

Running head: INFORMATICS COMPETENCY-BASED

Informatics Competency-Based Assessment: Evaluations and Determination of Nursing

Informatics Competency Gaps among Practicing Nurse Informaticists

by

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The Faculty Chair certifies approval of the following DNP Project:

Informatics Competency-Based Assessment: Evaluations and Determination of Nursing
Informatics Competency Gaps among Practicing Nurse Informaticists

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Abstract

In today's transformed healthcare industry, nursing informatics has become an essential and fast growing specialty. While nursing informatics competencies (NI) have been identified and recommended by national organizations as an essential component of nursing education and practice, limited information is available on the skills and informatics competencies of practicing informaticists. This evidence-based DNP project implemented and evaluated an evidence-based professional development program to address informatics competency gaps among practicing informaticists at a Magnet-recognized hospital at Northeast Florida, to ensure informaticists possess the essential skills and knowledge to improve achieving the organizational informatics needs. Nursing Informatics Competency Assessment (NICA) L3/L4 tool was used in this EBP project (McGonigle, Hunter, Hebda, & Hill, 2014). Overall, the project results indicated a positive outcome and improvement in competencies gaps intervened following the implementation and evaluation of an evidence-based professional development program and the results support the main objective of the quality improvement project.

Findings from this project are valuable to healthcare organizations and nurse leaders who wish to identify and address informatics competency gaps among informaticists and provide on-job-training to address gaps in knowledge and skills. Results of this QI project contributes and fills the gap in the literature on informatics competency assessment and development.

Key words: nursing informatics, informaticists, Informatics competencies, TIGER Initiative, NICA L3/L4

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Introduction

The American Recovery and Reinvestment Act (ARRA) was signed by President Obama in 2009, and required all care providers and hospitals to develop an electronic health record (EHR) and a health information technology (HIT) system to improve the health care delivery and outcomes. As a part of ACA, the Health Information Technology for Economic and Clinical Health (HITECH) Act was enacted to foster adoption, implementation and meaningful use of health IT (Office of the National Coordinator for Health Information Technology, 2015).

In 2003, Institute of Medicine (IOM) released a report explaining the need for a reform in the healthcare education to improve the quality of care provided. The report states: “All health professionals should be educated to deliver patient-centered care as members of an interdisciplinary team, emphasizing evidence-based practice, quality improvement approaches, and informatics” (IOM, page 45). After this report was released, the Technology Informatics Guiding Education Reform initiative (TIGER) was formed in 2004 with a goal to develop an action plan and set strategies to improve nursing education and nursing practice to prepare the nursing profession for the changes in the healthcare (TIGER, 2014).

In today’s healthcare system, informatics has become an essential part of the infrastructure to improve access to health information, safer patient care, decrease health care cost, and to improve outcomes (Tellez, 2012). Currently information technology is a critical part of our health care industry and the mandate for the EHR implementation, requires healthcare providers to have the basic computer knowledge as well as informatics competencies to manage and use technology to deliver care. The nursing profession, with more than four million members, is the largest group of healthcare providers and must have the computer skills and competencies in the workforce (Henry J. Kaiser Family Foundation, 2016). One of the six

competencies set forth by the Quality and Safety Education for Nurses (QSEN) initiative to improve quality and safety of patient care is informatics; therefore, all nursing students must learn the foundation of informatics knowledge to obtain the informatics competency required in the workforce (QSEN Institute, 2014).

Today, nurses are working in an advanced technological healthcare systems, but many entering the workforce are not prepared and lack the informatics competencies needed (Found, 2012). In order to prepare nursing graduates, both at the undergraduate and graduate levels, it is necessary to incorporate informatics education into the nursing curricula. The American Nursing Association (ANA), the National League for Nursing (NLN), TIGER initiative, and the American Association of Colleges of Nursing (AACN) all have argued that new nursing graduates must be able to demonstrate informatics competencies and call for the integration of informatics into nursing curricula (ANA, 2001; AACN, 2008; De Gagne, Bisaanar, Makowski & Neuman, 2011; Hunter, McGonigle, & Hebda, 2013; NLN, 2008). The national nursing governing organizations or their accrediting bodies do not mandate how informatics should be incorporated into the curricula; therefore, there are programs that offer a stand-alone course in informatics, while others may only integrate informatics content throughout the curriculum, or neither of the two. This lack of uniformity in informatics education causes an uneven preparedness for nurse graduates thus, negatively impacts their competency level and their use of health information technology (Hunter, McGonigle, & Hebda, 2013; De Gagne et al., 2011).

In the past decades, the importance of informatics in healthcare organizations has been recognized; thus, many informatics disciplines have been developed (The American Health Information Management Association, 2014). One of the first healthcare disciplines to integrate informatics is the profession of nursing through the recognition of nursing informatics as a

specialty in nursing practice (Bickford, 2015). Nursing informatics (NI) was first recognized by the American Nursing Association (ANA) in 1992, and the *first Scope of Practice for Nursing Informatics*, was published for the specialty in 1994. The most recent American Nursing Association (ANA) scope and standards defines nursing informatics as:

“Nursing informatics (NI) is the specialty that integrates nursing science and multiple information and analytical sciences to identify, define, manage, and communicate, data, information, knowledge, and wisdom in nursing practice. NI supports nurse, consumers, patients, the interprofessional healthcare team, and other stakeholders in their decision- making in all roles and settings to achieve desired outcomes” (ANA, p. 1, 2015).

This definition is close to the past definition of nursing informatics, but four key changes have been made which includes integration of nursing science with “multiple information and analytical sciences.” Today, the NI specialty is in high demand and has become a fast-emerging field (Hill, 2014). Consequently, to achieve the current healthcare reform goals and to connect the health information nationally, this specialty will continue to grow rapidly. According to Health Information and Management Systems Society's (HIMSS): “nurse informaticists play a crucial role in the development, implementation, and optimization of clinical applications including nursing clinical documentation, computerized practitioner order entry (CPOE) and electronic medical/health records (EMR/EHR)” (HIMSS, 2014, p.2).

Even though NI competencies have been defined by national nursing organizations, the introduction and adoption of the competencies and work-related informatics knowledge and skills for nurses has been very slow (Shultz, 2009). With the use of a well-designed technology, nurse informaticists (NI) provide tools to make nursing role more visible and support the work of

nurses and clinical staff members, and informatics competencies are crucial to a safe, efficient, and quality care which will enhance patient care outcomes (McGonigle, Hunter, Sipes, & Hebda, 2014). Their role requires proficiency on a board range of technological functions but they may not possess the competencies or required training since their knowledge and skills in informatics competencies were not assessed (Hill et al., 2014; Sipes et al., 2016). In many organizations, NIs have a diversified role and function with a vague job description, and lack in service educational training in informatics are challenges that healthcare organizations must overcome through strategies to improve NIs informatics knowledge and competency level assessment as they are key elements that engage them in successfully accomplishing organizational goals and optimizing care delivery (Liu, Lee, & Mills, 2015). Today nurses who pursue a career in health informatics will likely poses or seek a degree in nursing informatics or health information management; however, institutions lack informatics competency assessment and development of continuing educational needs to support and facilitate NI competency development (Camilli, 2016; Hill et al., 2014; Nahm, 2016).

Background of Problem

Nursing informatics competencies are a required set of skills required to effectively use health information technology in today's technology-rich healthcare delivery system (Sipes et al, 2016; Green, Hardie, Dohan, & Tan, 2015). Although informatics competencies for practicing nurses and NIs have been determined, evidence on the impact of nursing informatics competencies on the individual, organization and patients is scarce (Green et al, 2015).

The general problems addressed in this DNP quality improvement project are ill-defined informatics competencies and role requirements. Unclearly defined informatics competencies and role development requirements can lead to confusion and job ambiguity among nurse

informaticists. It is important to identify the essential information technology proficiencies, informatics competencies, and skills defined by the ANCC, TIGER initiative, IOM and ANA to develop job-specific standardized CI competencies and to form effective teaching and learning strategies (ANA, 2001; AACN, 2008; IOM, 2010; TIGER, 2009). There is a need to incorporate essential competencies through targeted training, in-service training, continuing education units (CEUs), and required educational requirements to support nurse informaticists (NIs) in obtaining necessary skills and knowledge required for their role.

The specific problem addressed in this project is the lack of role-specific informatics competencies and staff development curriculum pertinent to the organization's nursing informatics team. The current competency checklist is very general and specific role requirements are not measured. Informatics competencies are not formally written, and continuing education or training plans have not been verified to specifically address the clinical informatics competency needs identified by the national nursing and informatics organizations.

In an evidence-based practice improvement project, a well-structured question is essential and PICO is a format used to develop a question for a clinical practice that needs evaluation or a change. The letter P stands for patient, population, or a problem. The letter I, stands for intervention. The letter C stands for comparison and intervention. This is used when more than one intervention is considered, and is an optional component in the PICO question. This element may be eliminated only if the intervention is the focus of the evaluation. Lastly, the letter O refers to outcome and effects (Sherwood & Barnsteiner, 2012; Center for Evidence-Based Medicine, n.d.). For this DNP project, the following PICO question is formulated:

Among practicing nursing informaticists (P), does an evidence-based informatics professional development program (I), as compared to no program (C), improve technical and informatics competencies (O)?

Purpose of Project

This project developed, implemented, and evaluated an EBP informatics competency curriculum to address the identified competency gaps and support and enrich the team's informatics knowledge and skills required to improve achieving the organizational informatics needs. This project took place at a 304-bed, non-for-profit Magnet-recognized hospital in Northeast Florida. The organization's clinical informatics department currently consists 21 full time nurses. Evidence-based role-specific informatics competencies and staff development curriculum are not formally written and no continuing education or training plans have been verified to specifically address the needs for clinical informatics competencies at the CI department.

Currently, the organization utilizes Cerner Electronic Health records (EHR), but will transition the entire organization to a single EHR platform in the next year and a half. Due to this transition, the CI department will be experiencing a significant change in the workforce and the overall informatics department structure. As the organization prepares for the transition to a new EHR, the CI leadership is formulating plans for new roles that will expand the future organizational structure for the CI department. One of the necessary preparation considered is the educational plan to improve and enhance the exciting team's informatics knowledge and competencies. The goal of the organization is to evaluate and enhance the staff's current informatics competencies, knowledge, and skills level following the national organizations standards to ensure they develop the same knowledge level and competencies, and the achieved

level of competencies will become a required starting level competency for new hires as they transition to the new EHR. Through a survey process, the informatics competencies of the current NI staff have been evaluated and exclusive competencies requirements have been identified.

Significance of Project

This DNP quality improvement project provides an EBP professional development program which addressed the identified informatics competency needs among a group of practicing nurse informaticists. Further, the outcomes of this project are beneficial to the healthcare organization's clinical informatics leadership. The results provide guidance on how to identify informatics competency gaps among nursing informaticists, uncover critical competencies needed for the role, and develop in-service educational trainings. While the importance of nursing informatics competencies for nursing students, bedside nurses, and nursing leadership have been explored, this project contributes to the literature within the domain of nursing informatics competencies by focusing on the aspect of informatics competency gaps among practicing NIs at the designated institution.

Problem Statement

The general problems addressed by this DNP project are ill-defined informatics competencies and role requirements. The specific problem addressed in this DNP project is the lack of evidence-based, role-specific informatics competencies and a corresponding staff development curriculum pertinent to the organization's nursing informatics team. Currently the project site's clinical informatics department has a basic competency checklist for new NI employee's, which the preceptor completes during the three-month training period. This checklist includes basic computer competencies, clinical informatics processes, and testing but

essential informatics competencies recommended by national nursing organizations. This plays an important role in the short-term and long-term goals of the organization are not addressed in the current checklist. The organization's baseline assessment results indicate gaps in informatics competencies. Developing an educational training program and competency checklists, based on an organization's informatics needs, are essential to bridging the competency gaps in NIs practice.

Theoretical Framework

Two theoretical frameworks guided this project: the Benner's Dreyfus Model of Skill Acquisition novice-to-expert theory, and the Rosswurm and Larrabee's conceptual model (RLCM) (Benner, 1984; Rosswurm & Larrabee, 1999). Patricia Benner's theory, novice-to-expert, is a theory of skills acquisition to nursing practice adopted from the Dreyfus model of skills acquisition and skills development; the theory includes five levels of proficiency for skills development: novice, advanced beginner, competent, proficient, and expert (Butts & Rich, 2015). The first level is defined as a *novice* or a beginner as someone with no experience, inflexible, who strictly follows rules to guide practice due to limited or no clinical experience. The next level of skill acquisition is the *advanced beginner* nurse with some level of experience, has begun forming guiding principles based on experience, and uses those experiences to guide their actions. A *competent* nurse has a minimum of two to three years of practice and at this stage the nurse has developed planning skills and capable of planning her/his actions based on long-term goals, it is more efficient and organized, but lacks the ability to prioritize actions. The *proficient* nurse perceives the whole situation and can plan long-term goals with an improved decision making, understands more holistically, and can anticipate needs based on past experiences (see Appendix A). The last level in the skill and competency development theory is

the *expert* nurse who has a deep understanding of the situation, has a wide-ranging experience, does not rely of rules and guidelines, has a strong sense of intuition, can act quickly, and can use analytical skills and problem solving techniques to solve the situation (Benner, 1984; Butts & Rich, 2015). The model has been used as a foundation for skills and competency development and improvement in nursing education, faculty evaluation, faculty mentorship, and many nursing schools have followed the model to develop a structure for their curricula.

The information technology discipline in healthcare has also used the model as a framework throughout the implementation of the clinical decision support (CDS) systems in practice (Butts & Rich, 2015). The novice-to-expert theory is applicable to nursing informatics specialty research and education, and the theory can be utilized for the development of nursing informatics, skills, competencies, and education. The theory is also applicable to the development of health information systems competencies required in clinical practice (Kaminski, 2010).

The RLCM six step model was used as a guide for to integration of evidence-based change into current practice. This model was developed by Rosswurm and Larrabee in 1999 to guide practitioners through a process for implementing change based on best practice following the six steps:

1. **Assess the Need for Change in Practice.** Current practice and competency requirement for practicing NIs has been assessed and lack of formal competency requirements have been identified.
2. **Link the Problem, Intervention, and Outcomes.** The nursing informatics competency instrument (NICA) L3/L4 utilized at the study site identified gaps in informatics competencies, and based on the results of the survey and the organization's informatics

competencies needs educational curriculum and in-service training were constructed with a desired outcome of proficiencies in gap competencies.

3. **Synthesize the Best Evidence.** A scholarly literature search has been conducted in ProQuest, OVID, Cumulative Index to Nursing and Allied Health Literature (CINHAL), and PubMed. TIGER initiative and ANA Informatics Scope and Standards of Practice (2015) have been reviewed. The author has consulted with experts in the field, Clinical Nurse Informatics Officer (CNIO), nurse informatics specialists, and her mentor to identify gaps in practice.
4. **Design Practice Change.** The analytical findings from the surveys, review of the literature and brainstorming with the clinical informatics leadership has guided the design of this project.
5. **Implement and Evaluate the Change in Practice.** Three training sessions were offered to the participants addressing the gaps in competencies assessed in the baseline assessment. Four weeks following the intervention, post-survey was completed by the participants.
6. **Intergrade and Maintain the Change in Practice.** Once the project was completed, the results were presented to the clinical informatics stakeholders. Leadership would like to adopt this project design as a baseline assessment for future hires and ongoing competency evaluation. These competencies were incorporated into new hire orientation (see Appendix B).

Project Objectives

This DNP project aimed to answer the following PICO question:

Among practicing nursing informaticists (P), does an evidence-based informatics professional development program (I), as compared to no program (C), improve technical and informatics competencies (O)?

This DNP quality improvement project sought to accomplish the following objectives:

Primary Objectives

- Identify informatics competency gaps essential for the practicing nurse informatics specialists
- Design, implement, and evaluate an evidence-based informatics professional development program
- Evaluate program outcomes:
 - Pre-program needs assessment (pre-test) was completed by the organization prior to program development to inform project design and interventions using the NICA L3/L4 instrument assessment. This data set served as the pre-program baseline for comparison.
 - Post-program outcome evaluation (post-test) was completed four weeks following the last training session using the NICA L3/L4 instrument assessment by the DNP student (project primary investigator). Data from both the pre-test and post-test were analyzed to evaluate overall project outcome indicators.
 - Satisfaction with the program offerings was measured after each session using the Jacksonville University Nursing Continuing Education evaluation form to

inform future program improvements and offerings (see Appendix C).

Secondary Objectives

- Study the impact of age, educational background, and years of experience on the informatics competency rankings on the surveys.

Definition of Terms

The following definitions were used to guide this project:

Nursing informatics (NI): According to the American Nurses Association (ANA) nursing informatics is defined as:

“Nursing informatics (NI) is the specialty that integrates nursing science and multiple information and analytical sciences to identify, define, manage, and communicate, data, information, knowledge, and wisdom in nursing practice. NI supports nurse, consumers, patients, the interprofessional healthcare team, and other stakeholders in their decision-making in all roles and settings to achieve desired outcomes” (ANA, p. 1, 2015).

Informaticists/ Nursing Informatics Specialist (NIS): ANA recognizes NIS role as a clinical practice specialist that is a Master’s prepared Advanced Practice Registered Nurse (APRN) with graduate level education in informatics or an informatics-related field. NIS coordinate and implement projects with multidisciplinary teams, and interact with diverse stakeholders across all care settings (ANA, 2015).

Informatics Competencies: Since information technology has become an integral part of nursing practice, ANA strongly recommends “that state boards of nursing require that basic informatics competencies be incorporated into nursing programs curricula, from licensed nurse (LPN) to doctoral levels (ANA, 2015, p.42). The TIGER nursing informatics competencies

model includes: basic computer competencies, information literacy, and information management competencies recommended for all practicing nurses . Refer to Appendix D for the complete list of TIGER nursing informatics competencies (as cited in ANA, 2015).

TIGER Initiative: TIGER team was formed in 2004 by a group of prominent nurse leaders to develop strategies to ensure nursing education and practice is prepared for the adoption of EHR. The group agreed that informatics is a core competency required for all healthcare professionals and majority of nurses lack the information technology use and informatics competencies. Later in 2006, TIGER Initiative with a goal to prepare nursing profession for the adoption and utilization of technology and informatics in work force, developed nursing informatics competency recommendation for nursing education, research and practice (TIGER, 2014).

NICA L3/L4: The NICA L3/L4 is a self-assessment tool is developed by Hill, McGonigle, Hunter, Sipes and Hebda in 2013 to measure level 3 and level 4 competencies in nursing informatics. This instrument includes a demographic sheet and a self-assessment questionnaire divided into essential competencies assessing 178 perceived competencies in three main categories: computer skills, informatics knowledge, and informatics skills. Each competency category is assigned four-item Likert scales of: expert, proficient, comfortable, and beginner/N/A (Hill et al, 2013).

Review of Literature

The scholarly literature review provided a summary on the evidences available from the past empirical and theoretical literature to provide a more thorough understanding of the impact of informatics competencies in health care institutions and can help recognizing gaps in the existing research, and identify future research needs. The importance of nursing informatics

competencies has been revealed in literature but mostly the focus has been on the context of the implications of informatics competencies on nursing education, faculty, bed-side nursing and nursing leadership. Although fairly weak, but the finding of this integrative review will have an important implication for both nursing education and clinical practice.

A comprehensive review of the literature was conducted using key words “practicing nursing informatics,” “informatics competencies,” and “education and training” in the Cumulative Index of Nursing and Allied Health Literature (CINAHL), OVID Data, and ProQuest electronic databases. Review of the literature was evaluated based on the inclusion criteria: (1) qualitative and quantitative studies, (2) peer reviewed research articles published between 2010-2016, and (3) English language publications and nursing informatics competencies with a description on tools used for the assessment. Key publication elements from the selected articles were entered in a literature matrix to focus the literature review. Evidence was also reviewed and collected from health information technology and informatics textbooks, ANA, TIGER, Office of Coordinator of Health Information Technology, and HIMSS websites.

Nursing Informatics

Nursing informatics competencies have been discussed in the literature since 1980’s and in 1988 the National League of Nursing (NLN) first published informatics competencies for nurses developed by a workgroup from the International Medical Informatics Association (IMIA) (Peterson & Gerdin-Jelger, 1988). Later in 1992, the American Nurses Association for the first time recognized and defined nursing informatics as a nursing specialty and published the first NI scope of practice in 1994, followed by the NI standards in 1995 (ANA, 2001). The first major set of nursing informatics competencies (computer skills, informatics knowledge, and

informatics skills) were published in 2001 for nurses at four levels of practice: beginning nurse (level 1), experienced nurse (level 2), informatics specialists (level 3), and informatics innovators (level 4) (Staggers, Gassert, & Curran, 2001).

In 2003, a study by the Institute of Medicine (IOM): *Health Professional Education: A bridge to Quality*, identified five set of core competencies that all health professions should possess to provide the highest quality and safest clinical care. The five cores include: “delivering patient-centered care, working in interdisciplinary teams, evidence-based practice, quality improvement, and in informatics” (IOM, 2003, p 45-46). In 2004, President Bush outlined a health information technology plan to ensure every American would have an Electronic Health Record (EHR) by 2014. Followed by the release of this plan, the TIGER team was formed in 2004 by a group of prominent nurse leaders to develop strategies to ensure nursing education and practice is prepared for the adoption of EHR. The group agreed that informatics is a core competency required for all healthcare professionals and majority of nurses lack the information technology use and informatics competencies. Later in 2006, TIGER Initiative with a goal to prepare nursing profession for the adoption and utilization of technology and informatics in work force, developed nursing informatics competency recommendation for nursing education, research and practice (TIGER, 2014).

TIGER informatics competencies recommended for all graduating nursing students and practicing nurses are: basic computer competencies, information literacy, and information management. TIGER initiative recommends informatics competencies must be adopted by all levels of nursing education (TIGER, 2009).

The American Association of Colleges of Nursing (AACN) which provides educational guidance for nursing education and nursing practice, has identified informatics competencies as one of the “Essentials” for the baccalaureate (BSN), master’s, and DNP/PhD levels:

BSN Degree: “Essential IV: Information management and application of patient care” technology” (AACN, 2008, p. 17-19).

Master degree: “Essential V: Informatics and Healthcare technologies” (2011, p. 17).

Doctoral degree: “Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care” (AACN, 2006, p 12). According to ANA (2015, p 47): “informatics education is needed for all level of nursing, from both the clinical and educational points of view, as well as those nurses specialized in informatics” (see Appendix E).

Since 1995, informatics and nurse informatics specialists both have been able to obtain professional certification as a generalist-level nursing informatics certification(RN-BC) offered by the American Nurses Credentialing Center (ANCC, 2016). In addition to ANCC certification, nurse informatics and NIS are also eligible to obtain CPHIMS certification (Certified Professional in Healthcare Information and Management Systems) offered by Healthcare Information and Management Systems Society (HIMSS), a global organization promoting best use of health information technology in health care industry since the 60’s (HIMSS, 2017) (see Appendix F & G).

Informatics Competencies in Nursing Education

In an exploratory study, Hunter, McGonigle and Hebda (2013) examined the status of the informatics content integration in baccalaureate and graduate nursing. For this matter, they reviewed 24 top nursing programs and the study revealed that six schools had no informatics

content in any level, 18 schools listed informatics content; 10 at the baccalaureate level, 9 at the master's level, and 4 at the doctoral level. Only one school had content in all 3 levels. Choi, (2012) in a descriptive study of 131 students at a northeastern state university compared the informatics competencies in three undergraduate tracks: Traditional Pre-Licensure, Registered Nurse (RN) to Bachelor of Science in Nursing (BSN), and Accelerated BSN. The study revealed that RN to BSN and Accelerated BSN students were generally competent in informatics, but not Traditional Pre-Licensure students.

Thomas and Skiba, (2008) in a descriptive study of 1,557 faculty and 540 administrators examined the nursing informatics requirements in curricula. The study showed that although there has been some improvement across various educational levels, nursing education has not fully integrated informatics into the curriculum and a big gap remains in educating nurses with the skills and education needed to use Health Information Technology (HIT). Nursing faculty must be trained and prepared to teach nursing informatics, since the survey results indicated that there was an inconsistency between faculty's perception of nursing informatics, and simply exposure to a computer is not informatics education. According to the authors, Informatics education should not be viewed as an "extra" content, rather an integral component on the nursing curriculum and nursing practice (Thomas & Skiba, 2008).

Research findings indicated that lack of exposure to formal informatics education and lack of exhibiting informatics competencies leaves a gap in the knowledge and skills required for nurses in today's workforce where information technology plays an important role in the healthcare system (Gonen, A., Dganit, Sh., & Lev-Ail, L. , 2016; Hwang & Park, 2011; Lavin, Harper, & Barr , 2015; Nagel et. al, 2014; Pilarski, 2011). Developing a baseline of IC for undergraduate nursing programs is recommended for informatics curricula planning and

establishing nursing informatics skills for practicing nurse by providing continuing education and training (Hebda & Calderone, 2010; Vasuki, 2016).

An exploratory study by Choi and Zucker (2103) evaluated the informatics competencies of doctor of nursing practice (DNP) students in the post-baccalaureate (BS) and post-master's (MS) programs and the study revealed that students in both tracks were not competent in the three informatics competencies (computer skills, informatics knowledge, and informatics skills). The authors recommended establishing a baseline competency level in the DNP program is crucial for developing an informatics curriculum that prepares students to use technologies to promote safe and evidence-based nursing care (Choi & Zucker, 2013).

According to DeGange, Bisanar, Makowski, and Neumann (2012), “lack of consensus between computer, technology, and informatics literacy” (p. 667) was present in nursing curriculum and they recommended that basic computer skills must be a pre-requisite for new nursing students and informatics knowledge and skills must be attained prior to completing a BSN program in order to prepare the nurse graduates for the technologically advanced workforce (DeGange et al., 2012). 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 information technology plays an important role in the healthcare system (Hwang & Park, 2011; Nagel et. al, 2014; Pilarski, 2011). Developing a baseline of IC for undergraduate nursing programs is recommended for informatics curricula planning and establishing nursing informatics skills for practicing nurse by providing continuing education and training (Hebda & Calderone, 2010; Vasuki, 2016).

Informatics Competencies in Nursing Practice

The Quality and Safety Education for Nurses (QSEN) project explains that in order to provide the knowledge, skills, and attitude (KSAs) needed to improve quality and patient safety, informatics competency is required in all level of nursing education (QSEN, 2014; Sherwood & Barnsteiner, page 44, 2012). Informatics is an essential competency and has been recommended by all nursing leadership organizations, but unfortunately the gap still exists and many nursing programs do not provide informatics education (De Gagne et al., 2012). Informatics knowledge is required by all healthcare disciplines and must be obtained during the school years. Nursing students should receive adequate informatics education to obtain the informatics competencies required for nurses in the workforce.

Hwang and Park (2011), in a descriptive study on 365 nurses at a general nursing care unit, surveyed nursing groups at two teaching hospital in Koreas and studied factors affecting nurses' informatics competencies. The study showed that age had a negative correlation with computer literacy, 59% rated their computer skills below average, and nurses who had informatics education in nursing school had higher proficiency in computer skills and informatics competencies. Lack of informatics competency in practice provides evidence that NI education both in school and workforce is needed. The study findings revealed that majority of nurses considered their informatics competency below average and the authors suggested that basic computer skills must be enhanced and informatics education must be incorporated into nursing education (Hwang & Park, 2011).

Healthcare institutions must constantly adopt to the changes in technology and nurse informatics facilitate the implementation of technology and bridge the gap between clinical care and technology. Hui Liu, Lee, and Mills (2015) in a qualitative study explored the working

experiences of NIs and identified the healthcare organizations should have ongoing informatics development, and the role of NIs should be clearly defined as a specialist with identified support resources. Also, the authors explained that nursing informatics concepts should be seamlessly incorporated throughout the nursing educational curricula, and informatics competency-based courses should be designed to further strengthen future student's technology, data management, and informatics competencies (Hui Liu, Lee, & Mills). Continuous professional development and training are an integral part of professional nursing and informatics. Nursing students and practicing nurse need to have high level of proficiency with information technologies used in clinical settings; therefore, informatics competencies should be introduced to students at undergraduate level and evaluation of nursing informatics competencies should become standardized at a job-specific level (Gugerty, 2009; Sherri-ann, 2014; Chug& Stagger, 2014; Hart, 2008). Mastering information literacy is one of the core competencies and essential skills needed for both, graduating and practicing nurses as the foundation for evidence-based practice (EBP) and to ensure high quality research evidence is integrated in practice (Gugerty, 2009; Chesseman, 2013; Kleib, 2010).

Liu, Chia-Hui, Ting-Ting, & Milles (2015) in a qualitative study explored the working experiences of eight informatics nurses in Taiwan. The study results revealed that informatics nurses had a diversified roles and functions, vague nursing informatics job description, lack of decision-making authorities, and received very limited support from the management. The authors recommended that healthcare organizations “when implementing an informatics nurses position, practice standards and guidelines should be established to improve and strengthen problem-solving processes, career autonomy, and job responsibility” (Liu, Chia-Hui, Ting-Ting, & Milles, p 163, 2015).

Although NI competencies have been determined but the impact of possession or lack of the competencies on the individual, patients, and organizations have not been studied and is lacking in the literature (Green, Hardie, Dohan, & Tan, 2015). According to Green et al, (2015), “with a more thorough understanding of how NIC impacts healthcare organization, financial benefits may be seen in decreased costs of administration, system implementation, training” (p. 7) and other benefits on NIC may include increased quality of care, improved knowledge growth and management and research is needed on nursing informatics competencies among nurses.

Based on the literature review findings, there is a need for additional informatics education and subsequent evaluation of competencies. Lack of academic informatics education was found to be significant variable impacting practicing nurse’s preparedness, knowledge, and skills needed to meet the challenges of in today’s healthcare environment. There was limitation to the review, and the most significant limitation was the overall lack of evidence on the NI competency assessment among practicing informaticists. There was a gap in the literature on theory-driven research on informatics competencies. Limited studies were available on evaluation and determination of NI competencies in practicing nurse informaticists, and there was no mention on nursing informatics preparations and on job-training requirements. Since the studies reviewed were in English, it is possible that studies have been eliminated that were conducted on the topic.

Although limited, evidence suggests that there appears to be a positive relationship between informatics education and level of practicing clinical nurses and informaticists’ informatics competencies, skills and knowledge. The integrative review provided a comprehensive understanding of the existing problem relevant to nursing informatics competencies and more attention and research should be directed to this topic area. The

evidence revealed that NIs have a diversified role and functions, a vague job description, and lack of formal training or education in NI as major concerns (Liu, Chia-Hui, Ting-Ting, & Milles, 2015). As nursing informatics is a specialty that uses nursing science and information technology to enhance patient care, there is a need to evaluate current and ongoing assessment of their informatics competencies and the educations they need to pursue to develop the required competency (Hills et al, 2014; Hunter, McGonigle, & Hebda, 2013). Due to lack of baseline measurements on nursing informatics knowledge and skills, it is difficult to accurately assess the level of preparedness of new hires in the role on informatics, thus, prevents organizations from developing an informed nursing informatics curriculum to provide the staff with quality training tools.

An ongoing assessment of informatics competency among practicing NIs and clinical nurses is needed in to assess their level of informatics preparedness for the ongoing technological changes in the industry. Information gathered from a base-assessment would help planning of formal and continuing education programs on enhancing informatics competencies. It is important to identify the essential IT proficiencies and informatics competencies and skills defined by ANCC, TIGER initiative, ANA, and IOM in order to develop QI strategies to incorporate essential competencies through targeted training, in-service training, CEs, and required educational needs to support NIs in obtaining necessary skills required for their role, and to develop job-specific standardized CI competences.

Project Design/Implementation

Goal of Project

The purpose of this pre-test, post-test QI project was to evaluate participants' informatics competencies meeting the ANA scope and standards of practice (2015) and TIGER initiative (2009) informatics competencies (computer skills, informatics skills, and informatics knowledge) using NICA L3/L4 tool. The author implemented and evaluated an evidence-based professional development educational program to address competency gaps identified in a pre-program baseline assessment (NICA L3/L4 tool) and to address the participants' informatics competency that require further development. The primary objective of this project was to integrate an evidence-based informatics competency professional development program tailored to meet the organization's informatics competency needs, and develop a competency skills checklist to identify evidence-based competency needs for future new nurse informatics specialists joining the group. The secondary objective was to explore the impact of age, educational background, and years of experience on the informatics competency.

Setting

This project took place at a 304-bed, not-for-profit, Magnet-recognized hospital in Northeast Florida. The organization's clinical informatics department currently consists of 21 full time nurses. The campus includes a clinic, a 304-bed hospital, and 22 operating rooms which offers care in more than 35 medical and surgical specialties to patients nationally and internationally (Mayo Clinic, 2016).

Currently, the organization's clinical informatics department, due to transitioning to a single EHR platform, is comprised of two informatics groups; the clinical informatics group that oversee and maintain the legacy EHR and information systems, and the second group who have

been trained and certified to use the future single EHR platform as they transition in the next year and half. This group is currently overseeing the implementation, development of education curricula, education materials, workflow processes, go-live planning and overall transition into the new single EHR platform. Starting in Spring 2017, the current nursing informatics group will start training for the new platform in preparation for the implementation of the new EHR.

Population

A convenience sampling was appropriate for this project as the sample size was limited to the 21 NIs at the specific study site. The inclusion criteria for participants consisted of registered nurse informaticians employed at the selected study site's clinical informatics department at the time of the project interventions and evaluation. Initially, 21 surveys were distributed, 15 participants completed the pre-test survey, and 10 participants joined the professional training programs and completed the post-test survey.

Timeline

The aim of the project was to develop an evidence-based professional development program and competency curriculum to address the competency gaps identified in the baseline assessment, implement educational training, and evaluate the informatics competencies of the participants by Summer 2017. Baseline assessment data (retrospective pre-test) and the organization's specific informatics competency needs guided the curriculum development upon IRB approval. This project included the following phases:

- Pre-IRB Project Intervention Planning Phase
 - Collaboration by DNP student with organizational key stakeholders
 - Reviewing baseline gaps
- Project Intervention Planning

- Literature review to inform evidence-based interventions aligned with identified gaps from organizational needs assessment (pre-test)
- Defending project proposal
- Post-IRB approval
 - Evidence supported training and lesson plans development
 - Three sessions were offered to address competency gaps: Data Mining, role security, and statistical data management software trainings
 - Project implementation of sessions
 - Post-test assessment utilizing adapted L3/L4 NICA questionnaire
 - Analysis of the post-test data collated and compared with organizational baseline assessment data (pre-test)
 - Analysis of satisfaction with program sessions (CE evaluation forms)
 - Reporting of aggregate project outcomes

Selection of the Measurement Method

The informatics competency model for nurses was first introduced by Staggers, Gassert, and Curren (2002), and included four levels: “beginning nurse-level 1, experienced nurse-level 2, informatics specialists-level 3, and informatics innovators-level 4” (p 385). The Nursing Informatics Competency Assessment (NICA) L3/L4 tool was derived from the ground-breaking Delphi study of Staggers, Gassert and Curren. The instrument was developed by McGonigle, Hunter, Hebda, and Hill (2013) as the first valid and reliable self-assessment tool to measure informatics competencies for nurse informatics specialists and informatics innovators (see Appendix H). Lack of self-assessment of NI competencies was identified by the team as one of the gaps in NI competency development (Hill, 2014). The ANA scope and standards of practice

(2015) and TIGER initiative's competency sets (2009) are the guide for the competency assessment tool and the competencies are divided into three categories: computer skills, informatics knowledge, and informatics skills. (Sipes et al., 2016).

The NICA L3/L4 assessment tool includes a demographic sheet and a self-assessment questionnaire divided into essential competencies assessing 178 perceived competencies in three main categories: computer skills, informatics knowledge, and informatics skills (see Appendix H). Each competency category is assigned a four-item Likert score of expert, proficient, comfortable, and beginner/N/A. The authors of the NICA L3/L4 instrument have also developed a TIGER-based Assessment of Nursing Informatics Competencies (TANIC) tool to measure basic informatics competencies for level 1 and level 2 nurses.

Validity and Reliability

McGonigle, Hunter, Hebda, and Hill (2013) initially tested the instrument, followed by a Delphi approach in two separate reviews of the instrument by three NI experts. This allowed for identification of any unnecessary, redundant, or missing items from each sub-category, and validation of level 3 and level 4 competencies focused on computer skills, informatics knowledge, and informatics skills identified in the instrument (Hill, 2014; Hunter, McGonigle, & Hebda, 2013). Cronbach's alpha (α) was used to measure internal consistency and reliability of items in the instrument and were reported as 0.909 (computer skills subscale), 0.982 (informatics knowledge subscale), and 0.992 (informatics skills subscale), demonstrating acceptable reliability of the instrument (Hill, 2014). According to Tavakol and Dennick, (2011), when items in a test are correlated the value of alpha increases, and the recommended acceptable value of α is 0.70, therefore, at 0.909-0.992 the α exceeds the benchmark for acceptability.

The ANA Nursing Informatics Scope and Standards of Practice (2015) recommended the assessment tool to assist faculty and management for curricula development and continuing education needs for nursing informatics competencies for both students and employees. The NICA L3/L4 tool has been used for job descriptions, evaluations by leadership, by faculty to evaluate students at the doctoral level, used by graduate students conducting research, has been presented at the national informatics organizations, American Nursing Informatics Association (ANIA), ANCC webinars, and educational summits (Sipes et al., 2016). Permission to use the tool was granted to the researcher by Dr. Dee McGonigle (see Appendix I1 & I2).

Procedures

The project was approved by the clinical informatics department as an evidence-based quality improvement project. The author partnered with the organization's clinical informatics leadership for the post-assessment evaluation, intervention and post-test evaluation of the informatics competencies of the informatics team. The Nursing Informatics Competency Assessment (NICA) L3/L4 tool, developed by Hill et al., (2013) was used as the baseline assessment tool to identify potential informatics competency development needs (gaps), and was administered by the investigator following the training sessions for a group level, aggregated comparison.

During the design phase of the project, the author collaborated with the organization's administrators to identify a reliable and valid tool that could serve as a competency development needs assessment, and later be used by the author for post-intervention outcome evaluation. The organization's leaders then administered the tool to their employees for pre-intervention needs assessment and competency gap identification. Following the consultation, the CI leadership provided invaluable qualitative insight to identify the essential informatics competencies for the

CI group, relevant to the current role requirements. The informatics competencies that needed further improvement and training were three subcategories in the computer skills and information knowledge categories. Thus, the project interventions focused on addressing gaps in the competencies of creating of spreadsheets and macros, running reports on statistical data management software (Excel), Cerner role security, and data mining (see Appendix J) . The gaps identified for the information skills category (third category) are currently overseen by the information technology (IT) department; therefore, were not be addressed in this QI project. In addition, the author consulted with an education specialists regarding Excel training as well as an information technology specialists considering Cerner role security tainting to draft lesson plans and formalize staff educational training sessions.

The Institutional Review Board (IRB) approval was obtained from both, the Jacksonville University and the study site's IRB (see Appendix K1 & K2). Upon IRB approval, lesson plans were developed and the investigator co-created the data management software application training, and Cerner role security lesson plans, and exclusively created and presented the data-mining training session. Lesson plans for the three training CE courses addressed the identified IC gaps reflecting the organization's nursing informatics practice needs, and objectives for each lesson plan were aligned with gaps in competencies identified in the baseline-assessment and recommended by the leadership.

Lesson Plan I focused on addressing the gaps in Excel and running reports competency identified in the computer skills category. This formal class training provided hands-on experience in a computer lab to allow demonstrating the skills learned for a period of two hours. The objectives for lesson plan one are aligned were:

1. Understand spreadsheets and use of basic Excel
2. Format data and explore fundamentals of formulas
3. Create and understand pivot tables and charts
4. Explore and demonstrate grouping, sum, macros, consolidating and sorting data
5. Create charts

Lesson Plan two covered identifying and learning the algorithms/matrix for role security and access for positions and disciplines. In this session, issues surrounding computerized information management security and patient privacy following Health Insurance and Accountability Act (HIPAA) standards were discussed. This session was one-hour long and learning objectives for this class included:

1. Describe role security access algorithm
2. Discuss discipline Information System access barriers/privileges
3. Define HIPAA set of standards and regulations
4. Identify Protected Health Information (PHI) and HIPAA identifiers

Lesson plan three addressed the data mining competency gap identified in the informatics knowledge category in the data mining domain. This session was one and half hour and the objectives were:

1. Introduction to basic concepts, and application of data mining
2. Recognize the application of data mining for predictive modeling, and identifying trends
3. Discuss application of data mining and improving healthcare practice

Approximately four weeks after the final educational intervention session, the investigator attended the study site's Informatics department staff meeting and explained the study interventions and the post-test evaluation tool to measure educational interventions. The

post-test survey delivered included a cover page and modified informed consent which explained the participant's rights and purpose of the study, the abbreviated NICA L3/L4 (questions pertained to the selected subcategorized competencies included in the intervention training sessions), and a demographic sheet. The cover letter disclosed the details of the study and the investigator informed the participants that to ensure privacy and confidentiality, no personal information is collected on the study instruments, and to ensure not to include their names on the questionnaire. Further, it was explained that data collected will be codified, data reporting will be at the aggregate and not individual level, and that the participant's identity will remain anonymous. The cover letter included a statement indicating that by completing and returning the survey to the sealed box, the participants consent to participate in the project. Following the explanation of the survey, the investigator left the sealed box in the informatics department for participants to place their completed surveys. The investigator returned within one week and collected the completed surveys from the sealed box (see Appendix L).

Fiscal Consideration

There was minimal financial cost for the development and implementation of the training sessions. The doctoral student absorbed the costs associated with this project (preparing the educational materials and providing snacks during the training sessions). No funding was required for this project.

Ethical Considerations

The only identifier in the study was the participant's nursing license number on the continuing education (CE) sign in sheets. The form cannot be linked to the participant's demographic or NICA L3/L4 instrument forms. The CE sign in sheet forms are not kept by the investigator, but rather submitted with the CE packet to the JU liaison for the Florida Board of

Nursing to process the CEs. Therefore, there should be no identifiable risks to the participants in this project. To provide anonymity and confidentiality of the information collected in the post-test surveys, participants were informed in a cover page that their information will use study codes, and the project cannot link individual responses and the overall group responses are the focus on the project, and their information will remain anonymous (see Appendix M).

Participants were asked to not write their names on the questionnaire; and that by completing and returning the survey, the participants consent to participate in the project. To protect the data analysis datasets, all documents were stored on a secure, password protected Dropbox folder created by the investigator's faculty Chair, Dr. Roberta Christopher. Dr. Ryan Butterfield, statistician, will also have access for data analysis purposes. Only the doctoral student had access to the completed questionnaires stored in a double locked cabinet in the Faculty Chair's office. Questionnaires were scanned and stored password protected Dropbox folder. Paper documents were shredded upon completion of the study by the faculty chair. The electronic documents will be kept for a minimum of three years after the end of the project per federal regulations (U.S. Department of Health and Human Services, 2009) in the secure, password protected Dropbox folder.

Project Outcomes

Data Analysis and Descriptive Data

Descriptive statistical analysis summarized the participant's demographics, competency questions pertained to the three sub-categories assessed: general computer skills (data management), security, and data mining. Each question in the pre-test and post-test assessment was summarized statistically by time period (pre-/post-) and domain (i.e. general computer skills, privacy/security, and data mining subcategories) using traditional descriptive statistics.

Statistical testing between time periods will test the primary objective of improved effect via the education intervention. The test was used to determine if there were any statistically significant changes between the pre-test and post-test results. The Spearman's rho and analysis of variance (ANOVA) were used to explore the relationship between demographic such as age, highest educational preparation, and length of practice with nursing informatics on the informatics competencies measured in the three subcategories. Accuracy of statistical differences were described through the use of 95% confidence intervals. All tests were conducted at an $\alpha=0.05$. This alpha was used due to low response rates in the post session. Statistical analysis was conducted using Minitab version 17 (State College, PA).

Demographic Factors

The demographic section of the survey was completed by 24 participants in both, the pre-test (n=14) and post-test (n=10) surveys. This section consisted of: age, gender, nursing certification (RN), highest education preparation, length of practice in informatics, board certified in nursing informatics, and other certification in informatics. The mean age range of the participants in pre-test (n=14) was 41-45 years and 46-50 years in the post-test survey (n=10). The participants ranged in age was between 26-30 to 61-65 ranking. The majority of the pre-test participants were between the age of 40-55 (60%) and the largest group in the post-test participants was 40-50 years (50%). Table 1 represents the age of the participants in terms of percent and frequency.

Table 1

<i>Descriptive Statistics – Age: Pre-Test and Post-Test Groups</i>				
Age	<u>Pre-Test (n=14)</u>		<u>Post-Test (n=10)</u>	
	Frequency	Percent	Frequency	Percent
26-30	1	6.67%	1	10.00%
31-35	3	20.00%	1	10.00%
36-40	1	6.67%	1	10.00%
41-45	3	20.00%	2	20.00%
56-50	3	20.00%	3	30.00%
51-55	3	20.00%	1	10.00%
56-60	1	6.67%	1	10.00%

The majority of the participants in both, the pre-test (n=*13 *missing one) and post-test (n=10) in this QI project were female; 77% of the participants in the pre-test, and 80% in the post-test group were females, and one participant in the pre-test did not answer the question.

Table 2 represents the gender of the participants.

Table 2

<i>Descriptive Statistics – Gender: Pre-Test and Post-Test Groups</i>					
Gender	<u>Pre-Test (n=13) *Missing 1</u>		Gender	<u>Post-Test (n=10)</u>	
	Frequency	Percent		Frequency	Percent
1	10	76.92%	1	8	80.00%
2	3	21.43%	2	2	20.00%

Participants were asked whether they were board certified in nursing specialty (RN) and 100% of the participants were nationally board certified in nursing specialty. The highest level of education was categorized as follows: (a) diploma, (b) associate degree in nursing, (c) bachelor degree, (d) BSN, (e) master degree in nursing, (f) other master's degree, (g), ND, (h), DNS, (i) DSN, (j) DNSc, (k), DscN, (l) PhD, (m) DNP, (n), and other and doctorate. Table 4 presents the frequencies and percentages. In the pre-test group, 36% (n=5) had a BSN degree,

36% (n= 5) had master's degree in nursing, and 21% (n=3) other master's degree. The post-test group, 40% had a BSN degree, and 60% had either a master's degree in nursing or other master's degree.

Table 3

Descriptive Statistics- Highest Education Preparation: Pre-Test and Post-Test

Pre-Test (n=14)			Post-Test (n=10)		
HEP	Frequency	Percent	HEP	Frequency	Percent
2	1	7.14%	4	4	40.00%
4	5	35.71%	6	3	30.00%
6	5	35.71%	7	3	30.00%
7	3	21.42%			

Length of practice range was categorized from zero to 26-40 years and table 5 presents the length of practice in informatics of the participants in terms of percent and frequency. The mean number of years of informatics nursing experience reported in pre-test was 13-23 months was 61% (n=8), and in post-test group was 2-3 years 50% (n=5). In the pre-test group, 71% (n=10) and in post-test group 60% (n=6) had five years or less of informatics nursing experience, 21% percentage (n=3) had more than 10 years of practice experience, and 20% percentage (n=2) had more than 10 years of practice in the post-test group. One participant in the pre-test group did not answer the question.

Table 4

Descriptive Statistics-Length of Practice: Pre-Test and Post-Test

Pre-Test (n=13) *Missing 1			Post-Test (n=10)		
LOP	Frequency	Percent	LOP	Frequency	Percent
4	8	61.53%	5	5	50.00%
5	1	7.14%	6	1	10.00%
6	1	7.14%	7	2	20.00%
8	1	7.14%	9	1	10.00%
10	2	14.29%	10	1	10.00%

The last two sections asked the participants if they were certified in nursing informatics or other informatics certification. In the pre-test group, 100% percent (n=14) in the pre-test, and 100% percent of the post-test (n=10) participants were not board certified in nursing informatics. Conversely, 13% (n=2) of the post-test indicated that they were certified in other informatics certification, while 10%(n=1) in the post-test group was certified in other informatics certification.

Results

During the design phase, the author used a retrospective pretest method to assess and examine the results in the 15 anonymous NICA L3/L4 surveys provided by the informatics leadership. The focus was not on assessing individual knowledge and skill sets, rather, identifying competency gaps as a group, and reporting was done at the aggregate level. The mean score analysis on responses to each competency item in all three categories (computer skills, informatics knowledge, and informatics skills) was used to identify gaps in informatics knowledge and skills of the group. From the overall mean analysis report, responses revealing a mean score lower than 2 were selected and grouped for each subcategory, to identify gaps for the competency assessed (see Appendix J).

The NICA L3/L4 computer-skills category includes 3 subcategories (general computer

skills, systems, and quality improvement) and 13 items results, revealed that the quality improvement, data, and education subcategories under “general computer skills” category had the highest mean score. Participants in these categories classified themselves as comfortable (mean=2.5), while general computer skills and systems subcategories showed eight out of 10 items with a score mean lower than 2. Participants did not classify themselves as beginner (mean =1.6). See Table 5 for range of score interpretation.

The information-knowledge category includes 56 items in eighth subcategories measuring, data, education, impact, privacy/security, regulations, systems, usability, and data mining. The two subcategories where majority of respondents revealed lowest mean score identified were privacy/security (mean=1.87) and data mining (mean=1.6). The information skills category which covers 109 items under 13 subcategories: analysis, data/data structure, design/development, fiscal management, implementation, management, programming, requirements, and role. The majority of participants classified themselves as beginner/NA. The results revealed lower mean score (mean score ≤ 2) for the following subcategories and majority of respondents were not classified as comfortable: analysis, data/data structure, management, programing, requirements, system maintenance, and system selection (see Appendix L).

Following the identification of the competency needs, the mean score analysis results were reviewed with the organizations clinical informatics leadership. The author consulted with the leadership to select relevant informatics competencies meeting the organization’s needs. The competency gaps identified in the mean score analysis did not match the current informaticists role requirements and specific competency needs based on the organization’s priorities and informatics competency needs. After the consultation, the CI leadership provided invaluable insight to identify the informatics competencies essential for the CI group relevant to the current

role requirements. The informatics competencies agreed by the group entailing further improvement and training were identified as the subcategories in the general computer skills and informatics knowledge categories, and training focused on addressing gaps in competencies to creation of spreadsheets, macros, running reports on statistic can data management software (Excel), Cerner role security, and data mining (see Appendix L).

The gaps identified for the information skills category (third category) are currently overseen by the information technology (IT) department, therefore, will not be addressed in this QI project. Future, the author consulted with an education specialists regarding Excel training as well as an information technology specialists considering Cerner role security tainting and lesson plans were formalized for the staff professional development program. Following both the study site and Jacksonville University IRB approval, lesson plans were developed and the author co-created the data management software application training, Cerner role security lesson plans, and exclusively created and presented the data-mining training session.

The level of proficiency assigned on the NICA L3/L4 questionnaire is a four-item Likert scales of: expert, proficient, comfortable, and beginner/N/A. The Benner's theory of novice to expert level of competencies was applied to the measurement tool to measure the level of informatics competency. The "novice" and "advanced beginner" were considered equivalent to "beginner/NA" in the NICA L3/L4. Table 5 represents of score and interpretations.

The interval scale used to interpret mean scores based on the degree of competencies indicated in the NICA L3/L4 instrument were calculated using the following formula (Chonsilapawit & Rungpragaphyn, 2016):

Table 5

Range of Score Interpretation

Benner's Theory	NICA L3/L4	Level of Competency /Score	
Novice	Beginner/NA	Beginner (1)	1-1.75
Advanced Beginner	Beginner/NA		
Competent	Comfortable	Comfortable (2)	1.76-2.51
Proficient	Proficient	Proficient (3)	2.52-3.27
Expert	Expert	Expert (4)	3.28-4

* Range of Score = (Maximum Score-Minimum Score)/4= (4-1)/4= 0.75

The Kruskal Wallis test was implemented to compare the pre-test and post-test responses on the selected three subcategories to determine if there were any statistically significant changes between the pre-test and post-test results and competencies. Results indicating a p value greater than 0.05 were not significantly different. Table 6 presents the descriptive statistics for post-test survey questions.

Table 6

Descriptive Statistics-Pre-test and Post-test Questions

Variable	Pre-Post	N*(Missing)	Mean	SD	Minimum	Median	Maximum
General Computer Skills							
GCS1	Pre-test	1.000	2.214	0.893	1.000	2.500	3.000
	Post-Test	0.000	2.800	0.422	2.000	3.000	3.000
GCS2	Pre-test	1.000	1.286	0.611	1.000	1.000	3.000
	Post-Test	0.000	2.200	0.422	2.000	2.000	3.000
GCS3	Pre-test	1.000	1.500	0.760	1.000	1.000	3.000
	Post-Test	0.000	1.800	0.632	1.000	2.000	3.000
GCS4	Pre-test	1.000	1.929	0.829	1.000	2.000	3.000
	Post-Test	0.000	2.200	0.632	1.000	2.000	3.000
GCS5	Pre-test	1.000	2.000	0.961	1.000	2.000	4.000
	Post-Test	0.000	2.200	0.632	1.000	2.000	3.000
Privacy/Security							
PS1	Pre-test	1.000	2.000	1.109	1.000	2.000	4.000
	Post-Test	0.000	2.400	0.843	1.000	3.000	3.000
PS2	Pre-test	1.000	1.714	0.994	1.000	1.000	4.000
	Post-Test	0.000	2.100	0.994	1.000	2.000	3.000
PS3	Pre-test	1.000	1.929	0.997	1.000	2.000	4.000
	Post-Test	0.000	2.500	0.707	1.000	3.000	3.000
PS4	Pre-test	1.000	1.571	0.938	1.000	1.000	4.000
	Post-Test	0.000	2.100	0.876	1.000	2.000	3.000
Data Mining							
DM1	Pre-test	1.000	1.786	0.893	1.000	1.500	5.000
	Post-Test	0.000	2.700	0.823	1.000	3.000	4.000
DM2	Pre-test	1.000	1.500	0.760	1.000	1.000	3.000
	Post-Test	0.000	2.100	0.738	1.000	2.000	3.000
DM3	Pre-test	1.000	1.571	0.852	1.000	1.000	3.000
	Post-Test	0.000	2.400	0.699	1.000	2.000	3.000
DM4	Pre-test	1.000	1.500	0.760	1.000	1.000	3.000
	Post-Test	0.000	2.300	0.675	1.000	2.000	3.000
DM5	Pre-test	1.000	1.571	0.852	1.000	1.000	3.000
	Post-Test	0.000	2.400	0.699	1.000	2.500	3.000
DM6	Pre-test	2.000	1.615	0.870	1.000	1.000	3.000
	Post-Test	0.000	2.400	0.699	1.000	2.000	3.000

* Indicate the number of participants who did not answer the question.

The test results on the general computer skills subcategory (computer skills category) indicated a statistical significant between the pre-test and post-test results pertained to one of the five questions (mean=2.20, SD=0.422, P=0.001): “*write macros or shortcuts for spreadsheets*”; meanwhile, mean scores for pre-test and post-test responses were analyzed and the mean score for all questions in the same subcategory revealed an overall improvement and an increase in the mean scores in the post-test survey. Data is categorized in Figure 1. The NICA L3/L4 post-test assessment survey results revealed an increase in the participant’s self-assessment in the general computer skills competency by 25.41% (mean=11.2, SD=1.98, P=0.045). Table 7 presents the descriptive static for the general computer skills subcategory descriptive statistics.

Table 7

Descriptive Statistics: Kruskal Wallis Test-General Computer Skills

Variable	Pre-Post	N	Median
General Computer Skills			
GCS1	Pre-Test	14	2.50
	Post-Test	10	3.00
	Total	24	
	P-value	0.143	
	Adjusted for ties	0.090	
GCS2	Pre-Test	14	1.00
	Post-Test	10	2.00
	Total	24	
	P-value	0.002	
	Adjusted for ties	0.001	
GCS3	Pre-Test	14	1.00
	Post-Test	10	2.00
	Total	24	
	P-value	0.254	
	Adjusted for ties	0.208	
GCS4	Pre-Test	14	2.00
	Post-Test	10	2.00
	Total	24	
	P-value	0.429	
	Adjusted for ties	0.395	
GCS5	Pre-Test	14	2.00
	Post-Test	10	2.00
	Total	24	
	P-value	0.482	
	Adjusted for ties	0.452	

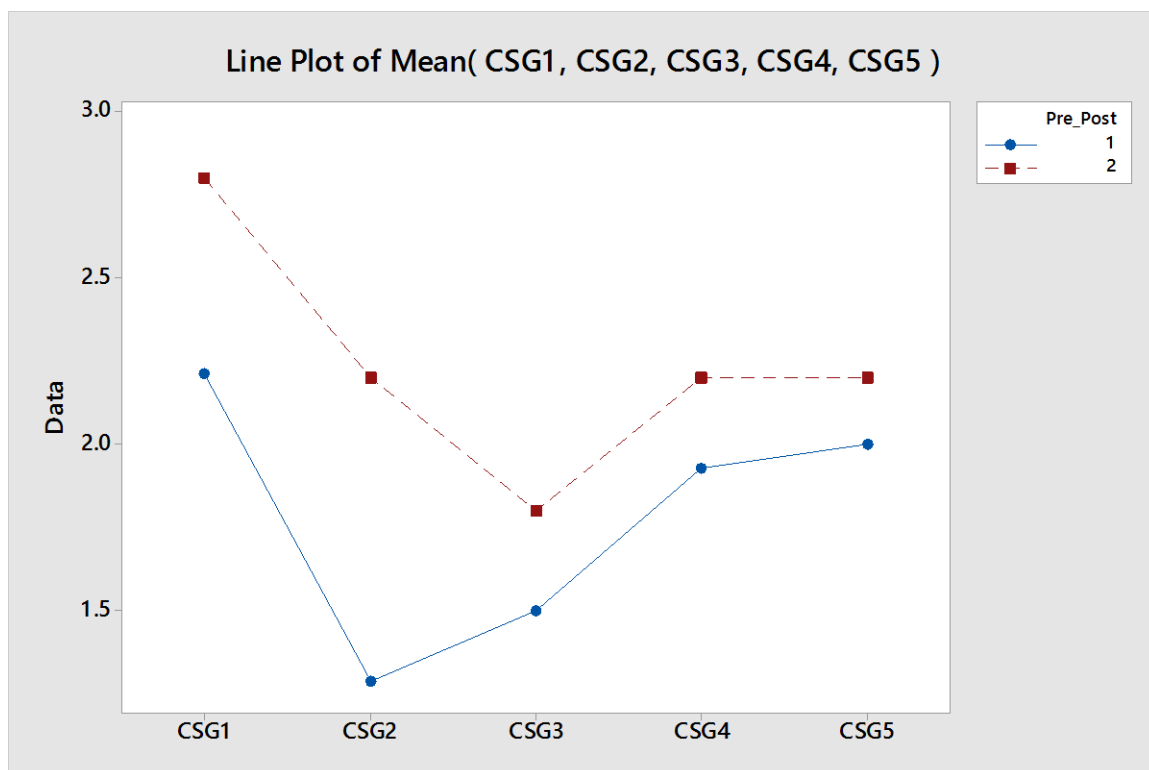


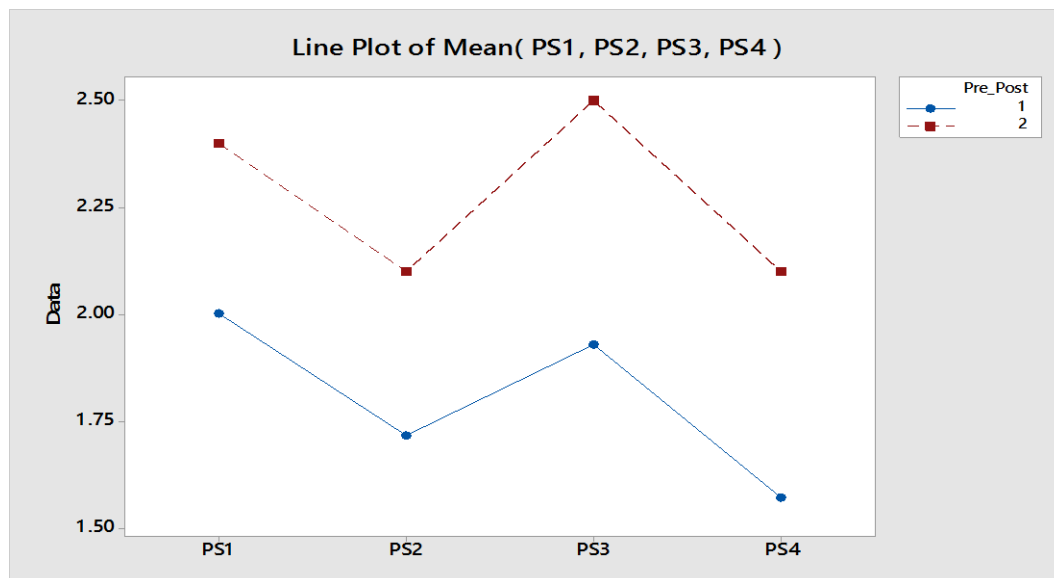
Figure 1. Change in General Computer Skills- Pre-test and Post-test Results

The second subcategory measuring the privacy/security competencies (Information Knowledge) revealed an increased score by 26.21% (Mean=9.10, SD=3.10, $P=0.155$, but Kruskal Wallis test did not reveal a statistically significant change in results, and the overall increase in post-test mean scores indicated an improvement in competencies tested and participants rated themselves as comfortable (mean=2.27) in four measured competencies. Table 5 presents the range interpretation. Table 8 presents the descriptive statistics for the privacy/security subcategory.

Table 8

Descriptive Statistics: Kruskal Wallis Test-Privacy/Security Subcategory

Variable	Pre-Post	N	Median
Privacy/Security			
PS1	Pre-Test	14	2.000
	Post-Test	10	3.000
	Total	24	
	P	0.292	
	Adjusted P	0.270	
PS2	Pre-Test	14	1.000
	Post-Test	10	2.500
	Total	24	
	P	0.364	
	Adjusted P	0.324	
PS3	Pre-Test	14	2.000
	Post-Test	10	3.000
	Total	24	
	P	0.128	
	Adjusted P	0.108	
PS4	Pre-Test	14	1.000
	Post-Test	10	2.000
	Total	24	
	P	0.143	
	Adjusted P	0.113	

*Figure 2. Change in Privacy/Security- Pre-test and Post-test Results*

Lastly, the project results indicated a statistically significant improvement in the data mining subcategory (Informatics knowledge category). The post-test scores (mean=14.30, SD=3.62, P=0.003) increased by 51.64 % compared to the pre-test scores and participants identified themselves as comfortable on items measuring data mining competencies. P values on four out of five survey questions indicated a statistically significant difference and improvement in the post-test scores. Although no study was found on assessing the informatics competency gaps among nurse informaticists in the U.S., but interpretation of findings was consistent with previous studies on informatics competency assessments and gaps in general computer skills, informatics knowledge, and informatics skills (Chonsilapawit & Rungpragayphan, 2016; Choi & Zucker, 2013; Hill, et al., 2014; Hunter, et al., 2014; Sun & Falan, 2013). Peltonen et al., (2016) report on international survey exploring future nursing informatics research indicated data mining as one of the top nursing informatics trends in future. Table 9 presents the descriptive statistics for the data mining subcategory.

Table 9

Descriptive Statistics: Kruskal Wallis Test-Data Mining Subcategory

Variable	Pre-Post	N	Median
DM1	Pre-Test	14	1.500
	Post-Test	10	3.000
	Total	24	
	P	0.033	
	Adjusted P	0.023	
DM2	Pre-Test	14	1.000
	Post-Test	10	2.000
	Total	24.00	
	P	0.074	
	Adjusted P	0.054	
DM3	Pre-Test	14	1.000
	Post-Test	10	2.500
	Total	24	
	P	0.030	
	Adjusted P	0.021	
DM4	Pre-Test	14	1.000
	Post-Test	10	2.000
	Total	24	
	P	0.022	
	Adjusted P	0.015	
DM5	Pre-Test	14	1.000
	Post-Test	10	2.500
	Total	24	
	P	0.030	
	Adjusted P	0.021	
DM6	Pre-Test	13	1.000
	Post-Test	10	2.500
	Total	23	
	P	0.04	
	Adjusted P	0.03	

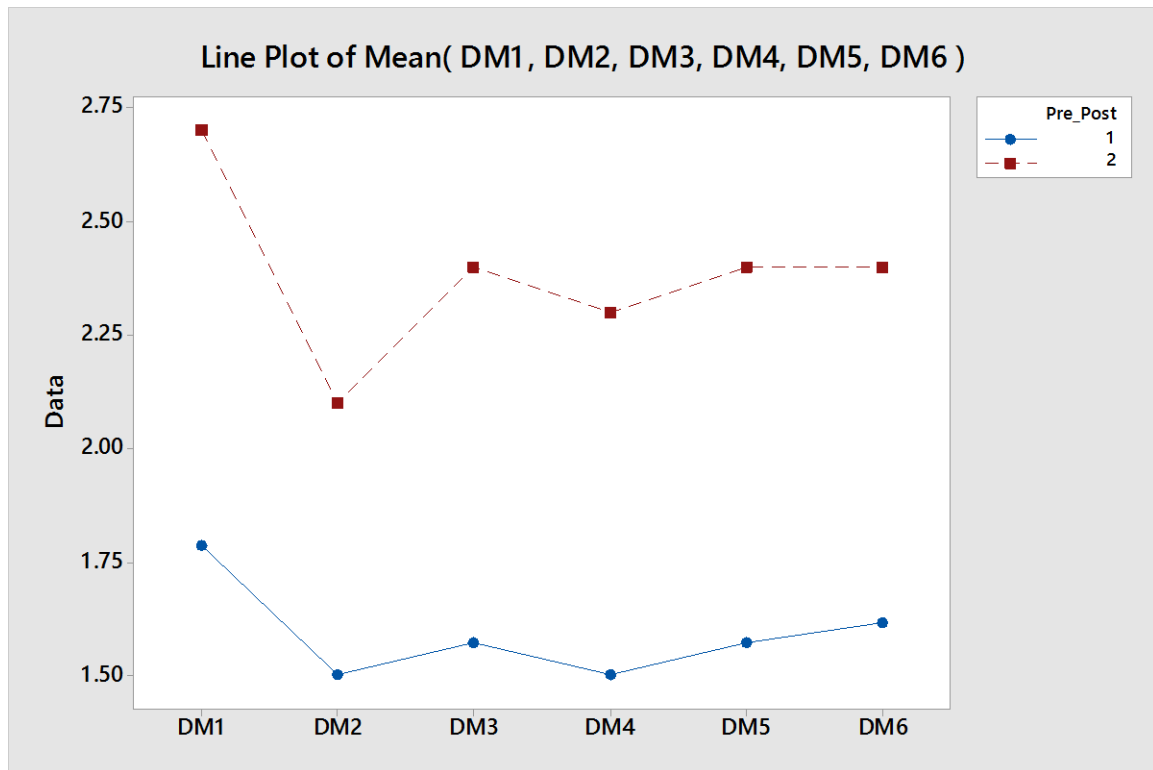


Figure 3. Change in Data Mining- Pre-test and Post-test Results

Overall, the project results indicated a positive outcome and improvement in competencies gaps intervened following the implementation and evaluation of an evidence-based professional development programs and the results support the main objective of the quality improvement project. Table 10 presents the pre-test and post-test percentage change in responds per competency measured. The design for the interpretation and comparison of the results table was adopted from a study done by Chonsilapawit & Rungpragayphan (2016).

Table 10

Descriptive Statistics: Kruskal Wallis Test-Data Mining Subcategory

Variable	Pre-Post	N*(Missing)	Mean	SD	1	2	3	4	Interpretation
General Computer Skills									
GCS1	Pre-test	1.000	2.214	0.893	4(28.57%)	3(21.43%)	7(50%)	-	Comfortable
	Post-Test	0.000	2.800	0.422	-	2(20%)	8(80%)	-	Proficient
GCS2	Pre-test	1.000	1.286	0.611	11(78.57%)	2(14.29%)	1(7.14%)	-	Beginner
	Post-Test	0.000	2.200	0.422	-	8(80%)	2(20%)	-	Comfortable
GCS3	Pre-test	1.000	1.500	0.760	9(64.29%)	3(21.43%)	2(14.29%)	-	Beginner
	Post-Test	0.000	1.800	0.632	3(30%)	6(60%)	1(10%)	-	Comfortable
GCS4	Pre-test	1.000	1.929	0.829	5(35.71%)	5(35.71%)	4(28.57%)	-	Comfortable
	Post-Test	0.000	2.200	0.632	1(10%)	6(60%)	3(30%)	-	Comfortable
GCS5	Pre-test	1.000	2.000	0.961	5(35.71%)	5(35.71%)	3(21.43)	1(7.14)	Comfortable
	Post-Test	0.000	2.200	0.632	1(10%)	6(60%)	3(30%)	-	Comfortable
Privacy/Security									
PS1	Pre-test	1.000	2.000	1.109	6(42.86%)	4(28.57%)	2(14.29%)	2(14.29%)	Comfortable
	Post-Test	0.000	2.400	0.843	2(20%)	2(20%)	6(60%)	-	Comfortable
PS2	Pre-test	1.000	1.714	0.994	8(57.14%)	3(21.43%)	2(14.29%)	1(7.14)	Beginner
	Post-Test	0.000	2.100	0.994	1(40%)	1(10%)	5(50%)	-	Comfortable
PS3	Pre-test	1.000	1.929	0.997	6(42.86%)	4(28.57%)	3(21.43)	1(7.14)	Comfortable
	Post-Test	0.000	2.500	0.707	1(10%)	3(30%)	6(60%)	-	Comfortable
PS4	Pre-test	1.000	1.571	0.938	9(64.29%)	3(21.43%)	1(10%)	1(10%)	Comfortable
	Post-Test	0.000	2.100	0.876	3(30%)	3(30%)	4(40%)	-	
Data Mining									
DM1	Pre-test	1.000	1.786	0.893	7(50%)	3(21.43%)	4(28.57%)	-	Comfortable
	Post-Test	0.000	2.700	0.823	1(10%)	2(20%)	6(60%)	1(10%)	Proficient
DM2	Pre-test	1.000	1.500	0.760	9(64.29%)	3(21.43%)	2(14.29%)	-	Beginner
	Post-Test	0.000	2.100	0.738	2(20%)	5(50%)	3(30%)	-	Comfortable
DM3	Pre-test	1.000	1.571	0.852	9(64.29%)	2(14.29%)	3(21.43)	-	Beginner
	Post-Test	0.000	2.400	0.699	1(10%)	4(40%)	5(50%)	-	Comfortable
DM4	Pre-test	1.000	1.500	0.760	9(64.29%)	3(21.43%)	2(14.29%)	-	Beginner
	Post-Test	0.000	2.300	0.675	1(10%)	5(50%)	4(40%)	-	Comfortable
DM5	Pre-test	1.000	1.571	0.852	9(64.29%)	2(14.29%)	3(21.43)	-	Beginner
	Post-Test	0.000	2.400	0.699	1(10%)	4(40%)	5(50%)	-	Comfortable
DM6	Pre-test	2.000	1.615	0.870	8(61.54%)	2(15.38%)	3(23.08%)	-	Comfortable
	Post-Test	0.000	2.400	0.699	1(10%)	4(40%)	5(50%)	-	Comfortable

The secondary objective of the project was to explore the relationship between demographic such as age, highest educational preparation, and length of practice with nursing informatics on the informatics competencies measured in the three subcategories. The spearman's rank order correlation, a test to find the correlation between two ranked non-normally distributed variables, was used to test if age was correlated to the composite score representing the subcategories and competencies measured. Results in both, the pre-test and post-test groups indicated that there was not a statistically significant correlation found between age and the general computer skills (pre-test $\rho = -0.093$, $P\text{-value} = 0.753$; post-test $\rho = -0.263$, $P\text{-value} = 0.463$) privacy/security (pre-test $\rho = 0.328$, $P\text{-value} = 0.253$; post-test $\rho = -0.336$, $P\text{-value} = 0.343$) and data mining competencies (pre-test $\rho = 0.432$, $P\text{-value} = 0.123$; post-test $\rho = -0.134$, $P\text{-value} = 0.713$).

To look at the relationship between higher education preparation and length of practice in nursing informatics on the three measured subcategories, an analysis of variance (ANOVA) model was used to analyze differences between the subcategories. The length of practice mean differences in both pre-test and post-test groups showed no relationship between the length of practice and the three subcategories evaluated. The general computer skills (pre-test $P\text{-value} = 0.305$; post-test $P\text{-value} = 0.815$) privacy/security (pre-test $P\text{-value} = 0.316$; post-test $P\text{-value} = 0.712$) and data mining competencies (pre-test $P\text{-value} = 0.620$; post-test $P\text{-value} = 0.666$). Lastly, the higher education preparation mean differences in both pre-test and post-test groups also showed no relationship between the level of education preparation and the three subcategories evaluated. The general computer skills (pre-test $P\text{-value} = 0.563$; post-test $P\text{-value} = 0.337$) privacy/security (pre-test $P\text{-value} = 0.412$; post-test $P\text{-value} = 0.128$) and data mining competencies (pre-test $P\text{-value} = 0.916$; post-test $P\text{-value} = 0.208$).

Project Outcomes

The anticipated outcome of the quality improvement project was to reveal an improvement in participant's post-test NICA L3/L4 assessment following the implementation and evaluation of an evidence-based professional development program. The post-test modified NICA L3/L4 survey focused on three sessions offered addressing the competency gaps determined in the pre-assessment surveys. The evaluation of the participants learning followed the intervention was assessed by comparing the mean score of the pre-test and post-test scores.

Initially, 21 surveys were distributed among the informaticists and 15 had completed the pre-test survey but 14 were used for analysis due to late submission and ten participants completed the post-test surveys. There were few questions with missing responses. Participants ranked themselves as comfortable (Mean of the sums=8.92 SD=2.89) with general computer skills subcategory, comfortable (Mean of the sums=7.21, SD=3.28) in the privacy/security, and comfortable (Mean of sums=9.43, SD=4.82) in the data mining subcategories. Table 5 presents the interpretation and ranking information.

The participants in the post-test survey response to the selected three subcategories scores increased by 27.44% in the general computer skills, 26.21 % in the security, and 51.64% in the data mining subcategory. Figure 4 presents the overall change in the three subcategories. Participants rated themselves as proficient (Mean of the sums=11.2, SD=1.98) with general computer skills, comfortable (Mean on the sums=9.1, SD=3.10 ,) in the privacy/security, and expert (Mean of the sums=14.30, SD=3.62, percent increase) in the data mining subcategory. Table 11 illustrates the pre-test and post-test overall score results comparison. Table 5 presents the interpretation and ranking information.

Table 11

Descriptive Statistics-NICA L3/L4 Pre-Test and Post-test Results Per Subcategory

Variable	Pre-Post	N	Median	Mean	SD	Mean Percent Change
General Computer Skills	Pre-Test	14	9	8.93	2.9	27.44%
	Post-Test	10	11	11.2	1.99	
	Total	24				
	P	0.046				
	*Adjusted P	0.045				
Privacy/Security	Pre-Test	14	6	7.21	3.29	26.21%
	Post-Test	10	10	9.1	3.1	
	Total	24				
	P	0.16				
	*Adjusted P	0.155		-	-	-
Data Mining	Pre-Test	14	6.5	9.43	4.82	51.64%
	Post-Test	10	15	14.3	3.62	
	Total	24				
	P	0.033				
	*Adjusted P	0.03				

*P-value from non-parametric Kruskal-Wallis. adjusted for ties

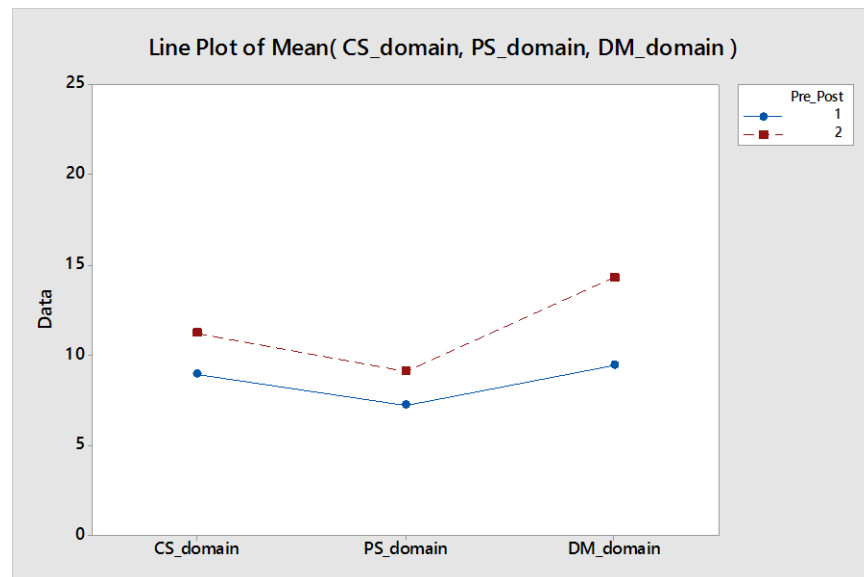


Figure 4- Change in Three Subcategories-Pre-Test and Post-Test Results

In addition to the NICA L3/L4 surveys, project participants completed the Jacksonville University Nursing Continuing Education evaluation to evaluate each training session (see Appendix C). The evaluation Rating Scale is as follows: 5 = Outstanding, 4 = Above average, 3 = Average, 2 = Below average, 1 = Unsatisfactory, and NA = Not Applicable. The mean score on the evaluation surveys was 4.9 revealing an above average rating. Participants' satisfaction for the professional training program offered and their positive comments on three training sessions on informatics competencies demonstrated an effective process concerning competency improvements. Data was analyzed based on the quantitative content and responses to the survey questions (mean=4.9) and open-ended questions revealed that participants highly valued the learning experience and reported an overall satisfaction with the professional development program. They valued the interactions and discussions, in each training session. One described that data management course has been very helpful and said: *Offering it yearly to clinical informatics would be helpful to keep it fresh in our minds. Also, additional excel hands on class with assessment was recommended.* Regarding Cerner security additional comments included: *this information was long-over-done. Very informative and wish we had done this sooner!* Comments and recommendations for the data mining session was also very positive and one said: *learning more about data mining was both enjoyable and interesting; great discussion with the group and excellent information. Great presentation that generated great discussion.*

Project Objectives

The primary objective of this quality improvement project was to integrate an evidence-based informatics competency professional development program tailored to meet the organization's informatics competency needs, and develop a competency skills checklist to identify evidence-based competency needs for future new nurse informatics specialists joining

the group. Post-test survey results showed a statistically significant improvement of 51.64% increase in the data mining subcategory. A 27.44% increase in self-assessment scores in the general computer skills and 26.21% privacy and security subcategories. Self-assessment scores for the three subcategories between the pre-test and post-test assessment showed an overall improvement in competencies measured. These results revealed the fact that the professional development program and training sessions did in fact increase the NI competencies measured.

The secondary objective was to explore the relationship between demographic such as age, highest educational preparation, and length of practice in nursing informatics on the informatics competencies. The spearman's rank order correlation was used to test if age correlated to the subcategories and competencies measured and the results showed no significant correlation between age and the three subcategories. Also, ANOVA was used on the length of practice and higher education preparations demographics and results indicated that there was no relationship between the two variables and competencies measured in the three subcategories.

Discussion

The qualitative methodology examined the informatics competency gaps and described the positive impact of professional development programs on competency based on the self-assessment post-test results. Despite the fact that the sample size in both the pre-test and post-test was small, results were evident that gaps existed in informatics competencies. Furthermore, positive outcome and competency improvement was successfully measures following intervention and staff training sessions. Few factors may have contributed to the fact that the post-test results did not reveal a statistically significant improvement on all competencies measured; first, survey questions might have been more general compared to the content covered in the training sessions. Also, the time gap between taking the pre-test and post-test assessment

may have influenced the answers associated with the competencies measured, and a shorter interval between the pre-test, intervention and post-test survey could be considered. One other factor could have influenced the lower mean score on survey questions maybe the fact that the range of 1 was used for ranking competencies both as beginner and not applicable “beginner/NA”.

Following this project opportunities for future improvement in competencies was evaluated and discussed with the informatics leadership. An ongoing routinely evaluation process will enable the leadership to provide evidence based training to reduce gaps in informatics competencies. In six month, a refresher training session on topics discussed data will help refresh the skills acquired in the professional development program. Overall, this project was overwhelmingly favorable by the leadership and the staff. Moving forward, the competency of information intervened in this project will be assessed annually through self-learning review. These competencies will become incorporated into the new hire orientation and must be achieved through online self-learning trainings, preceptor assistance, and classes offered through educational trainings.

Identification of Limitation

Although this project provided valuable information on NI competency assessment and intervention, there were barriers influencing the project. One limitation was the conveniently selected small sample size which may have impacts the results of the study. The NICA L3/L4 instrument includes 178 questions and some domains did not apply to the participants’ role and may have impacted the study results. Other limitation was the fact that limited research studies were available on informaticists informatics competency assessment and intervention. This

project was tailored to address specific informatics competency needs of the informaticists at the study site, therefore, results cannot be generalized.

Recommendations

Informatics competencies are integral component of today's clinical practice and as health information technology continues to change and grow the need for continually evaluating and refining informatics competencies is necessary and must be an ongoing requirement (Schleyer, Burch, & Schoessler, 2011). It is evident that nursing informatics competencies, skill sets, and the application of the informatics in practice is still not clearly understood in our industry (McGonigle, Hunter, Spies, & Hebda, 2014). In order to plan for an informatics curriculum, both at the clinical settings and academic institutions, a baseline assessment should be established in order to determine competency gaps and training considerations (Choi & Zucker, 2012; Sipes, 2016; Liu, Lee, & Mills, 2015). Utilizing the NI competency self-assessment tools (NICA L3/L4 or TANIC) will enable healthcare organizations to identify gaps in competencies and better understand required skill sets for both, bedside nurses and informatics nurses (Sipes, 2016).

Lack of procedures and assessments for determining nurses' informatics competencies in organizations has been a concern. Although, the NICA L3/L4 instrument is detailed and includes ANA and TIGER suggested informatics competencies, but competencies measured may not be unit specific and due to the length of the instrument it may decrease the accuracy of the measurement. One recommendation is to assess role specific competencies that are listed in selected categories/subcategories on the tool instead of the entire 178 questions. This may increase the accuracy of the measurement and the development of professional development programs specific to the unit informatics competency needs.

According to Sipes (2016): “we must assess and understand current competencies/skills, then address gaps in education by developing more relevant curricula that will meet needs of the workforce for 2020 (p 255)”. The outcomes of this QI project validate that utilizing NICA L3/L4 instrument as an effective method to assess competency levels, design professional development programs and educational trainings to address those gaps. Results could be valuable to healthcare organizations for developing informatics professional development programs. Additionally, findings could be beneficial to academic institutions and nursing curricula development to ensure graduate nurses entering the workforce are prepared and have accomplished informatics competency needs.

Very limited research is available on informaticists competency assessment and future qualitative and quantitative research is needed to expand the knowledge on the assessment and implementation of informatics competency trainings applicable to NI profession in practice. One recommendation for future research could replicate this QI project to assess informatics competencies at multiple institutions and include a broader number of informaticists to generalize the possible competencies gaps identified. Further examination of NICA L3/L4 tool in practice will provide insight on the potential need to revise and shorten the length of the assessment tool to enhance competency gap assessments. Furthermore, research is needed to raise awareness on the importance of informatics competencies and guide the development of training needs required for an ongoing proficiency in informatics competencies in practice.

Implications for Practice

Findings from this QI project have multiple implications for practice and adds to the body of knowledge for informatics competency assessment among practicing informatics specialist. Findings suggest an effective process for conducting an informatics competency, baseline

assessment and for the development of professional training programs needed for knowledge and skills enhancement, since informatics competencies are critical to an effective and safe clinical practice (Sipes et al., 2016). Interpretation of the project results are consistent with previous studies in identifying informatics competency gaps in practice (Choi & Zucker, 2012; Choi & DeMartinis, 2013; Hwang & Parker, 2011; Hunter, McGonigle, & Hebda, 2013). This project demonstrates the effectiveness of utilizing a self-assessment instrument to identify informatics competency gaps which can guide the design of a professional development program to address the identified gaps in unit-specific competency needs (Hill, et al., 2014; Hunter, McGonigle, & Hebda, 2013; Kleib, Simpson, & Rhodes, 2016; Sipes, et al, 2016; Schleyer, Bruch, & Schoessler, 2011).

In order to improve and advance informatics competencies, training on informatics knowledge is needed regularly for both the bedside and informatics nurses. Subsequently, as healthcare information technology continues to grow, competencies and trainings must be revisited, revised, and updated routinely to adapt to the fast-changing technological advances and innovative developments (Sipes, et al., 2016, Schleyer, Bruch, & Schoessler, 2011). Nurse leaders should support, promote and provide informatics continuing education, and the development of informatics competencies to increase nurse participation in healthcare information technology decisions.

The methodology of this quality improvement project is promising and can pave the way as a method to evaluate and intervene informatics competency gaps in practice. This project was tailored to address specific informatics competency needs of the informaticists at the study site, therefore, results cannot be generalized. The NICA L3/L4 can be used for both baseline assessment to identify competency gaps in practice, as well as a tool to describe job descriptions,

informatics skills and knowledge required (Hunter, et al., 2014). Although the results of this study may not be generalizable, the results reported provide guidance for future research in nursing informatics competency assessment. This evidence-based project provides evidence that the use of an informatics competency, self-assessment instrument is an effective method for identifying competency gaps and developing professional development programs to address the gaps as an effective method to enhance informatics competency and knowledge. As health information technology changes, in order to ensure high quality and an efficient care, healthcare organizations should focus on strategies to develop and improve staff informatics knowledge and competencies skills. This requires establishing a baseline assessment of the informatics competencies to guide curricula developments addressing competency needs (Choi & Zucker, 2012; Sipes, 2016; Liu, Lee, & Mills, 2015).

Dissemination of Results

Dissemination of research finding is extremely important for the adoption and implementation of evidence-based practice (EBP) and translation evidence into practice. The project result is available on the Henderson Repository, a global e-repository resource of the Honor Society of Nursing, Sigma Theta Tau. In addition, the author will disseminate study results by presenting poster and oral presentation at local or national professional conferences, and will seek publication of findings in scholarly journal.

References

- American Association of College of Nursing (2006). *The essentials of doctoral education for advanced nursing practice*. Retrieved from <http://www.aacn.nche.edu/dnp/Essentials.pdf>
- American Association of Colleges of Nursing (2008). *The essentials of baccalaureate education for professional nursing practice*. Retrieved from <http://www.aacn.nche.edu/Education/pdf/BEdraft.pdf>
- American Association of College of Nursing (2011). *The essentials of master's education in nursing practice*. Retrieved from <http://www.aacn.nche.edu/education-resources/MastersEssentials11.pdf>
- American Health Information Management Association Work Group (2014). Defining the Basics of Health Informatics for HIM Professionals. *Journal of AHIMA*, 85(9).
- American Nurses Association (2008). *Nursing informatics: Scope and standards of practice*. Silver Spring, MD: Nursesbooks.org
- American Nurses Association (2001). *Nursing informatics: Scope and standards of practice*. Washington, Dc. American Nurses Association Publishing.
- American Nurses Association (2015). *Nursing informatics: Scope and standards of practice* (2nd ed.). Silver Spring, Maryland: American Nurses Association.
- American Nursing Credentialing Center (2016). *Informatics nursing certification eligibility criteria*. Retrieved from <http://www.nursecredentialing.org/informatics-eligibility.aspx>
- Benner, P. A. (1984). *From novice to expert: Excellence and power in clinical nursing practice*. Menlo Park, CA: Addison-Wesley

- Bickford, C. (2015). *The specialty of nursing informatics: New scope and standards guide practice*. CIN: Computers, Informatics, Nursing, 33(4), 129-131
- Butts, J. B., & Rich, K. (2015). *Philosophies and theories for advanced practice nursing*. Sudbury, Mass: Jones and Bartlett Publishers.
- Center for Evidence-Based Medicine (n.d.). *Study design*. Retrieved from <http://www.cebm.net/study-designs/>
- Cheeseman, S. E. (2013). Information literacy: Foundation for evidence-based practice. Neonatal Network 32 (2), 127-130, doi.org/10.1891/0730-0832.32.2.127
- Chung, S.Y., & Staggars, N. (2014). Measuring nursing Informatics competencies of practicing nurses in Korea. Nursing informatics competencies questionnaire. CIN: *Computer, Informatics, Nursing*.
- Choi, J. & Zucker, D. M. (2012). Self-assessment of nursing informatics competencies for doctoral of nursing practice students. *Journal of Professional Nursing*, 29(6), 381-387.
- Choi, J. & De Martinis, J. E. (2013). Nursing informatics competencies: assessment of undergraduate and graduate nursing students. *Journal of Clinical Nursing*. 22, 1970-1976. Doi: 10.1111/jocn.12188
- Chonsilapawit, T. & Rungpragayphan, S. (2016). Skills and knowledge of informatics, and training needs of hospital pharmacists in Thailand: A self-assessment survey. *International Journal of Medical Informatics*, 94, 255-262
- De Ganged, J. C., Bisanar, W. A., Makowski, J. T., & Neuman, J. L. (2012). Integrating informatics into BSN curriculum: A review of the literature. *Nurse Education Today*, 32. 675-681. Doi: 10.1016/j.nedt.2011.09.003

- Found, J. (2012). Developing competency in baccalaureate nursing education: Preparing Canadian nurses to enter today's practice environment. *Canadian Journal of Nursing Informatics*, 7(2).
- Gonen, A., Sharon, D., & Lev-Ail, L. (2016). Integration information technology's competencies into academic nursing education-An action study. *Cogent Education*, 3. doi:10.1080/2331186X.1193109
- Grebe, S.J. (1988). Nursing informatics competencies for nurse educators and researchers. *National League of Nursing Publication*, 25-40.
- 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. <http://aisel.aisnet.org/con rm2015/12>
- Grover, K.S., Burns, & Gray, J.R. (2013). *The practice of nursing Research: Appraisal, synthesis, and generation of evidence* (7th ed.) St. Luis: Saunders/Elsevier.
- Gugerty, B. (2009). *Technology Informatics Guiding Educational Reform (TIGER). TIGER informatics competencies collaborative (TICC) final report*. Retrieved from http://tigercompetencies.pbworks.com/f/TICC_Final.pdf
- Hart, M. D. (2008). Informatics competency and development within the US nursing population workforce. A systematic literature review. *CIN: Computers, Informatics, Nursing* 26 (6), 320-329.
- Health Information Management Systems Society (2014). *2014 nursing informatics workforce survey*. Retrieved from <http://www.himss.org/ni-workforce-survey>
- Healthcare Information and Management Systems Society (2017). *Professional development*. Retrieved from <https://www.himss.org/ProfessionalDevelopment>

- Hebda, T.; & Calderone, T. L. (2010). What nurse educators need to know about the TIGER Initiative. *Nurse Educator*, 35(2), 56-60. doi: 10.1097/NNE.0b013e3181ced83d
- Henry J. Kaiser Family Foundation (2016). Total number of professionally active nurses. Retrieved from <http://kff.org/other/state-indicator/total-registered-nurses/?currentTimeframe=0>
- Hill, T., McGonigle, D., Hunter, K.M., Sipes, C., & Hebda, T. T.L. (2014). An instrument for assessing advanced nursing informatics competencies. *Journal of Nursing Education and Practice*, 4(7), 104-112
- Hui Liu, Ch., Lee, T. & Milles, M. T. (2015). The experience of informatics in Taiwan. *Journal of Professional Nursing* 31 (2).
- Hunter, H., McGonigie, D., & Hebda, T. (2013). The integration of informatics content in baccalaureate and graduate nursing education. *Nurse Educator*, 38(3), 110-113. doi: 10.1097/NNE.0b013e31828dc292.
- Hwang, J. & Park, H. (2011). Factors associated with nurses' informatics competency. *Computer, Informatics, Nursing*, 29(4). 256-262.
- Institute of Medicine, (2003). *Health care professional education: A bridge to quality*. National Academics Press. Washington, DC. Retrieved form <http://www.iom.edu/Reports/2003/health-professions-education-a-bridge-to-quality.aspx>
- Institute of Medicine. 2003. Health Professions Education: A Bridge to Quality. Washington, DC: The National Academies Press. doi: 10.17226/10681.

Institute of Medicine (2010). The future of nursing: Leading change, advancing health.

Retrieved from <https://www.nap.edu/catalog/12956/the-future-of-nursing-leading-change-advancing-health>

Kaminsski, J. (2010). Theory applied to informatics: Novice to expert. *CJNI: Canadian Journal of Nursing Informatics*, 5(4), 967.

Klieb, M., Sales, A. E., Lima, I, Andea-BAYlon, M. & Beaith, A. (2010). Continuing education in informatics among registered nurses in the United States in 2000. *The Journal of Continuing Education in Nursing* 41 (7). 329-336, DOI: 10.3928/00220124-20100503-08

Liu, Ch, Lee, T, & Mills, M. T. (2015). The experience of informatics nurses in Taiwan. *Journal of Professional Nursing*, 31(2), 158-64. doi: 10.1016/j.profnur.2014.09.005

Office of the National Coordinator for Health Information Technology, (2015). Health IT legislation. Retrieved from <https://www.healthit.gov/policy-researchers-implementers/select-portions-hitech-act-and-relationship-onc-work>

Mayo Clinic (2016). Mayo clinic's campus in Florida. Retrieved from <http://www.mayoclinic.org/patient-visitor-guide/florida/clinic-hospital-buildings>

McGonigle, D., Hunter. K, Sipes, C., & Hebda, T. (2014). Why nurses need to understand nursing informatics. *AORN Journal*, 100 (3). Retrieved from <https://www.ncbi.nlm.nih.gov/pubmed/25172566>

Nagel, L. M. et al. (2014). Developing entry-to-practice nursing informatics competencies for registered nurses. *Nursing Informatics*. doi:10.3233/978-1-61499-415-2-356

National League of Nursing, (2008). Preparing the next generation of nurses to practice in a technology-rich environment. An informatics agenda. Retrieved from <http://www.nln.org/docs/default-source/professional-development-programs/preparing->

the-next-generation-of-nurses.pdf?sfvrsn=6

Pilaski, T. (2011). Where is nursing informatics in undergraduate nursing education? CJNI:

Canadian Journal of Nursing Informatics, 5(4). Retrieved from Vasuki, 2016

<http://cjni.net/journal/?p=1041>

Peltonen, L. M., et al., (2016). Nursing informatics research priorities for the future:

Recommendations from an international survey. *Nursing Informatics*.

Doi:10.3233/978/1/61499/658/3/222

Quality and Safety Education for Nurses (2014). Graduate QSEN competencies.

Retrieved from <http://qsen.org/competencies/graduate-ksas/>

Rosswurm and Larrabee (1999). A model for change to evidence-based practice. /, 31(4), 317-322.

Schleyer, R. H., Bruch, C. K., & Schoessler, M. T. (2011). Defining and integrating informatics competences into a hospital nursing department. *CIN: Computers, Informatics, Nursing*, 29(3), 167-173.

Simpson, L. R. (2013). Chief Nurse executives need contemporary informatics competencies.

Nursing Economic\$ 32(6), 277- 288.

Sipes, C. (2016). Project management: Essential skills of nurse informaticists. *Nursing*

Informatics. Doi:10.3233/978-1-61499-658-3-252.

Sipes, C., McGonigle, D., Hunter, K., & Hebda, T., Hill, T., & Lamblin, J. (2016).

Operationalizing the TANIC and NICA-L3/L4 tools to improve informatics competencies. *Nursing Informatics*. Doi:10.3233/978-1-61499-658-3-292

Sherrie-Ann, C. (2014). Plugging into nursing informatics: Preparation, practice, and beyond.

Canadian Journal of Nursing Informatics, 9 (2).

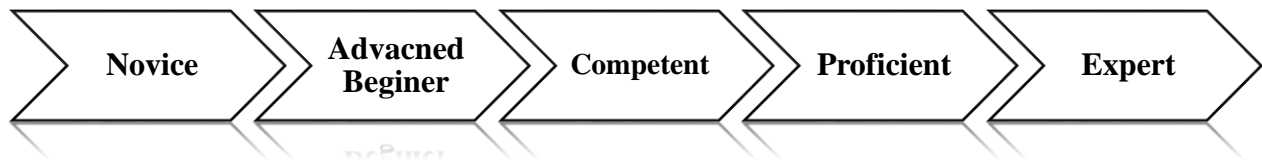
- Sherwood, G., & Barnsteiner, J. (2012). *Quality and safety in nursing. A competency approach to improving outcomes*. Oxford, United Kingdom: Wiley-Blackwell.
- Stagger, N., Gassert, C. A., & Curran, Ch. (2001). Informatics competencies for nurses at four levels of practice. *Journal of Nursing Education* 40 (7).
- Shultz, C. (2015). Preparing to work in n informatics-based world. *National Student Nurses' Association Publication*, 56(3):36-9. Retrieved from http://www.nсна.org/Portals/0/Skins/NSNA/pdf/Imprint_AprMay09_Feat_Shultz.pdf
- Sun, X. (2013). What is your informatics skills level? The reliability of an informatics competency measurement tool. Transactions of the International Conference on Health Information Technology Advancement. Retrieved from http://scholarworks.wmich.edu/ichita_transactions/31
- Tavakol, M. & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medicine*, 2, 53-55. doi: 10.5116/ijme.4dfb.8dfd
- Technology Informatics Guiding Education Reform, (2009). TIGER informatics competencies collaboration final report. Retrieved from http://tigercompetencies.pbworks.com/f/TICC_Final.pdf
- Technology Informatics Guiding Education Reform, (2014). *Informatics competencies for every practicing nurse: Recommendations from the TIGER collaborative*. Retrieved from http://www.thetigerinitiative.org/docs/TigerReport_InformaticsCompetencies_001.pdf
- Tellez, M. (2012). Nursing informatics education past, present, and future. *Computer, Informatics, Nursing Journal* 30(5), 229-234. doi: 10.1097/NXN.0b013e3182569f42
- Thomas Pilarski, (2011). Where is nursing informatics in undergraduate nursing education? *Canadian Journal of Nursing Informatics*, 5 (4).

- Thompson, B. W., & Skiba, D. J. (2008). Informatics in the nursing curriculum: A national survey of nursing informatics requirements in nursing curricula. *Nursing Education Perspectives*, 29(5), 312-317.
- U.S. Department of Health and Human Services, (2009). Code of federal regulations; 45 CFR 46. Retrieved from <https://www.hhs.gov/ohrp/regulations-and-policy/regulations/45-cfr-46>
- 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 (IOSR-JNHS)*5 (1), 20-25. Retrieved form www.iosrjournals.org

Appendix A
Benner's Theory

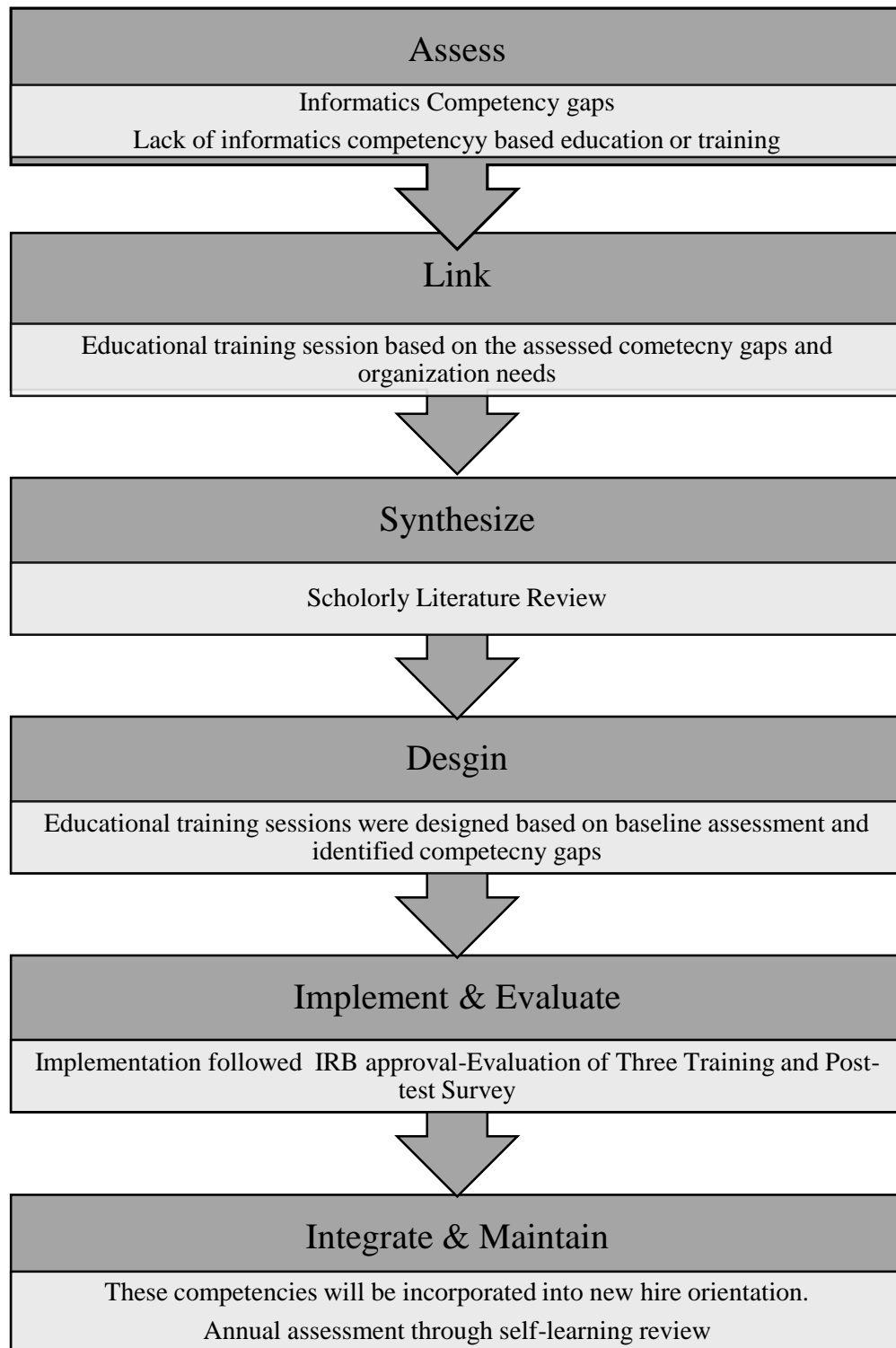
Benner's theory describes five levels of nursing experience:

- *Novice*
- *Advanced beginner*
- *Competent*
- *Proficient*
- *Expert*



Appendix B

Rosswurm and Larrabee's Conceptual Model (LRCM)



Appendix C

Nursing Continuing Education Evaluation form

PROGRAM EVALUATION

Program Title:

Date:

LOCATION:

Presented by:

Rating Scale: 5 = Outstanding 4 = Above Average 3 = Average 2 = Below Average 1 = Unsatisfactory NA = Not Applicable

Please circle the following:

1. Did the program meet the course objectives? 5 4 3 2 1

NA

2. Was the content accurate in terms of current issues? 5 4 3 2 1

NA

3. Was the content of the information presented current? 5 4 3 2 1

NA

4. Rate the effectiveness of teaching methods. 5 4 3 2 1

NA

5. Was the material presented in an understandable manner? 5 4 3 2

1 NA

6. Was the educational level appropriate for the audience? 5 4 3 2 1

NA

7. If a test was given, did it relate to the objectives? 5 4 3 2

1 NA

8. Was the time used effectively in covering the subject? 5 4 3 2 1

NA

9. Rate the degree to which the program met your educational/professional needs. 5 4 3 2 1

NA

10. Was the physical environment conducive for learning? 5 4 3 2 1

NA

11. Additional comments:

12. What are additional topics that interest you?

Appendix D

TIGER Informatics Competencies

1. Basic Computer Competency**1.1 Hardware***1.1.1. Concepts*

1.1.1.1 Understand the term hardware. Understand what a personal computer is.

Distinguish between desktop, laptop (notebook), tablet PC in terms of typical users

1.1.1.2 Identify common handheld portable digital devices like: personal digital assistant (PDA), mobile phone,

1.1.1.3 smartphone, multimedia player and know their main features.

Know the main parts of a computer like: central processing unit (CPU), types of memory, hard disk, common

1.1.1.4 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 (read-only memory) and distinguish between them.

1.1.3.2 Know storage capacity measurements: bit, byte, KB, MB, GB, TB.

Know the main types of storage media like: internal hard disk, external hard disk, network drive, CD, DVD,

1.1.3.3 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.

Know some options available for enhancing accessibility like: voice recognition software, screen reader,

1.2.1.5 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 concept of an online (virtual) community. Recognize examples like: social networking websites, Internet forums, chat rooms, online computer games.

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 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 term e-learning. Know some of its features like: flexible learning time, flexible learning location, multimedia learning experience, cost effectiveness.

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

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 license.

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, 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/workbasket/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.

2.1.4.1 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.

2.2.3.1 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.

2.3 Utilities

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.

2. 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.

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.

3.11 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.

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

3. 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,

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

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 Communication

9.1 Facilitate Inter-Provider Communication

9.2 Facilitate Provider-Pharmacy Communication

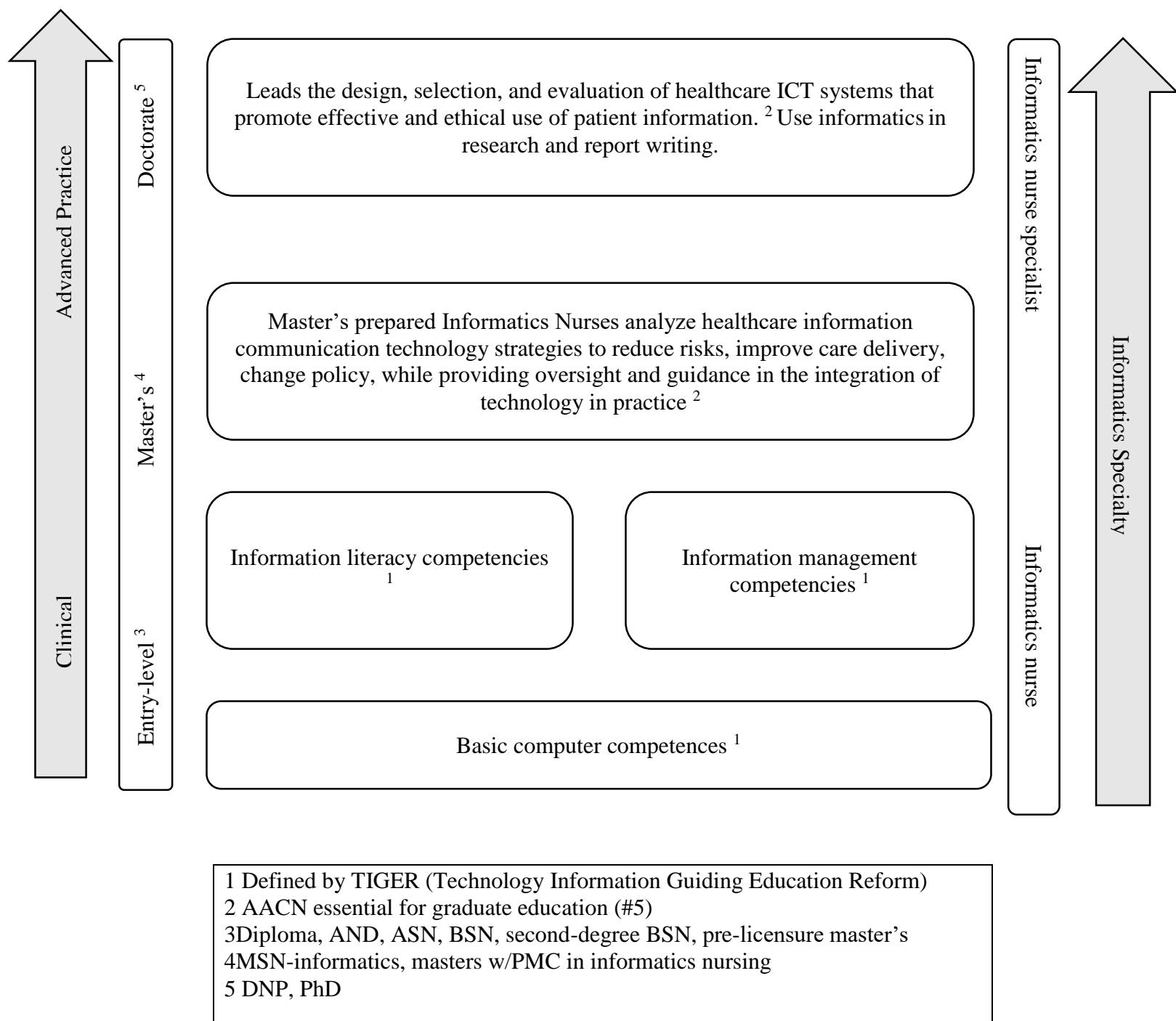
9.3 Facilitate Communications Between Provider and Patient and /or the Patient Representative

9.4 Facilitate Patient, Family and Care Giver Education

9.5 Facilitate Communication with Medical Device

Appendix E

ANA: Nursing Informatics Competencies for all Registered Nurses (2015)



Appendix F

Informatics Nursing Certification Eligibility Criteria (ANCC, 2016)

Informatics Nursing Certification Eligibility Criteria

Credential Awarded: RN-BC

Eligibility Criteria

Hold a current, active RN license within a state or territory of the United States or the professional, legally recognized equivalent in another country. [International Applicants: Learn about additional requirements for candidates outside the US.](#)

Hold a bachelor's or higher degree in nursing or a bachelor's degree in a relevant field.

Have practiced the equivalent of 2 years full-time as a registered nurse.

Have completed 30 hours of continuing education in informatics nursing within the last 3 years.

Meet one of the following practice hour requirements:

- ▶ Have practiced a minimum of 2,000 hours in informatics nursing within the last 3 years.
- ▶ Have practiced a minimum of 1,000 hours in informatics nursing in the last 3 years and completed a minimum of 12 semester hours of academic credit in informatics courses that are part of a graduate-level informatics nursing program.
- ▶ Have completed a graduate program in informatics nursing containing a minimum of 200 hours of faculty-supervised practicum in informatics nursing.

Appendix G

CPHIMS Certification requirement

Certification Eligibility Requirements

CAHIMS Eligibility Requirements

To qualify to take the CAHIMS examination and earn CAHIMS certification, you **must** have earned a high school diploma or its equivalent.

For detailed information on CAHIMS eligibility requirements, refer to the [CAHIMS Candidate Handbook](#).

CPHIMS Eligibility Requirements

To qualify to take the CPHIMS examination and earn CPHIMS certification, you must either:

- Hold a baccalaureate degree from an accredited college or university **and**
- Have five years of information and management systems* experience, with three of those years in a healthcare setting**.

OR

- Hold a graduate degree or higher from an accredited college or university **and**
- Have three years of information and management systems* experience, with two of those years in a healthcare setting**.

Appendix H

NICA L3/L4 Self-Assessment instrument (Pre-Test Needs Assessment tool)

**NURSING INFORMATICS COMPETENCY ASSESSMENT:
LEVEL 3/LEVEL 4 (NICA L3/L4)**



Dee McGonigle, PhD, RN, CNE, FAAN, ANEF
Kathleen Hunter, PhD, RN-BC, CNE
Chamberlain College of Nursing

Toni Hebda, PhD, RN, CNE
Taryn Hill, PhD, RN

chamberlain.edu

Dear Informatics Nurse,

Thank you for your participation in Chamberlain College of Nursing's pilot test of an instrument for self-assessment of nursing-informatics (NI) competencies. This instrument has 4 parts: questions about you (demographics) and the self-assessment, consisting of: computer skills, informatics knowledge and informatics skills. There are a total of 178 items in the self-assessment portion.

The purpose of this study is to test the feasibility, usability, reliability, validity and item performance of the instrument currently known as Nursing Informatics Competency Assessment – Level 3/Level 4 (NICA L3/L4). All data collected will be kept confidential. Tracing of Internet connections will not be conducted. Data reporting will be at the aggregate level.

This study has been approved by the Institutional Review Board of Chamberlain College of Nursing. Chamberlain College of Nursing is hosting the online presence of the questionnaire and providing support for statistical analysis.

Continuation beyond this page of the study instrument constitutes your agreement to participate in this study.

Please respond to each item. Do not skip any items. Use the comment spaces to share your thoughts on item wording and the need for additional items or items that you think should be removed.

Thank you,

Dee McGonigle, PhD, RN, CNE, FAAN, ANEF
 Kathy Hunter, PhD, RN-BC, CNE
 Toni Hebda, PhD, RN, CNE
 Taryn Hill, PhD, RN

Permission is granted by Chamberlain College of Nursing for non-commercial use of the Nursing Informatics Competency Assessment – Level 3/Level 4 (NICA L3/L4) in the context of research or practice, provided credit is given as noted below. The wording of the introductory paragraph above should be changed to reflect the situation in which the tool is used. The wording and order of the questionnaire items may not be changed.

Acknowledgement of this work must include:

- Dee M. McGonigle, Kathleen M. Hunter, Toni L. Hebda and Taryn Hill
- Nursing Informatics Competency Assessment – Level 3/Level 4 (NICA L3/L4): The development and implementation of an online tool for self-assessment (2013)

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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Below are a series of demographic questions for your completion. Please respond to each item.

Age

- | | | | | | |
|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|--------------------------------|
| <input type="checkbox"/> 19-21 | <input type="checkbox"/> 22-25 | <input type="checkbox"/> 26-30 | <input type="checkbox"/> 31-35 | <input type="checkbox"/> 36-40 | <input type="checkbox"/> 41-45 |
| <input type="checkbox"/> 46-50 | <input type="checkbox"/> 51-55 | <input type="checkbox"/> 56-60 | <input type="checkbox"/> 61-65 | <input type="checkbox"/> 66-70 | <input type="checkbox"/> 70+ |

Gender

- ☐ Male ☐ Female

RN

- ☐ Yes ☐ No

Highest Education Preparation

- | | | | | |
|-----------------------------------------------------|------------------------------------------------------|-------------------------------------------------|------------------------------|-----------------------------------------------------|
| <input type="checkbox"/> Diploma in nursing | <input type="checkbox"/> Associate degree in nursing | <input type="checkbox"/> Other associate degree | <input type="checkbox"/> BSN | <input type="checkbox"/> Other baccalaureate degree |
| <input type="checkbox"/> Master's degree in nursing | <input type="checkbox"/> Other master's degree | <input type="checkbox"/> ND | <input type="checkbox"/> DNS | <input type="checkbox"/> DSN |
| <input type="checkbox"/> DNSc | <input type="checkbox"/> DScN | <input type="checkbox"/> PhD | <input type="checkbox"/> DNP | <input type="checkbox"/> Other Doctorate |

Length of Practice in Informatics

- | | | | | |
|----------------------------------------|--------------------------------------------|----------------------------------------|-----------------------------------------|----------------------------------------|
| <input type="checkbox"/> 0 | <input type="checkbox"/> 1 week – 6 months | <input type="checkbox"/> 6 – 12 months | <input type="checkbox"/> 13 – 23 months | <input type="checkbox"/> 2 – 3 years |
| <input type="checkbox"/> 4 – 5 years | <input type="checkbox"/> 6 – 10 years | <input type="checkbox"/> 11 – 15 years | <input type="checkbox"/> 16 – 20 years | <input type="checkbox"/> 21 – 25 years |
| <input type="checkbox"/> 26 – 30 years | <input type="checkbox"/> 31 – 35 years | <input type="checkbox"/> 26 – 40 years | | |

Board Certification in Nursing Informatics

- ☐ Yes ☐ No

Other Certification in Informatics

- ☐ Yes ☐ No

Job Description (please do not abbreviate)

Job Title (please do not abbreviate)

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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How to Complete this Self-Assessment

This instrument is divided into the key dimensions, or core competencies, of Nursing Informatics (NI) practice and assesses 178 perceived competencies in three areas or categories: computer skills (13 items), informatics knowledge (56 items) and informatics skills (109 items). Please take your time when completing this self-assessment.

Reflect on each competency. Read each one, "As an informatics nurse, I can..." and determine your level of competency (Expert, Proficient, Comfortable or Beginner/NA) based on your ability to exhibit the behavior or perform the skill.

- Beginner / N/A level reflects that you are unaware of or have limited knowledge and/or skills
- Comfortable level relates to easy association with the information, knowledge or skill necessary to be able to function with ease and able to use your judgment to problem solve, infer and interpret
- Proficient level denotes that you are informatics competent, well-advanced, and fluent in your ability to bilingually address nursing and IT; able to analyze and synthesize data, information and knowledge into wisdom to inter-professionally guide other healthcare team members
- Expert level reflects extraordinary or exceptional proficiency that progresses the data, information, knowledge and wisdom pathway to intuition; the breadth of your experience provides the ability to assess the context of each situation intuitively and respond and perform appropriately

Please select only one competency level for each item based on your perceived ability. There are no right or wrong responses.

1. Computer Skills

Please select one competency level for each item. There are no right or wrong responses.

1. General Computer Skills

I rate my competence in each of the following activities as:

	Expert	Proficient	Comfortable	Beginner/ NA
1.1.1 Develop or modify spreadsheets used for complex problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.2 Write macros or shortcuts for spreadsheets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.3 Create queries for a database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.4 Run reports from a database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.5 Manage projects with project-management software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Systems

	Expert	Proficient	Comfortable	Beginner/ NA
1.2.1 Integrate different applications or programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.2 Use utility programs for data recovery and system-performance indices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.3 Support research efforts through the use of specific types of software (for example, statistical or qualitative data management software)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.4 Determine the impact of electronic information management on leadership roles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.2.5 Utilize pattern recognition technologies for mathematical analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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3. Quality Improvement

	Expert	Proficient	Comfortable	Beginner/ NA
1.3.1 Collect data to monitor quality and effectiveness of nursing informatics practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3.2 Determine data indicators used to monitor quality and effectiveness of nursing informatics practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.3.3 Determine aspects of nursing informatics practice important for quality monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Informatics Knowledge

1. Data

I rate my competence in each of the following activities as:

	Expert	Proficient	Comfortable	Beginner/ NA
2.1.1 Demonstrate fluency in informatics and nursing terminologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.1.2 Recognize the capacity for data aggregation and integration	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.1.3 Teach nurses to find, retrieve and evaluate information	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

2. Education

	Expert	Proficient	Comfortable	Beginner/ NA
2.2.1 Implement and evaluate application/system training programs for users and clients	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.2 Develop and plan application/system training programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.3 Construct guidelines for the purchase of software and hardware	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.4 Participate with practicing nurses, nurse administrators and nurse researchers to define and develop new computer competencies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.5 Teach users/clients about effective and ethical uses of applications and systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.6 Serve as an informational resource person for applications and systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.2.7 Assist with and support others engaging in social media (Facebook, Twitter, etc.) to benefit the patient	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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3. Impact

	Expert	Proficient	Comfortable	Beginner/ NA
2.3.1 Determine the impact of computerized information management on leadership roles through program evaluation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.2 Interpret current legislation, research and economics affecting computerized information management in healthcare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.3 Assess current capabilities and limitations of technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.4 Determine projected impacts to users and organizations when changing to computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.5 Assess the social, legal and ethical impacts of computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.6 Determine the limitations and reliability of computerized patient-monitoring systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.7 Apply strategies for change management to ensure satisfied and productive users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.8 Determine the impact of information-management technologies on therapeutic outcomes and quality of care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.9 Interpret the benefits and risks of computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.10 Interpret research findings about the impact of computerized information management on clinical practice, education, administration and/or research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.11 Analyze the impacts of information-management technologies on time allocation and tasks of care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.12 Participate with and adhere to IRB regulations for patient safety	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.13 Assist in developing clinical practice environments that support the knowledge work of nurses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.14 Assess clinical workflow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.3.15 Support and maintain clinical workflow	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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4. Privacy/Security

	Expert	Proficient	Comfortable	Beginner/ NA
2.4.1 Interpret copyright issues and plagiarism in this knowledge era	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.2 Assess features, capabilities and scope of user passwords	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.3 Differentiate issues surrounding confidentiality in computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.4 Participate with and adhere to IRB regulations for data/IT security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Informatics Knowledge - Regulations

	Expert	Proficient	Comfortable	Beginner/ NA
2.5.1 Incorporate relevant law and regulations into informatics practice, such as the HITECH Act	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.5.2 Support adhering to ADA technology accessibility guidelines	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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6. Systems

	Expert	Proficient	Comfortable	Beginner/ NA
2.6.1 Explain various input and output devices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.2 Apply theories that influence computerization in healthcare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.3 Describe computer fundamentals (hardware, software, networks, data communications)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.4 Project healthcare computing trends in nursing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.5 Evaluate applications/systems available in healthcare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.6 Interpret capabilities and limitations of hardware and interfaces and their relationship to the outcomes of healthcare computing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.7 Demonstrate extensive knowledge of the applications/systems currently in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.8 Construct resources to support users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.9 Describe general knowledge and terminology of computer, information and cognitive sciences	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.10 Recognize viruses and other system risks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.11 Devise strategies to involve clinicians in the design, selection, implementation and evaluation of applications and systems in healthcare	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.12 Assess current applications available to support clinical care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.13 Describe concepts of telehealth/telenursing and the Internet and their relationship to nursing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.14 Analyze point-of-care terminals and associated issues, such as use in sterile environments	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.6.15 Interpret the current and projected future state of physiological monitoring	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Usability

	Expert	Proficient	Comfortable	Beginner/ NA
2.7.1 Analyze the ergonomics, health and safety aspects of the work station and its location	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.2 Apply human factors and ergonomics to the design of the computer screen, location and design of devices, and design of software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.3 Use cognitive science principles and artificial intelligence theories to participate in the design of technology appropriate to the cognitive abilities of the user	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.7.4 Develop algorithms for clinical decision support in nursing practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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2. Data Mining

	Expert	Proficient	Comfortable	Beginner/ NA
2.8.1 Appreciate the value of data mining techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.2 Utilize data mining to predict future uses and trends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.3 Utilize data mining to describe patterns within a data set	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.4 Utilize statistics to provide complete analysis patterns within a data set	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.5 Utilize data mining to provide informed decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.6 Utilize data mining to provide quality data metrics for proposed practice change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

3. Informatics Skills

1. Analysis

I rate my competence in each of the following activities as:

	Expert	Proficient	Comfortable	Beginner/ NA
3.1.1 Develop and implement work plans during application development and implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.2 Construct data elements appropriate to a given practice context	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.3 Apply principles and techniques of systems analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.4 Apply principles of computing (e.g., reading an algorithm)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.5 Analyze user areas to determine procedural errors versus hardware and software problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.6 Interpret information flow within the organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.7 Modify existing applications/devices to meet changing requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.8 Conduct feasibility assessments throughout the information systems life cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.9 Prepare process flow charts to describe current and proposed information flows for all aspects of practice-related information systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.10 Determine problems and impediments in installing computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.1.11 Understands and can retrieve information using data mining	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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2. Data/Data Structures

	Expert	Proficient	Comfortable	Beginner/ NA
3.2.1 Construct data structures and maintains data sets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.2 Apply data structure concepts in designing a database system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.3 Determine relationships among tables in databases and performs tasks such as database normalization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.4 Integrate nursing taxonomies, unified nomenclatures and other data needed by nurses within database design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.5 Develop procedures to establish and maintain the validity and integrity of data and databases	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.2.6 Modify available software programs to support data aggregation and analyses	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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3. Design/Development

	Expert	Proficient	Comfortable	Beginner/ NA
3.3.1 Develop screen layouts, report formats and custom views of clinical data through working directly with clinical departments and individual users	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.2 Consult in the design or enhancements to integrated patient information, management, educational or research systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.3 Participate in the development of new methods or in making modifications to improve the efficiency and/or effectiveness of data storage and its communication	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.4 Coordinate the development of integrated computer-based patient record technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.5 Maintain a database (e.g., adding, deleting fields, structuring input for others, relational database)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.6 Incorporate established data and database management standards into database design	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.7 Participate in the development of new tools for management purposes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.8 Develop methods of data communication, hardware and software integration and data transformation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.9 Develop database structures to support clinical care, education, administration or research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.10 Apply concepts of nursing theory and research to the design of health information applications and systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.11 Develop databases to facilitate clinical care, education, administration or research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.12 Develop new ways to interact with information technology and access data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.13 Assist in the development of computer applications to meet clinical, education, administration and research requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.14 Evaluate existing technologies for cost-effectiveness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.15 Evaluate data storage capacities of the system in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.16 Evaluate hardware, software and vendor support	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.17 Participate on interdisciplinary teams that evaluate nursing-informatics practice or health informatics services	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.18 Use a variety of analytical tools to assess the systems in use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.3.19 Analyze the system in use through internal environment scanning	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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4. Fiscal Management

	Expert	Proficient	Comfortable	Beginner/ NA
3.4.1 Develop strategies to obtain funding for information systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4.2 Use strategies to optimize application use after implementation (benefits realization)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4.3 Participate in budget activities for the procurement and maintenance of the system	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4.4 Determine the cost versus benefit of computer technology used in practice, education, administration and/or research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.4.5 Conduct return on investment (ROI) analysis regarding the use of IT systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. Implementation

	Expert	Proficient	Comfortable	Beginner/ NA
3.5.1 Lead or participate in user groups during all phases of the systems life cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.2 Devise strategies for installing applications/systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.3 Develop implementation plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.4 Distinguish implementation phases (i.e., pre-implementation, implementation, post-implementation)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.5 Apply appropriate implementation strategies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.6 Recognize opportunities for applying information management technologies to clinical practice, education, administration and/or research situations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.5.7 Devise strategies to encourage interdisciplinary use of computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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6. Management

	Expert	Proficient	Comfortable	Beginner/ NA
3.6.1 Function as a project manager	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.2 Manage terms and conditions of a contract with an information-systems vendor	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.3 Develop a plan for limited resources (e.g., costs, staffing, equipment)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.4 Determine project scope, objectives, and resources for each proposed application, system or enhancement	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.5 Develop system testing, implementation, conversion and backup plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.6 Develop a strategic or long-range plan for the management of applications and systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.7 Develop policies, procedures and guidelines based on research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.8 Develop policies and procedures related to information-systems implementation, use and maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.9 Escalate client issues and problems to the next available level of management in a timely manner	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.10 Communicate progress of the project to appropriate personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.11 Apply principles and concepts of project management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.12 Develop policies related to privacy, confidentiality, and security of patient and client data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.6.13 Recommend procedures for achieving data integrity and security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

7. Programming

	Expert	Proficient	Comfortable	Beginner/ NA
3.7.1 Apply principles of computer programming in order to communicate with software developers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.7.2 Differentiate between machine and high-level programming languages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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8. Requirements

	Expert	Proficient	Comfortable	Beginner/ NA
3.8.1 Determine priorities for new requirements within budget constraints	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.2 Modify information technologies to meet changing data requirements/needs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.3 Determine new requirements according to the needs of the organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.4 Demonstrate skills in the systems life cycle to support policies, procedures and knowledge bases in organizations	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.5 Include client needs in requirements development	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.6 Develop requirements for integrated clinical, education, administration and/or research applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.7 Communicate informatics needs to a systems analyst	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.8.8 Perform needs assessment for future requirements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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9. Role

	Expert	Proficient	Comfortable	Beginner/ NA
3.9.1 Influence change to improve the impact of informatics on the system of care	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.2 Design strategies to manage the impact of change to information-systems implementation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.3 Consult with clinical, managerial, educational and/or research entities regarding informatics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.4 Develop collegial relationships with information system technical support personnel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.5 Serve as a liaison among agency departments and vendors	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.6 Collaborate with nursing personnel and interdisciplinary teams to accomplish information management work	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.7 Promote understanding and effective use of information technology	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.8 Make formal presentations of project findings, recommendations, and specifications to user/client department managers, supervisors and/or administrators	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.9 Recommend changes in health informatics practice based upon evaluation data from nursing informatics (e.g., a validated severity-of-illness instrument)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.10 Recommend policies and procedures to improve the quality of nursing-informatics practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.11 Implement activities to enhance the quality of nursing-informatics practice	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.12 Develop recommendations to improve nursing-informatics practice or outcomes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.13 Act as a liaison to support communication among providers, patient/client and technical communities	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.14 Use software tools as appropriate during the systems life cycle	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.15 Apply knowledge of patient-care processes to systems and their life cycles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.16 Maintain a system perspective that encompasses the entire organization	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.17 Integrate knowledge from other informatics disciplines with nursing to improve patient care, administration, education and/or research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.18 Participate in top-level decisions and policy design that impact clinical information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.19 Conduct research to examine impacts of computer technology in nursing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.20 Conduct research to determine application needs in clinical care, education, administration and research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.21 Conduct research in informatics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

NURSING INFORMATICS COMPETENCY ASSESSMENT: LEVEL 3/LEVEL 4 (NICA L3/L4)



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	Expert	Proficient	Comfortable	Beginner/ NA
3.9.22 Disseminate new knowledge by informing colleagues of new developments and applications in nursing or healthcare informatics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.23 Contribute to informatics education of students, peers and colleagues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.24 Analyze information to generate new knowledge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.9.25 Consult with clinical, managerial, educational and/or research entities about informatics	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Systems Maintenance

	Expert	Proficient	Comfortable	Beginner/ NA
3.10.1 Assist in the resolution of basic software problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10.2 Perform complex trouble-shooting in applications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10.3 Recommend solutions to application-specific problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.10.4 Maintain the data dictionary and other technical-support elements	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

11. System Selection

	Expert	Proficient	Comfortable	Beginner/ NA
3.11.1 Design evaluation criteria and strategies for selecting applications and systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.11.2 Apply ergonomics principles in the selection and use of information-management technologies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.11.3 Participate with others in selecting applications or systems (e.g., users, vendors, system designers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

12. Testing

	Expert	Proficient	Comfortable	Beginner/ NA
3.12.1 Develop procedures and scenarios for acceptance testing, conversions and interface testing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.12.2 Conduct tests of information-management applications, systems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

13. Training

	Expert	Proficient	Comfortable	Beginner/ NA
3.13.1 Produce short-term and long-term training plans	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.13.2 Produce training materials and operating manuals tailored to the organization and end-user	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.13.3 Deliver user-training programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3.13.4 Evaluate user-training programs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix I1

Permission To use NICA L3/L4 instrument



TANIC instrument Hunt...
170 KB



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Hi Leyla,

Thank you for your interest in the TIGER-based Assessment of Nursing Informatics Competencies (TANIC). The research team at Chamberlain College of Nursing is delighted you are thinking of using this tool.

A formatted copy of the instrument is attached. The formatted copy contains information on the permission granted for using the instrument and acknowledging its use. Scoring is straightforward. Each item in each category is assigned a point value of 1 to 4, with 4 points being the highest level of competency.

My colleagues and I look forward to learning the results of your work. We request that you share the TANIC data with us, if possible.

Please contact me with any questions or comments.

Thank you.

Dee

Dee McGonigle PhD, RN*, CNE, FAAN, ANEF

Director, Virtual Learning Experiences (VLE)

Professor, Graduate Programs

Chamberlain College of Nursing

2014 TEACH HONOREE
Distinguished Faculty



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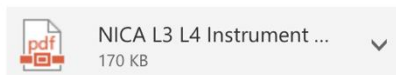


Appendix I2

Permission To use NICA L3/L4 instrument



Inbox

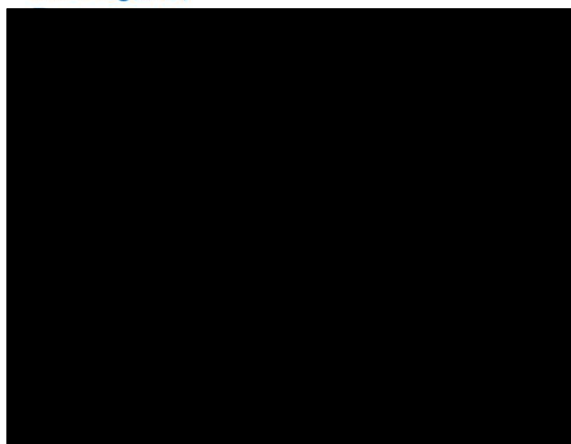


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Hello Leyla,

Attached the NICA L3/L4 for you as well J

Kind regards,



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Appendix J

NICA L3/L4 Mean Score Per Subcategory and Selected Subcategories

Competencies	Mean Score Below 2 Per Question	Selected
I. Computer Skills	13	
<i>1. General Computer Skills</i>	<i>4/5</i>	X
<i>2. Systems</i>	<i>4/5</i>	
3. Quality Improvement	0/3	
II. Informatics Knowledge	56	
1. Data	0/3	
2. Education	1/7	
3. Impact	3/15	
<i>4. Privacy/Security</i>	<i>4/4</i>	X
5. Regulations (Informatics Knowledge)	0/1	
6. Systems	7/15	
7. Usability	1/4	
<i>8. Data Mining</i>	<i>6/6</i>	X
III. Informatics Skills	109	
<i>1. Analysis</i>	<i>9/11</i>	
<i>2. Data/Data Structure</i>	<i>6/6</i>	
3. Design/Development	12/19	
4. Fiscal Management	5/5	
5. Implementation	1/7	
6. Management	10/13	
7. Programming	2/2	
<i>8. Requirements</i>	<i>6/8</i>	
9. Role	3/25	
10. System Maintenance	3/4	
11. System Selection	2/3	
12. Testing	1/2	
13. Training	0/4	



Gap in Competency



Competent

Appendix K1

Jacksonville University Institutional Review Board Approval Letter



Office of Research
& Sponsored Programs
JACKSONVILLE UNIVERSITY

DATE: January 24, 2017

PROJECT TITLE: JU2017-001: Informatics Competency-Based Assessment: Evaluations and Determination of Nursing Informatics Competency Gaps among Practicing Nurse Informaticists

Dear Leyla Pordeli,

The purpose of this letter is to inform you that your application to the Institutional Review Board (IRB) for this project has been reviewed.

Project JU 2017-001 has been Approved.

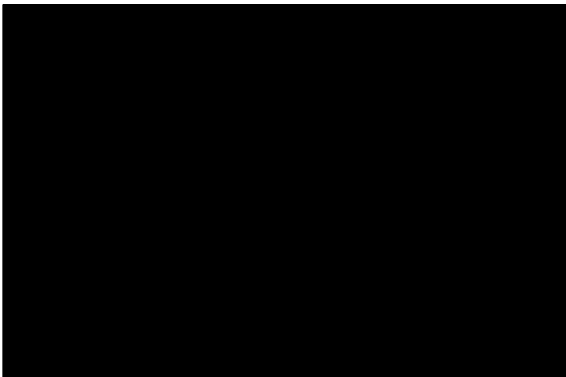
If you submitted a proposed consent with your application, the approved stamped consent is attached to this approval notice. Only the stamped version of the consent may be used in recruiting subjects.

If the project has not been completed by 1/24/18 you must submit a Continuing Review Report for the project. As a courtesy, a renewal notice will be sent to you prior to the expiration date; however, it is your responsibility as the Principal Investigator to timely request a renewal from the IRB.

You are advised that any change in the protocol for this project must be reviewed and approved by the IRB prior to implementation of the proposed change. A Revision/Amendment Form is required for consideration of any change. In addition, Federal Regulations require that the Principal Investigator promptly report, in writing any unanticipated problems or adverse events involving risks to research subjects or others.

By copy of this memorandum, the Chairman of your Department and your Faculty Mentor is reminded of his/her responsibilities as a Principal Investigator and Faculty Mentor in the conduct of research involving human subjects.

If you have questions, please contact me in the Office of Research and Sponsored Programs, at



Appendix K2

Mayo Clinic Institutional Review Board Approval Letter

**Principal Investigator Notification:**

From: Mayo Clinic IRB

To: Leyla Pordeli

CC: Leyla Pordeli

Re: **IRB Application #:** 17-000717

Title: TITLE: Informatics Competency-Based Assessment: Evaluations and Determination of Nursing Informatics Competency Gaps among Practicing Nurse Informaticists

IRBe Protocol Version: 0.01

IRBe Version Date: 1/25/2017 11:48 AM

IRB Approval Date: 2/6/2017

IRB Expiration Date:

The IRB reviewed the above referenced application. The Reviewer noted that the application involves quality improvement and determined that it does not constitute research as defined under 45 CFR 46.102. Continued IRB review of this application is not required.

Mayo Clinic Institutional Reviewer

Appendix L

NICA L3/L4 Post-Test Instrument Cover Page/Modified Informed Consent

Dear Informatics Nurse Specialist,

My name is Leyla Pordeli, MSN, MBA, RN, and I am a doctoral student at Jacksonville University working under the direction of Roberta Christopher, EdD, MSN, ARNP, NE-BC, CHTS-CP. You are invited to take part in a study entitled, "Informatics competency-based assessment: Evaluations and determination of nursing informatics competency gaps among practicing nurse informaticists." The purpose of the study is to develop, implement, and evaluate an EBP informatics competency curriculum to address the identified competency gaps and support and enrich the team's informatics knowledge and skills required to improve achieving the organizational informatics needs.

Participation in this study is voluntary, and you may withdraw from the study at any time you wish by not submitting the survey. There is no penalty for not participating or withdrawing (not returning the form) at any time. You may choose not to answer specific questions or to stop participating at any time. All data collected will be kept confidential and codified. Data reporting will be at the **aggregate** level. The results of the study may be used in nursing publications or presentations but will be reported as aggregate data only. Paper forms will be stored by the investigator in the faculty's Jacksonville University office, and electronic data will be stored on a password protected, secure folder.

There are no known risks associated with this study and no identifying data will be collected on the NICA L3/L4. There may be no direct benefit to you through completion of this survey. Knowledge acquired from the study will be shared with your department to inform future professional development programs. There is no compensation for participation in the study.

The survey includes a demographics form and a self-assessment consisting of computer skills and informatics knowledge. The survey will take approximately 10-15 minutes to complete. The completed forms will then be turned to the sealed dropbox in the Informatics Office location.

If you have concerns or questions about this study, please contact the researcher (Leyla Pordeli via email [REDACTED]). If you have questions or concerns about your role and rights as a research participant, would like to obtain information or offer input, or would like to register a complaint about this study, you may contact, anonymously if you wish, the Jacksonville University Office of Research Compliance, [REDACTED].

Please do not include your name on the questionnaires.

Please respond to each item. Continuation beyond this page of the study instrument constitutes your agreement to participate in this study.

Best regards,

Leyla Pordeli MSN, MBA, RN
DNP candidate (Jacksonville University)

Below are a series of demographic questions for your completion. Please respond to each item.

Age

- ☐ 19-21 ☐ 22-25 ☐ 26-30 ☐ 31-35 ☐ 36-40 ☐ 41-45
☐ 46-50 ☐ 51-55 ☐ 56-60 ☐ 61-65 ☐ 66-70 ☐ 70+

Gender

- ☐ Male ☐ Female

RN

- ☐ Yes ☐ No

Highest Education Preparation

- ☐ Diploma in nursing ☐ Associate degree in nursing ☐ Other associate degree ☐ BSN ☐ Other baccalaureate degree
☐ Master's degree in nursing ☐ Other master's degree ☐ ND ☐ DNS ☐ DSN
☐ DNSc ☐ DScN ☐ PhD ☐ DNP ☐ Other Doctorate

Length of Practice in Informatics

- ☐ 0 ☐ 1 week-6 months ☐ 6-12 months ☐ 13-23 months ☐ 2-3 years
☐ 4-5 years ☐ 6-10 years ☐ 11-15 years ☐ 16-20 years ☐ 21-25 years
☐ 26-30 years ☐ 31-35 years ☐ 26-40 years

Board Certification in Nursing Informatics

- ☐ Yes ☐ No

Other Certification in Informatics

- ☐ Yes ☐ No

Nursing Informatics Competency Assessment L3/L4 (adapted)

How to Complete this Self-Assessment

Please take your time when completing this self-assessment. **Please do NOT put your name on the survey.**

Reflect on each competency. Read each one, “As an informatics nurse, I can...” and determine your level of competency (Expert, Proficient, Comfortable or Beginner/NA) based on your ability to exhibit the behavior or perform the skill.

- Beginner / N/A level reflects that you are unaware of or have limited knowledge and/or skills
- Comfortable level relates to easy association with the information, knowledge or skill necessary to be able to function with ease and able to use your judgment to problem solve, infer and interpret
- Proficient level denotes that you are informatics competent, well-advanced, and fluent in your ability to bilingually address nursing and IT; able to analyze and synthesize data, information and knowledge into wisdom to inter-professionally guide other healthcare team members
- Expert level reflects extraordinary or exceptional proficiency that progresses the data, information, knowledge and wisdom pathway to intuition; the breadth of your experience provides the ability to assess the context of each situation intuitively and respond and perform appropriately

Please select only one competency level for each item based on your perceived ability. There are no right or wrong responses.

Please select one competency level for each item. There are no right or wrong responses.

1. General Computer Skills

I rate my competence in each of the following activities as:

	Expert	Proficient	Comfortable	Beginner/NA
1.1.1 Develop or modify spreadsheets used for complex problems	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.2 Write macros or shortcuts for spreadsheets	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.3 Create queries for a database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.4 Run reports from a database	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
1.1.5 Manage projects with project-management software	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

4. Privacy/Security

2.4.1 Interpret copyright issues and plagiarism in this knowledge era	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.2 Assess features, capabilities and scope of user passwords	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.3 Differentiate issues surrounding confidentiality in computerized information management	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.4.4 Participate with and adhere to IRB regulations for data/IT security	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

8. Data Mining

	Expert	Proficient	Comfortable	Beginner/NA
2.8.1 Appreciate the value of data mining techniques	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.2 Utilize data mining to predict future uses and trends	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.3 Utilize data mining to describe patterns within a data set	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.4 Utilize statistics to provide complete analysis patterns within a data set	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.5 Utilize data mining to provide informed decision making	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2.8.6 Utilize data mining to provide quality data metrics for proposed practice change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix M

NICA L3/L4 Questions and Mean Scores

NICA L3/L4 Questions	N	Mean
1. Computer Skills		
General Computer Skills		
Develop or modify spreadsheets used for complex problems	14	2.21
Write macros or shortcuts for spreadsheets	14	1.29
Create queries for a database	14	1.50
Run reports from a database	14	1.93
Manage projects with project-management software	14	2.00
Systems		
Integrate different applications or programs	14	2.00
Use utility programs for data recovery and system-performance indices	14	1.21
Support research efforts through the use of specific types of software (for example, statistical or qualitative data management software)	14	1.14
Determine the impact of electronic information management on leadership role	14	2.29
Utilize pattern recognition technologies for mathematical analysis	14	1.43
Quality Improvement		
Collect data to monitor quality and effectiveness of nursing informatics practice	14	2.21
Determine data indicators used to monitor quality and effectiveness of nursing informatics practice	14	2.29
Determine aspects of nursing informatics practice important for quality monitoring	14	2.36
2. Information Knowledge		
Data		
Demonstrate fluency in informatics and nursing terminologies	14	2.71
Recognize the capacity for data aggregation and integration	14	2.43
Teach nurses to find, retrieve and evaluate information	14	2.86
Education		
Implement and evaluate application/system training programs for users and clients	14	2.57
Develop and plan application/system training programs	14	2.50
Construct guidelines for the purchase of software and hardware	14	1.64
Participate with practicing nurses, nurse administrators and nurse researchers to define and develop new computer competencies	14	2.43

NICA L3/L4 Questions	N	Mean
Serve as an informational resource person for applications and systems	14	2.79
Determine the impact of computerized information management on leadership roles through program evaluation	13	2.23
Interpret current legislation, research and economics affecting computerized information management in healthcare	13	1.92
Assess current capabilities and limitations of technology	13	2.23
Determine projected impacts to users and organizations when changing to computerized information management	13	2.08
Assess the social, legal and ethical impacts of computerized information management	13	2.08
Determine the limitations and reliability of computerized patient-monitoring systems	13	2.08
Apply strategies for change management to ensure satisfied and productive users	13	2.38
Determine the impact of information-management technologies on therapeutic outcomes and quality of care	13	2.08
Interpret the benefits and risks of computerized information management	13	2.00
Interpret research findings about the impact of computerized information management on clinical practice, education, administration and/or research	13	2.15
Analyze the impacts of information-management technologies on time allocation and tasks of care	13	2.15
Participate with and adhere to IRB regulations for patient safety	12	1.75
Assist in developing clinical practice environments that support the knowledge work of nurses	13	2.46
Assess clinical workflow	13	2.77
Support and maintain clinical workflow	13	2.62
Privacy/Security		
Interpret copyright issues and plagiarism in this knowledge era	14	2.00
Assess features, capabilities and scope of user passwords	14	1.71
Differentiate issues surrounding confidentiality in computerized information management	14	1.93
Participate with and adhere to IRB regulations for data/IT security	14	1.57
Informatics Knowledge-Regulations		
Incorporate relevant law and regulations into informatics practice, such as the HITECH Act	14	2.21

NICA L3/L4 Questions	N	Mean
Explain various input and output devices	14	1.93
Describe computer fundamentals (hardware, software, networks, data communications)	14	2.21
Project healthcare computing trends in nursing	14	1.86
Evaluate applications/systems available in healthcare	14	2.07
Interpret capabilities and limitations of hardware and interfaces and their relationship to the outcomes of healthcare computing	14	1.71
Demonstrate extensive knowledge of the applications/systems currently in use	14	2.07
Construct resources to support users	14	2.29
Describe general knowledge and terminology of computer, information and cognitive sciences	14	2.21
Recognize viruses and other system risks	14	1.57
Devise strategies to involve clinicians in the design, selection, implementation and evaluation of applications and systems in healthcare	14	2.50
Assess current applications available to support clinical care	14	2.36
Describe concepts of telehealth/telenursing and the Internet and their relationship to nursing	14	2.00
Analyze point-of-care terminals and associated issues, such as use in sterile environments	14	1.64
Interpret the current and projected future state of physiological monitoring	14	1.79
Usability		
Analyze the ergonomics, health and safety aspects of the work station and its location	14	2.07
Apply human factors and ergonomics to the design of the computer screen, location and design of devices, and design of software	14	2.14
Use cognitive science principles and artificial intelligence theories to participate in the design of technology appropriate to the cognitive abilities of the user	14	1.86
Develop algorithms for clinical decision support in nursing practice	14	2.00
Data Mining		
Appreciate the value of data mining techniques	14	1.79
Utilize data mining to predict future uses and trends	14	1.50
Utilize data mining to describe patterns within a data set	14	1.57
Utilize statistics to provide complete analysis patterns within a data set	14	1.50
Utilize data mining to provide informed decision making	14	1.57

NICA L3/L4 Questions	N	Mean
Analysis		
Develop and implement work plans during application development and implementation	14	2.14
Construct data elements appropriate to a given practice context	14	1.86
Apply principles and techniques of systems analysis	14	1.79
Apply principles of computing (e.g., reading an algorithm)	14	1.79
Analyze user areas to determine procedural errors versus hardware and software problems	14	1.86
Interpret information flow within the organization	14	2.07
Modify existing applications/devices to meet changing requirements	14	2.00
Conduct feasibility assessments throughout the information systems life cycle	14	1.50
Prepare process flow charts to describe current and proposed information flows for all aspects of practice-related information systems	14	1.93
Determine problems and impediments in installing computerized information management	14	1.86
Understands and can retrieve information using data mining	14	1.57
Data/Data Structure		
Construct data structures and maintains data sets	14	1.21
Apply data structure concepts in designing a database system	14	1.21
Determine relationships among tables in databases and performs tasks such as database normalization	14	1.21
Integrate nursing taxonomies, unified nomenclatures and other data needed by nurses within database design	14	1.21
Develop procedures to establish and maintain the validity and integrity of data and databases	14	1.21
Modify available software programs to support data aggregation and analyses	14	1.14
Design/Development		
Develop screen layouts, report formats and custom views of clinical data through working directly with clinical departments and individual users	14	2.29
Consult in the design or enhancements to integrated patient information, management, educational or research systems	14	2.36
Participate in the development of new methods or in making modifications to improve the efficiency and/or effectiveness of data storage and its communication	14	2.00

NICA L3/L4 Questions	N	Mean
Incorporate established data and database management standards into database design	14	1.64
Participate in the development of new tools for management purposes	14	1.57
Develop methods of data communication, hardware and software integration and data transformation	12	1.50
Develop database structures to support clinical care, education, administration or research	13	1.85
Apply concepts of nursing theory and research to the design of health information applications and systems	13	2.54
Develop databases to facilitate clinical care, education, administration or research	13	1.69
Develop new ways to interact with information technology and access data	13	1.77
Assist in the development of computer applications to meet clinical, education, administration and research requirements	13	2.38
Evaluate existing technologies for cost-effectiveness	14	1.57
Evaluate data storage capacities of the system in use	13	1.15
Evaluate hardware, software and vendor support	14	2.14
Participate on interdisciplinary teams that evaluate nursing-informatics practice or health informatics services	14	2.57
Use a variety of analytical tools to assess the systems in use	13	1.62
Analyze the system in use through internal environment scanning	14	1.36
Fiscal Management		
Develop strategies to obtain funding for information systems	14	1.14
Use strategies to optimize application use after implementation (benefits realization)	14	1.29
Participate in budget activities for the procurement and maintenance of the system	14	1.21
Determine the cost versus benefit of computer technology used in practice, education, administration and/or research	14	1.14
Conduct return on investment (ROI) analysis regarding the use of IT systems	14	1.21
Implementation		
Lead or participate in user groups during all phases of the systems life cycle	14	2.21
Devise strategies for installing applications/systems	14	1.93
Develop implementation plans	14	2.00

NICA L3/L4 Questions	N	Mean
Apply appropriate implementation strategies	14	2.14
Recognize opportunities for applying information management technologies to clinical practice, education, administration and/or research situations	14	2.21
Devise strategies to encourage interdisciplinary use of computerized information management	14	2.00
Management		
Function as a project manager	14	2.00
Manage terms and conditions of a contract with an information-systems vendor	14	1.50
Develop a plan for limited resources (e.g., costs, staffing, equipment)	14	1.71
Determine project scope, objectives, and resources for each proposed application, system or enhancement	14	1.71
Develop system testing, implementation, conversion and backup plans	14	1.93
Develop a strategic or long-range plan for the management of applications and systems	14	1.57
Develop policies, procedures and guidelines based on research	14	1.93
Develop policies and procedures related to information-systems implementation, use and maintenance	14	1.71
Escalate client issues and problems to the next available level of management in a timely manner	14	2.00
Communicate progress of the project to appropriate personnel	14	2.43
Apply principles and concepts of project management	14	2.00
Develop policies related to privacy, confidentiality, and security of patient and client data	14	1.64
Recommend procedures for achieving data integrity and security	14	1.50
Programming		
Apply principles of computer programming in order to communicate with software developers	14	1.29
Differentiate between machine and high-level programming languages	14	1.21
Determine priorities for new requirements within budget constraints	14	1.14
Modify information technologies to meet changing data requirements/needs	14	1.57
Requirements		
Determine new requirements according to the needs of the organization	14	1.71

NICA L3/L4 Questions	N	Mean
Include client needs in requirements development	14	1.86
Develop requirements for integrated clinical, education, administration and/or research application	14	1.79
Communicate informatics needs to a systems analyst	14	2.36
Perform needs assessment for future requirements	14	2.07
Role		
Influence change to improve the impact of informatics on the system of care	14	2.21
Design strategies to manage the impact of change to information-systems implementation	14	2.21
Consult with clinical, managerial, educational and/or research entities regarding informatics	14	2.71
Develop collegial relationships with information system technical support personnel	14	2.50
Serve as a liaison among agency departments and vendors	13	2.31
Collaborate with nursing personnel and interdisciplinary teams to accomplish information management work	14	2.79
Promote understanding and effective use of information technology	14	2.86
Make formal presentations of project findings, recommendations, and specifications to user/client department managers, supervisors and/or administrators	14	2.71
Recommend changes in health informatics practice based upon evaluation data from nursing informatics (e.g., a validated severity-of-illness instrument)	14	2.43
Recommend policies and procedures to improve the quality of nursing-informatics practice	14	2.43
Implement activities to enhance the quality of nursing-informatics practice	14	2.50
Develop recommendations to improve nursing-informatics practice or outcomes	14	2.57
Act as a liaison to support communication among providers, patient/client and technical communities	14	2.71
Use software tools as appropriate during the systems life cycle	14	2.43
Apply knowledge of patient-care processes to systems and their life cycles	14	2.57
Maintain a system perspective that encompasses the entire organization	14	2.50

NICA L3/L4 Questions	N	Mean
Conduct research to examine impacts of computer technology in nursing	14	1.71
Conduct research to determine application needs in clinical care, education, administration and research	14	1.71
Conduct research in informatics	14	1.57
Disseminate new knowledge by informing colleagues of new developments and applications in nursing or healthcare informatics	14	2.71
Contribute to informatics education of students, peers and colleagues	14	2.79
Analyze information to generate new knowledge	14	2.36
Consult with clinical, managerial, educational and/or research entities about informatics	14	2.43
Systems Maintenance		
Assist in the resolution of basic software problems	14	2.07
Perform complex trouble-shooting in applications	14	2.00
Recommend solutions to application-specific problems	14	1.93
Maintain the data dictionary and other technical-support elements	14	1.43
System Selection		
Design evaluation criteria and strategies for selecting applications and systems	14	1.79
Apply ergonomics principles in the selection and use of information-management technologies	14	1.71
Participate with others in selecting applications or systems (e.g., users, vendors, system designers)	14	2.07
Testing		
Develop procedures and scenarios for acceptance testing, conversions and interface testing	14	1.93
Conduct tests of information-management applications, systems	14	2.00
Training		
Produce short-term and long-term training plans	14	2.50
Produce training materials and operating manuals tailored to the organization and end-user	14	2.57
Deliver user-training programs	14	2.71
Evaluate user-training programs	14	2.57