2. Identify essential information that must be available in a common database to support patient care. | 1 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 5 | Lecture, readings, chart audits, QI project |
| 4.3. Use standardized terminologies in a care environment that reflects nursing's unique contribution to patient outcomes. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Lecture, reading assignments |
| 4.4. Value nurse's involvement in design, selection, implementation, and evaluation of information technologies to support patient care. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lecture, readings |
| 4.5. Value technologies that support clinical decision making, error prevention, and care coordination. | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | Lecture, readings, case studies |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **5. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice.** | | | | | | | | | | | |
| 5.1. Explain why information and technology skills are essential for safe patient care. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures, readings, DPCs, FLAs |
| 5.2. Recognize the role of information technology in improving patient care outcomes and creating a safe care environment. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures, readings, case study, simulation |
| 5.3. Recognize that redesign of workflow and care processes should precede implementation of care technology to facilitate nursing practice. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures, readings, DPCs, FLAs |
| 5.4. Document and plan patient care in an electronic record. | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | Lectures, readings, DPCs, FLAs |
| 5.5. Navigate the electronic health record. | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | DPCs, FLAs |
| 5.6. Apply patient care technologies as appropriate to address the needs of a diverse patient population. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | DPCs, FLAs |
| 5.7. Apply technology and information management tools to support person-centered care and safe process of care. | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 4 | DPCs, FLAs |
| 5.8. Use telecommunication technologies to assist in effective communication in a variety of healthcare settings. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | DPCs, FLAs |
| 5.9. Contrast benefits and limitations of different communication technologies and their impact on safety and quality. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | DPCs, FLAs |
| 5.10. Respond appropriately to clinical decision supports and alerts. | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | DPCs, FLAs |
| **6. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers.** | | | | | | | | | | | |
| 6.1. Discuss the influence of policy and ethics on patient engagement, clinical decision support, and the delivery of safe, high-quality care. | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 4 | Lectures, class discussion |
| 6.2. Describe examples of how technology and information management are | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Lectures, DPCs, FLAs |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| related to decision support and the quality and safety of patient care. | | | | | | | | | | | |
| 6.3. Protect confidentiality of protected health information in electronic health record. | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 5 | Lectures, DPCs, FLAs |
| 6.4. Participate in evaluation of information systems in practice settings through policy and procedure development. | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | Lectures, DPCs, FLAs |
| **7. Discuss future trends and issues related to nursing knowledge and informatics literacy to support the advancement of practice, education, and research.** | | | | | | | | | | | |
| 7.1. Advocate for the use of new patient care technologies for safe, quality care. | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures |
| 7.2. Appreciate the core competencies for interprofessional collaborative practice and education to support safe, effective high-quality care delivery. | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 3 | IPE simulations, DPCs, FLAs |
| **Total competencies covered among the 34** | **28 (82%)** | **28 (82%)** | **27 (79%)** | **9 (27%)** | **5 (15%)** | **6 (18%)** | **0** | **0** | **0** | | |

*Note.* Data are not provided for last three courses because no faculty members responded for those courses.
CAS indicates Complex Adaptive Systems; DIKW, Data, Information, Knowledge, Wisdom framework; DPC, direct patient care; FLA, Focus Learning Activities; IPE, interprofessional education; QI, quality improvement; SWA, Scholarly Writing Assignment.

# Appendix M:

## Informatician Course Survey Results

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **1. Demonstrate the basic understanding and use of computer technologies and skills that support nursing knowledge work, healthcare delivery, and the advancement of nursing knowledge, learning, and service.** | | | | | | | | | | | |
| 1.1. Demonstrate knowledge of basic computer competencies. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Use of devices (laptop, notebook) in class |
| 1.2. Differentiate between different computer parts. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Hands on |
| 1.3. Identify a variety of software applications used for productivity and patient care applicability. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Cloud, Kahoot, Google Doc, Voalte |
| 1.4. Demonstrate knowledge of major operating systems. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Readings |
| **2. Appreciate and value nursing knowledge work, informatics literacy, and the role of emerging technologies in the advancement of nursing science and the delivery of high-quality, safe nursing care within the context of a learning health system.** | | | | | | | | | | | |
| 2.1. Develop a systems thinking and quality improvement mindset that values innovation and the use of evidence in service area. | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | 335, CAS; 471/476, systems concepts; 472, evidence-based practice; 485/486, health determinants; 328/334, complexity science; 478, system-based care |
| 2.2. Explore definitions of knowledge, knowledge management, and knowledge complexity. | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Lecture, readings |
| 2.3. Develop understanding about the relationships between and among data, information, knowledge, learning, performance and meaning, philosophy, and wisdom derived from nursing informatics knowledge. | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 6 | 335, Intro to nursing informatics frame-work; 327, DIKW lecture |
| 2.4. Appreciate the history, evolution, and development of the science of informatics, and nursing informatics as a means to support high-quality, safe, efficient, and effective healthcare delivery. | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Class lecture |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **3. Explain nurses' role in supporting and engaging people in the adoption, use, and meaningful evaluation of technologies and resources that promote health and prevent diseases.** | | | | | | | | | | | |
| 3.1. Describe and explain the evolution and development of nursing informatics to support care delivery across healthcare context. | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Class lecture |
| 3.2. Recognize the history of the evolution of nursing informatics. | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 3.3. Identify major theories of nursing informatics. | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 5 | Lecture, readings |
| 3.4. Identify key health informatics literacy terms and components. | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 6 | Lecture, readings |
| 3.5. Explore current definitions, theories, and concepts in nursing informatics. | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Lecture, readings |
| 3.6. Evaluate information from a web source for professional education on a health topic. | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | SWA, lectures, journal reflections |
| **4. Understand the use of clinical information systems (CIS) and electronic healthcare records (EHR) to support decisions and document nursing value in service healthcare's triple aim: improved patient experience, improved health of populations, and healthcare cost reduction.** | | | | | | | | | | | |
| 4.1. Recognize the time, effort, and skill required for computers, databases, and other technologies to become reliable and effective tools for patient care. | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 1 | 7 | Lecture, readings |
| 4.2. Identify essential information that must be available in a common database to support patient care. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Lecture, readings, chart audits, QI project |
| 4.3. Use standardized terminologies in a care environment that reflects nursing's unique contribution to patient outcomes. | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | Lectures, readings |
| 4.4. Value nurse's involvement in design, selection, implementation, and evaluation of information technologies to support patient care. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures, readings |
| 4.5. Value technologies that support clinical decision making, error prevention, and care coordination. | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 1 | 7 | Lectures, readings, case studies |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **5. Demonstrate skills in using patient care technologies, information systems, and communication devices that support safe nursing practice.** | | | | | | | | | | | |
| 5.1. Explain why information and technology skills are essential for safe patient care. | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 7 | Lectures, readings, DPCs, FLAs |
| 5.2. Recognize the role of information technology in improving patient care outcomes and creating a safe care environment. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Lectures, DPCs, FLAs |
| 5.3. Recognize that redesign of workflow and care processes should precede implementation of care technology to facilitate nursing practice. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | Lectures, DPCs, FLAs |
| 5.4. Document and plan patient care in an electronic record. | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 | DPCs, FLAs |
| 5.5. Navigate the electronic health record. | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 6 | DPCs, FLAs |
| 5.6. Apply patient care technologies as appropriate to address the needs of a diverse patient population. | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 8 | DPCs, FLAs |
| 5.7. Apply technology and information management tools to support person-centered care and safe process of care. | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 8 | DPCs, FLAs |
| 5.8. Use telecommunication technologies to assist in effective communication in a variety of healthcare settings. | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 1 | 6 | DPCs, FLAs |
| 5.9. Contrast benefits and limitations of different communication technologies and their impact on safety and quality. | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 4 | DPCs, FLAs |
| 5.10. Respond appropriately to clinical decision supports and alerts. | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 5 | DPCs, FLAs |
| **6. Apply safeguards and decision-making support tools embedded in patient care technologies and information systems to support a safe practice environment for both patients and healthcare workers.** | | | | | | | | | | | |
| 6.1. Discuss the influence of policy and ethics on patient engagement, clinical decision support, and the delivery of safe, high-quality care. | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | Lectures, reflections |
| 6.2. Describe examples of how technology and information management are | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | Lectures, DPCs, FLAs |

| Core NI Competencies Content Listing (AACN, QSEN & TIGER) | Nurs327 COMM & HI | Nurs 335 QI | Nurs 471/476 Ssys. Leader | Nurs 485/486 Pop Health -II | Nurs 31/332 BATI | Nurs 472 EBP | Nurs 328/334/473 PD 1-3 | Nurs 333/339 H & I I-III Practicum | Nurs 475/ 478/480 N4 Practicum | Total courses covering competencies | Exemplars |
|---|---|---|---|---|---|---|---|---|---|---|---|
| related to decision support and the quality and safety of patient care. | | | | | | | | | | | |
| 6.3. Protect confidentiality of protected health information in electronic health record. | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | Lectures, DPCs, FLAs |
| 6.4. Participate in evaluation of information systems in practice settings through policy and procedure development. | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 3 | DPCs, FLAs |
| **7. Discuss future trends and issues related to nursing knowledge and informatics literacy to support the advancement of practice, education, and research.** | | | | | | | | | | | |
| 7.1. Advocate for the use of new patient care technologies for safe, quality care. | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 6 | Lectures |
| 7.2. Appreciate the core competencies for interprofessional collaborative practice and education to support safe, effective high-quality care delivery. | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 8 | IPE simulations, DPCs, FLAs |
| **Total competencies (34)** | **32 (94%)** | **31 (91%)** | **29 (85%)** | **20 (58%)** | **15 (44%)** | **14 (41%)** | **17 (48%)** | **20 (58%)** | **24 (70%)** | | |

*Note.* CAS indicates Complex Adaptive System; DIKW, Data, Information, Knowledge, Wisdom framework; DPC, direct patient care; FLA, Focus Learning Activity; IPE, interprofessional education; QI, quality improvement; SWA, Scholarly .