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Development of a Nursing Informatics Competency Assessment Tool (NICAT)

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This is to certify that the doctoral study by

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Abstract

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MS, Towson University, 2011

BSN, Notre Dame of Maryland University, 2008

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

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Abstract

Nursing workforce competency in informatics is crucial to providing safe patient care, improving quality, and reducing healthcare costs. Assurance of informatics competency in a workforce with increasingly diverse educational preparations, demographics, and informatics skills poses significant challenges. The question addressed was the lack of nursing informatics competency assessment tool relevant to bedside nursing. The purpose of this project was to develop and review a new nursing informatics competency assessment tool designed to address the individual educational needs of newly hired nurses. The tool was designed to measure nurses' competency in computer literacy, informatics literacy, and informatics management skills recommended in the American Nurses Association's *Standards and Scope of Practice* and *Technology Informatics Guiding Education Reform.* This tool supports practices at the bedside by providing individualized education according to the results of a self-assessment. The project was guided by the Benner's model and the Rosswurm and Larrabee framework. Content validity was established by item analysis, relevancy scale, and validation by the identified experts from the organization's Nursing Informatics Department ($n = 4$); the Department of Education, Practice, and Research ($n = 8$); the Clinical Outcomes Department ($n = 1$); and bedside nurses ($n = 14$). The administration recommended this tool be incorporated into its strategic plan. This project promoted positive social change by developing a tool to assess informatics competencies in newly hired nurses and guide educators in developing future educational strategies. These efforts will assist in creating a workforce that is prepared to deliver healthcare safely, efficiently, and cost-effectively in the increasingly technology-savvy environment of U.S. healthcare in the 21st century.

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Dedication

This project is dedicated in honor of all the nurses who work diligently at the bedside, under innumerable challenges, to maintain the safety of patients. You are always willing to accept changes and adapt to an ever-evolving healthcare system. You work tirelessly day and night to run the healthcare system smoothly. You are the frontline, regardless of the situation. Thank you for all that you do every single day.

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I would like to thank Dr. Joan Moon, Dr. Susan Hayden, Dr. Tracy Wright, and my preceptor Dr. Joyce Maygers for all the guidance, expertise, and constant encouragement. Your support and leadership has inspired me to pursue my aspirations. My sincere gratitude to Carrie Stein, Carol Brown, and Dr. Michelle Cummings for their continuous mentoring and guidance. I would also like to acknowledge my colleagues, nursing leadership, the Department of Nursing Education, Practice, and Research, and the Clinical Informatics Department at the study site for supporting me in my journey and playing a major role in my professional endeavors.

My family and friends have been a major source of support, encouragement, and inspiration over the past few years. Thank you to my children Rishma, Naveed, and Nishad for your patience, love, critiques, and computer help! You have done so much for me and taught me many things. To my parents in heaven: Thank you for strengthening my inner spirit and teaching me the value of perseverance.

Lastly, I owe all my success and achievements to my lifelong partner and best friend, my husband Rahman. You have lifted me up and stood with me with your love and support. You have helped me immensely in fulfilling my dreams. Thank you for all your encouragement and patience. I look forward to spending more time with you.

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Section 1: Nature of the Project

Introduction

The role of health information technology (HIT) has become an absolute necessity rather than an option in nursing practice in the United States (Cheeseman, 2011). Nursing informatics (NI), a specialty within HIT, has transformed healthcare and nursing practice by increasing patient safety, improving healthcare quality, and reducing healthcare costs by integrating the best practices into patient care. However, a lack of nursing knowledge and skills related to NI has been identified as a significant issue affecting safe patient care, the nurse's comfort with the use of a clinical documentation system, and patient outcomes (Ball et al., 2011). Assessing bedside nurses' self-confidence and competency in computer literacy, informatics literacy, and informatics management skills is necessary in order to provide an education that is tailored to nurses with different levels of educational preparation and various demographics.

This Doctor of Nursing Practice (DNP) quality initiative (QI) project was strongly linked to two DNP-related publications by the American Association of Colleges of Nursing (AACN): *Essentials II: Organizational and Systems Leadership for Quality Improvement I and Systems Thinking* (AACN, 2006) and *Essentials IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care* (AACN, 2006). The project took place in an acute care teaching hospital on the East Coast of the United States where I was employed as a Clinical Nurse Specialist (CNS). This hospital is an international healthcare leader and attracts nurses from both within the US and around the world. Facility also hires a

significant number of new graduate nurses with associate, baccalaureate, and master's degrees each year.

At the time of the project study, new nurses being hired did not receive either formal training in NI or a self-assessment of NI knowledge and skills. This was an important omission because the nurses being hired which includes individuals from abroad and from various nursing education preparation levels, making unclear whether all new nurses had the fundamental NI knowledge and skills required for their position. This lack of baseline measurements regarding NI knowledge of new hires also prevented the institution from developing an informed NI curriculum to meet individual needs. The clinical informatics system (CIS) training was left to unit preceptors, who were potentially ill-prepared to meet new hires' needs. Increased workloads, shortage of staff, high acuity, and a fast-paced environment created an increasing likelihood of nurses developing workarounds and deviations from protocols, which ultimately place patients at risk. The purpose of this section is to explain the background, problem statement, purpose, goal and objectives, framework, nature of the project, definitions, assumptions and limitations, and the significance of the project.

Background

An employer survey conducted by the National Council of State Boards of Nursing (NCSBN) showed that only 41.9% of participants believed that new graduate nurses were prepared to provide safe and efficient patient care (Goode, Lynn, Krsek, Bednash, & Jannetti, 2009). Since the U.S. healthcare industry is preparing to apply HIT at every point of care, new nurses need training, education, and support in their role transition to take care of complex patients in hospitals. NI is a core competency for

nurses in order for them to work safely in a technologically intense healthcare setting (Ball et al., 2011). Preparing this workforce with essential NI knowledge and skills is therefore crucial to providing safe patient care.

The problem of incorporating HIT into healthcare is complicated by an aging nursing workforce. According to a 2013 study by the National Center for Health Workforce Analysis, 61.7% nurses were older than 40 years, and the average age of a nurse in the United States was 46.8 years. These nurses did not grow up with technology, and are therefore considered novices in technology and termed *digital immigrants* (Ball et al., 2011, p. 139). At the time of the study, a significant portion of the workforce at the study site was digital immigrants. Neither the current nurses' nor the new nurses' NI Competencies were being assessed at the study site, creating a need for both groups to undergo assessment and training. However, this project specifically focused on addressing these needs with new nursing hires at the study site.

In order to create a knowledge-based workforce, equipping these nurses with the necessary computer and informatics skills to perform their duties safely and efficiently is necessary. A health care workforce prepared with the necessary knowledge, skills, and attitude is crucial to providing safe patient care (Boykins, 2014). However, integration of NI into the knowledge bases of nurses from a wide variety of educational backgrounds, informatics skill sets, and years of experience, while also hailing from different generations, is a significant institutional challenge.

The lack of NI competency in bedside care was a significant problem at the clinical site. The project study was framed using Elkins' (2010) method for analyzing the patient or population, suggesting an anticipated intervention, comparing results between

groups or against the current standard, and identifying the outcome desired (PICO). The PICO problem statement was as follows:

- P: Bedside nurses in an acute care hospital on the East Coast of the United States
- I: Developing the nursing informatics competency assessment tool (NICAT) to assess nursing informatics competency
- C: Current standard was no assessment of NI competency
- O: Developing educational programs based on the identified needs in NI to improve the patient care and nurses' self-confidence and competence in using the CIS efficiently.

Problem Statement

The major problems addressed in this study were the lack of an NI competency assessment for bedside nurses and the challenges of integrating NI education into a nursing workforce with different educational backgrounds, diverse informatics skill sets, and various years of experience, international origins, and different generations. Although the National League of Nursing (NLN) has called for informatics competencies in every nursing education program, at the time of this study there was not a mandate from the NLN or other nursing accrediting bodies regarding integrating NI into the curriculum (Hunter, McGonigle, & Hebda, 2013). As a result, there are significant NI competencies gaps in NI integration in nursing education.

Incorporating NI in teaching-learning activities of clinical simulations and academic electronic medical records can serve as models to bridge the practice gap in nursing programs. Clinical simulations allow students to navigate the technology and document electronically, thereby applying critical thinking NI skills in a simulated

format. However, there are significant barriers to the integration of NI competencies into nursing curriculum: a lack of faculty NI skills, discomfort with technology, multiple electronic health record (EHR) systems in hospital settings, and limited funds (Gardner & Jones, 2012). In a self-perception computer literacy study, Campbell and McDowell (2011) noted that nurses in a community hospital under study had little or no knowledge of nearly half of the survey items in the NI competency list. Nursing leaders need to assess the competency of their workforce and address the gaps that limit the ability of their employees to use HIT, which is required for safe patient care (Ball et al., 2011).

Purpose Statement

The purpose of this DNP quality initiative project was to develop a nursing informatics competency self-assessment tool. Nurses at the bedside are challenged by lack of training, skills, competencies, and support in NI (Ball et al., 2011). As a result, I designed a NI competency assessment tool (NICAT) to help address these needs and challenges. NICAT was designed to be used to provide nurses with a tailored educational plan for NI competencies including computer skills, informatics literacy, and informatics management. This self-assessment tool will be implemented at the study site following the completion of my DNP program.

The Technology Informatics Guiding Education Reform (TIGER) initiative in 2009 established recommendations for informatics competency for bedside nurses and called for NI integration into nursing education as well as into nurse leader and faculty development (Hunter, McGonigle, & Hebda, 2013). These recommendations were intended to prepare healthcare personnel with necessary skills and knowledge in NI. However, an extensive literature search for this study failed to identify a NI competency

tool applicable to nurses at the bedside. As a result, I decided to develop a tool to meet this need, NICAT, to bridge this gap and meet the needs of nurses to be sufficiently competent in NI to provide safe patient care, improved healthcare quality, and reduced healthcare costs.

Project Goals/Objectives

Goal

The goal of this QI project was to support NI practices at the bedside by developing a standardized, evidence-based nursing informatics competency assessment tool (NICAT) that could be used in the future to develop NI education tailored to individual nurses' educational needs.

Objectives

This project's main objectives were:

- To create an evidence-based NICAT that self-assesses nurses' perceived competency in computer literacy, informatics literacy, and informatics management skills applicable to the patient care at the bedside, and which met and complied with ANA standards (2008) and TIGER recommendations (2009).
- Content on the NICAT was reviewed for acceptability and applicability of the items and questionnaire to bedside nurses by a team of bedside nurses and experts in NI, nursing education, and clinical outcomes.

Framework of the Project

The NICAT tool development process followed the framework of Rosswurm and Larrabee's conceptual model (RLCM). This self-assessment tool was developed based on the Benner's Dreyfus Model of Skill Acquisition (Benner, 1984) to assess NI

competencies at the novice, advance beginner, competent, proficient, and expert levels. The NICAT development and the DNP project were based on the six steps of RLCM (White & Dudley-Brown, 2012):

1. **Assess the Need for Change in Practice**. This step determined if there was evidence for a lack of NI competencies in bedside nurses at the study site. I assessed the need for practice change by asking stakeholders, collecting information regarding current practice, comparing information to available research, and reviewing pertinent literature.
2. **Link the Problem, Interventions, and Outcomes**. I used a standardized NI classification system and assessment to facilitate a shift from the practice of "one size fits all" NI education strategy used at the study site to a competency-based education strategy based on NI needs assessments and evidence.
3. **Synthesize the Best Evidence**. I conducted a scholarly literature search using the Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, ProQuest, PubMed, and Cochrane Review databases. I also worked with a multidisciplinary team that included a project mentor, members from clinical nursing, stakeholders, and experts in the field to critically review the literature, TIGER recommendations, ANA standards, and to weigh the evidence in conjunction with my recommendations.
4. **Design Practice Change**. The NICAT was designed based on reviewing literature, analyzing evidence, synthesizing best evidence, and assessing the feasibility and value.

5. **Implement and Evaluate the Change in Practice**. Experts and stakeholders evaluated the NICAT.
6. **Integrate and Maintain the Change in Practice**. The tool was presented to the stakeholders with the recommendation of implementing and integrating the tool as a baseline assessment for new hires.

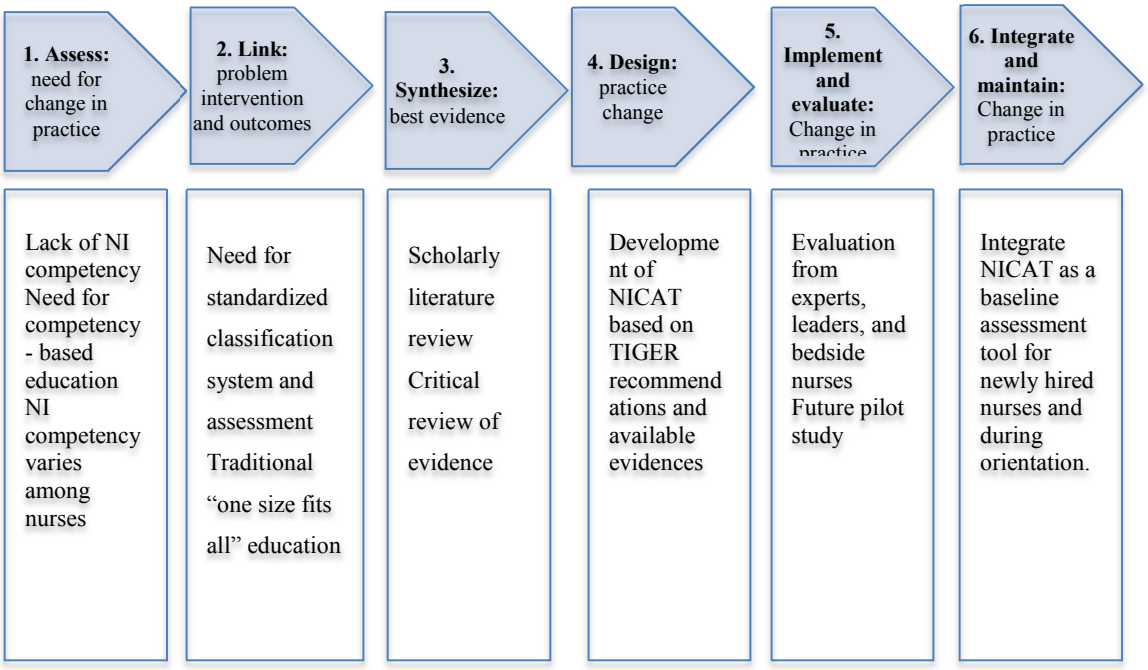

Figure 1. Adapted RLCM (1999) for NI practice at the bedside.

Nature of the Project

A multidisciplinary task force was formed under my leadership and developed the NICAT based on the TIGER recommendations and ANA standards. This multidisciplinary team included myself, a project mentor, members from clinical nursing, educators, stakeholders, and experts in the NI field. The questions in the tool were developed using face-to-face discussions with clinicians and leaders in the NI specialty area with clinical expertise, previous HIT implementation experiences, previous studies,

and literature review. The content of the tool was evaluated by a group of nurses for question clarity and will be pilot tested after my graduation from DNP program, as recommended by Polit and Beck (2012).

Definitions of Terms

The following definitions were used to guide this EBP project:

Advanced Practice Registered Nurses (APRN): A registered nurse (RN) with an advanced, graduate-level education who has passed a national certification examination in order to practice in one of four recognized APRN roles: clinical nurse specialist, nurse midwife, nurse practitioner, and registered nurse anesthetist (Zaccagnini & White, 2011).

Clinical Nurse Specialist (CNS): A Master's prepared APRN, who is Board certified, and whose function is to improve outcomes in patient care. The CNS is an expert in clinical practice, patient education, research, and consultation and influences the three spheres of practice (patient care, nursing, and systems) (Zaccagnini & White, 2011).

Computer Literacy Skills: A skill set including the psychomotor skills needed to use computer tools and knowledge of basic hardware and software functionality. Computer literacy skills are required for effective bedside nursing in the United States (Schleyer, Burch, & Schoessler, 2011).

Electronic Health Record (EHR): The "systematic documentation of a client's health status and healthcare in a secured digital format meaning that it can be processed, stored, transmitted, and accessed by authorized interdisciplinary professionals for the purpose of supporting efficient, high quality health care across the clients healthcare continuum" (McGonigle & Mastrian, 2012, p. 563).

Health Information Technology (HIT): "Hardware, software, integrated technologies or related licenses, intellectual properties, up-grades, or packaged solution sold as services that are designed for or support the use by healthcare entities or patients for the electronic creation, maintenance, access, or exchange of health information" (McGonigle & Mastrian, 2012, p. 163).

Informatics Literacy Skills: A nurse's ability to recognize the need for information and to retrieve, evaluate, and use this information appropriately for patient care (Schleyer, Burch, & Schoessler, 2011).

Information Management Skills: A skill set including the ability to apply data to support clinical decisions, documenting and ensuring data integrity, maintaining confidentiality, and practicing information security. Information management skills encompass the knowledge to articulate the value of information systems in improving patient safety, quality, and outcome (Schleyer, Burch, & Schoessler, 2011)**.**

Nursing-Informatics (NI): "A specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, knowledge, and wisdom in nursing practice" (American Nurses Association, 2008, p. 99). NI enables data integration, information, and knowledge to support patients and the healthcare team in their decision making across the settings and roles.

Nursing-Informatics (NI) Competency: An acceptable level of knowledge, skill, and ability to complete specific informatics tasks **(**Hunter, McGonigle, & Hebda, 2013).

The Technology Informatics Guiding Education Reform (TIGER) Initiative: A nursing reform initiative set forth at the TIGER Summit in 2006 that established computer literacy, information literacy, and information management as categories of NI

competency (Hunter, McGonigle, & Hebda, 2013). This summit defined a collective vision in preparing nursing workforce to use technology and informatics with the goal of improving the delivery of patient care. The National League for Nursing (NLN) has approved the TIGER recommendations (DuLong, 2008).

Workaround: A method created by users to bypass the system to complete a task by cutting corners and deviating from the best practices to save time (McGonigle & Mastrian, 2012).

Assumptions and Limitations

Assumptions

An assumption refers to a rudimentary principle that is believed to be true based on logic or reasoning but without proof or confirmation (Polit & Beck, 2012). Assumptions are expectations that are not tested scientifically or by research. The assumptions of the EBP project were:

- Bedside nurses desire to provide the best care for their patients.
- All healthcare organizations should provide education and training for nurses based on their educational needs.

Limitations

Limitations are theoretical and methodological limitations or weaknesses that may decrease the generalizability of the project outcomes (Grove, Burns, & Gray, 2013). Limitations of the project were:

- The NICAT developed in this DNP project was focused on the acute care settings and may not be generalizable to all healthcare settings. Thus, the tool needs to be

validated through studies with large, diverse nurse populations in other clinical settings.

Significance

Nursing Practice

EHR plays a significant role in quality of care, safety, and communication between the healthcare professionals and departments. President Bush called for EHR adoption in 2004. President Obama further endorsed EHR adoption by adding the American Recovery and Reinvestment Act of 2009, which granted 19 billion dollars to promote EHR implementation (Ball et al., 2010). The goal of this legislation was to promote electronic health information exchange among providers and other stakeholders such as patients, patient families, healthcare intra departments, home care, and primary care. As pressure increases to cut healthcare costs and improve access to care HIT, health-enabling technologies (HET), and electronic health (e-health) are becoming solutions to address healthcare burdens worldwide (Knight & Shae, 2014).

Chronic disease rates are on the rise in the United States. There are an estimated 125 million people with at least one chronic condition and half of these individuals have multiple chronic illnesses (Nash, Reifsnyder, Fabius, & Pracilio, 2011). The increased number of people with chronic disease, along with the pressure to decrease healthcare costs, creates a demand for nurses and healthcare to utilize HIT and HET in hospitals and communities to educate, communicate, and assist patients to self-manage their chronic illness with technology-based interventions (Knight & Shae, 2014). In order to meet these demands in healthcare today, nurses need to be prepared with the necessary skills and knowledge in HIT and NI. The lack of knowledge in basic computer and informatics

skills and the current "one size fits all" education in NI for bedside nurses are challenges in the delivery of safe patient care. NICAT will be instrumental in assessing the nurses' baseline NI competencies during new hire orientation to modify and evaluate educational programs. NICAT will facilitate end user satisfaction, confidence in using multiple HITs, HETs, and safe patient-centered care by providing required knowledge and skills based on the individual needs.

EHR improves quality of care, safety, and communication. However, staff resistance and low computer literacy are noted as barriers to EHR implementation in sub-acute and long-term care. According to a survey, almost half of the respondents still report staff resistance to EHR implementation (Technology, 2013). The key reason for staff resistance is lack of computer and informatics skills and staff support, technology intimidation, and difficulty in adapting to technology changes (Ball et al., 2011). Preparing and supporting nurses in HIT with NI competencies and training are crucial in safe patient care at the bedside. Self-assessment of NI competency using NICAT and developing and evaluating training programs based on individual needs supports nurses in adopting HIT, EHR, and nursing practices at the bedside.

Evidence-Based Significance of the Project

HIT plays an important role in patient safety and quality by supporting and communicating the application, as well as providing necessary tools (Ball et al., 2011). However, with any technology integration there is a learning curve to achieve skills, accept the change, and trust the system. Technology integration requires careful planning, education, and training (McGonigle & Mastrian, 2012). End-user satisfaction and confidence in using health information systems will depend on informatics knowledge,

computer skills, educational support, and readiness to learn. The “one size fits all” format of education adversely affects informatics self-confidence in bedside nurses and does not maximize the use of the HIT system (Campbell & McDowell, 2011). Thus, assessing nursing informatics competency is crucial to determining nurses’ educational needs and to developing an educational program specific to individual nurses, whether they are experienced bedside nurses, new graduates, or new hires.

Evidence Based Practice (EBP) is identified as "integration of individual clinical expertise with the best available external clinical evidence from systematic research” (McEwen & Wills, 2011, p. 375). While reviewing the literature to find support to develop the NICAT, I found very few studies which were significant to the project. The dissemination of this project through scholarly efforts will add to the evidence-based body of knowledge found in the literature.

Implications for Social Change

Doctoral level knowledge and skills are essential in organizational leadership to implement system-wide changes for better patient outcomes. APRNs work consistently in many areas to make the healthcare system safe and effective, along with their own personal transformation creating social change (Walden University, 2012). The use of EHR and information systems plays a crucial role in providing safe care, improving patient outcomes, and reducing healthcare costs. The clinical site under study was in the process of renovating the healthcare delivery system into a unified, seamless, and patient-focused enterprise with a new CIS system called the EPIC program throughout the healthcare system. Assessing the NI competency and preparing the staff for change management reflected the DNP Essentials of the AACN standards (AACN, 2006):

Essential II: Organizational and Systems Leadership for Quality Improvement I and Systems Thinking and Essential IV: Information Systems/Technology and Patient Care Technology for the Improvement and Transformation of Health Care (AACN, 2006).

Social change is created through structural transformation of administrative, social, and financial systems in any society or organization. A DNP graduate is a leader in healthcare who leads a multidisciplinary team to institute changes, closes gaps in practice, implements policies, and utilizes expertise in interfacing policy between practice and research to improve the healthcare system.

As an APRN and a healthcare leader, assessing the policies, procedures, and protocols in order to meet the needs of a specific population is essential (AACN, 2006). Developing NICAT will assist in creating a workforce that is prepared to deliver healthcare safely, efficiently, and cost effectively by evaluating nurses' baseline NI competencies and developing educational strategies based on individual needs.

Summary

This section presented an overview of the lack of NI competency assessment for bedside nurses and the plan to develop a NI competency self-assessment tool to support NI needs at the bedside. The tool development was supported by Rosswurm and Larrabee's conceptual model (1999) and the competencies were assessed using Benner's From Novice to Expert theory (Benner, 1984).

Section 2: Review of Literature and Theoretical and Conceptual Framework

Introduction

This Doctor of Nursing Practice (DNP) quality initiative (QI) project was designed to address a set of problems facing the U.S. nursing field and that were observed at the study site, a major U.S. hospital. These problems consist of a lack of an NI competency assessment for bedside nurses and the challenges of integrating NI education into a nursing workforce with different educational backgrounds, diverse informatics skill sets, and various years of experience, international origins, and different generations.

The purpose of this DNP quality initiative project was to develop a nursing informatics competency self-assessment tool. This tool was designed to be used to provide nurses with a tailored educational plan for NI competencies that include computer skills, informatics literacy, and informatics management, and is scheduled to be used at the study site following the completion of my DNP program. The scholarly literature review evaluates the current U.S. nursing workforce, validates the need for developing an NI assessment tool, and discusses the potential implementation of the tool. This section also examines NI competencies at the beginner and experienced level using the lens of Benner's Dreyfus model of skill acquisition and Rosswurm and Larrabee's conceptual framework.

Literature Search Strategy

I conducted a scholarly literature search using the databases Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, ProQuest, PubMed, Google Scholar, and Cochrane Review. The search keywords used included *nursing informatics*,

competency, *self-assessment*, *technology*, *computerized*, *health information technology*, *Benner*, *theory*, *model*, *nursing population*, *workforce*, *advanced practice nurse*, and *safety*. The studies used consisted of peer-reviewed research articles, systematic reviews, and journal articles published within the past 10 years, a relatively extensive timeframe selected due to the limited extant research on the study topic. I also collected evidences and information from the websites of the Technology Informatics Guiding Education Reform (TIGER), American Nurse Association (ANA), American Nursing Informatics Association (ANIA), and Meaningful Use regulation. Furthermore I reviewed textbooks for information regarding informatics theories and their implications for nursing.

Due to the lack of available research studies on the topic, I secured additional assistance from the librarian at the study site. I contacted hospitals around the area to inquire about the availability of a NI assessment tool for bedside nurses and information regarding the competency assessment processes with new hires. I further asked DNP students at Walden University about an existing NI competency assessment tool for bedside nurses in their healthcare institutions and found none. In addition, I also contacted Dr. Yoon, a postdoctoral research scientist at Columbia University School of Nursing who developed the self-assessment of nursing informatics competency scale (SANICS). Yoon provided me with the SANICS tool and information on how to calculate the level of self-confidence.

An extensive literature review revealed a lack of studies on NI competency assessment at the bedside. My scholarly review also noted the specific absence of an assessment tool for nurses relevant to patient care at the bedside intended for use in

planning education in HIT in hospitals where nurses hail from different educational backgrounds and demographics.

Nursing Workforce and Nursing Informatics Competencies

Incorporating NI knowledge and skills in the nursing profession has been progressing slowly over the last several years, while technology advancements in U.S. healthcare have been increasing at a dramatic rate. Hart (2008) reviewed the U.S. nursing workforce from 1991 to 2006 and noted that NI competency developments were primarily focused on nursing schools and faculty, whereas most of the nursing workforce is based in clinical settings. The U.S. nursing workforce has an average age of 46.8 years, with 73.4% nurses older than 40 years, and just 8.1% of nurses younger than 30 years; this suggests that a high percentage of the current workforce are not recent nurse graduates and most likely did not receive any NI education (Hart, 2008).

Whether or not to establish a single entry level for nursing practice has been debated for over 50 years. Over the years, single entry level was supported by many nursing organizations and acute care facilities, as evidenced by the U.S. industry beginning to hire only bachelor-graduate nurses (Hawkins & Shell, 2012). However, the ongoing nursing shortage and lack of legislative support continue to permit all four levels of nursing education to take the same exam and carry the same title of a registered nurse.

According to the United States Bureau of the Health Professions (2010), 38.6% of United States registered nurses (RNs) are prepared with an associate degree, 13.9% with a diploma, 36.8% with a bachelor, and 13.2 % with a master's degree. Though Yoon, Yen, and Bakken (2009) reported a higher mean NI competency level in graduate degree-prepared students than undergraduates, Choi and Zucker (2013) noted that even DNP

students believed they were not competent in almost all areas of NI. Choi and Zucker's study examined the informatics competency of DNP students, comparing the post baccalaureates (BS) and postmaster's (MS) tracks. The authors, assessing 18 areas of computer skills and informatics knowledge with 132 DNP students, suggested that establishing a baseline NI competency is vital to planning curricula and to providing safe patient care. A wide variation in level of preparation stresses the importance of baseline assessment and workforce training in NI competencies.

According to the Bureau of Labor Statistics' projection for 2012-2022, the nursing shortage in the U.S will reach 1.05 million by 2022 (American Association of Colleges of Nursing [AACN], 2014). One of the strategies that employers have pursued over the years for addressing this nursing shortage is to increase their international recruitment of nurses. An estimated 146,097 internationally educated nurses worked in United States in 2008, comprising 5.6% of the total RN workforce (US Bureau of the Health Professions, 2010). This combination of multilevel educational preparation, not having a single entry level to nursing practice, a large number of internationally educated nurses with wide dissimilarity in informatics system use, and a lack of standardized NI assessment tools poses multiple challenges for nursing workforce training.

Existing Scholarship Review

In a systematic review of the literature, Hart (2008) examined 17 eligible research studies in clinical nursing from 1999 to 2006. The purpose of this meta-analysis was to evaluate the NI competency of the United States nursing workforce to expedite evidence-based practices, HIT, and EHR. Hart found that most competency development focus was primarily on nursing educational institutions, resulting in clinical workforce development

in NI not being prioritized. Job specific competency development and training programs based on the individual educational need assessment are paramount.

Hart's (2008) study analysis noted that establishing a baseline informatics competency in the existing nursing workforce is vital to protecting and planning for advancement in the electronic healthcare delivery system. There is a desperate need for NI assessment, job-specific competency development, and established competency evaluation tools. Reviewing the available research at that time, Hart (2008) identified a significant gap in nursing literature and concluded that the current nursing workforce in the United States is not ready for evidence-based practice due to lack of information knowledge, computer skills, and approach towards research.

The Gassert/McDowell Computer Literacy survey was developed to assess competencies for undergraduate nursing students (Campbell & McDowell, 2011). With the modified Gassert/McDowell Computer Literacy survey, Campbell and McDowell (2011) assessed the computer literacy for bedside nurses in a community hospital. This descriptive study collected information from 112 participants and noted a lack of knowledge in basic computer and informatics skills and the current "one size fits all" education in NI for bedside nurses. Campbell and McDowell recommended assessing the nurses' baseline NI competencies during new hire orientation to modify educational programs. Producing end-user satisfaction, confidence in using HIT safely, and patient-centered care requires knowledge, skills, and extensive training. Education and training in HIT that is not based on the assessment neither maximizes the use of the system nor increases the informatics self-confidence in bedside nurses. Developing the NICAT will

assist in assessing the NI competency and developing educational programs based on the nurses individual needs.

Although TIGER initiatives established computer literacy, information literacy, and information management as categories of NI competency, TIGER initiatives did not operationalize this competency into an instrument assessing NI competencies (Hunter, McGonigle, & Hebda, 2013). With the goal of developing a valid and reliable NI competency self-assessment online tool for the students and faculty based on TIGER initiative, Hunter, McGonigle, and Hebda (2013) developed an NI competency assessment tool in six steps. The authors reviewed the literature and various private and public organizational recommendations for NI competency. The definition of competency for the study was established as "knowledge, skill, and ability to perform specific informatics tasks" (McGonigle & Hebda, 2013, p. 71) based on The Joint Commission and other regulatory bodies.

With three rounds of review, Hunter, McGonigle, and Hebda (2013) established the content validity of the NI competency assessment tool by using the content validity index (CVI). An instrument was developed in six steps. During step one to four, the competency subsets were studied, duplicates were removed, and relevancy of each subset was revised through literature review. In step five, the CVI was calculated, all non-relevant items were removed, and the subset questions were reduced to 85 from the previous 231 items. In step six, each category was assigned a numerical value based on the work of Staggers, Gassert, and Curran (2001), with beginner as 1, comfortable as 2, proficient as 3, and expert as 4.

Hunter, McGonigle, and Hebda (2013) focused on the instrument development mainly for the students and faculty. Items in the instrument were focused towards the academic side and not on clinical care. The pilot study of this self-assessment online tool participants were from the research population at the Chamberlain College of Nursing. Results showed that the majority of the participants scored themselves as experts. Items that were not self-rated as expert were the informatics literacy items at 17%, information management elements at 22%, and basic computer skills at 4%. The study recommended using the instruments in diverse undergraduate and graduate students and using the results for formal and independent education in NI to enhance the nursing competency.

The TIGER summit defined the necessary skills for direct care bedside nurses including computer literacy, informatics literacy, and informatics management skills (DuLong, 2008). However, very few studies found in the literature were performed in academic settings by examining either nursing faculty or students with the purpose of curriculum development and not much has been done at the bedside. Hunter, McGonigle, and Hebda (2013) identified the lack of a research-based NI competency list or assessment tool for nurses and noted the gap in NI competency development. The development of a valid and reliable assessment tool is necessary for beginner and experienced nurses at the bedside.

Developing a standardized NI assessment tool pertinent to bedside nurses in a hospital environment is vital. NI knowledge and skills need to be assessed at a novice to expert level based on Benner's novice-to-expert theory to advance new nurses in their skill sets. Based on the available existing evidence in the literature, lack of NI competencies at bedside will be addressed by this DNP QI by developing a standardized

NI assessment tool in order to support NI practices at the bedside. The method of the NICAT development for bedside nurses was based on the Hunter, McGonigle, and Hebda (2013) study that developed a valid and reliable NI competency self-assessment online tool in the academic setting for faculty and students.

Staggers, Gassert, and Curran published the first research-based master list of NI competencies in 2001. These authors identified NI competencies in computer skills, informatics skills, and informatics knowledge for four levels of nursing practice including beginning nurse, expert nurse, informatics specialist, and informatics innovator. Nurses at the bedside were included in beginning and experienced levels. The TIGER action plan focused on bedside nurses and recommended the creation of a professional nursing model that supports NI competency and integrates NI competency into professional development (Schleyer, Burch, & Schoessler, 2011). This study explained the translation of NI competency into the professional nursing practice model with the application of Benner's Dreyfus model of Skill Acquisitions and how NI competencies were applied in stages in context of novice to expert model.

Conceptual Model and Theoretical Framework

Benner's Dreyfus Model of Skill Acquisition

This project used Patricia Benner's Dreyfus model of skill acquisition as its core conceptual model. This model provides a framework to guide nurses through the process of professional growth and development (Benner, 1984). Although Benner's theory encompasses nursing domain functions and interventions, the Dreyfus model of skill acquisition is applied in the field of administration, education, and research (McEwen & Wills, 2011). Skill acquisition literature is traced back to the investigations of artificial

intelligence and has been successfully used in knowledge assessment, professional development activities, and acquiring new knowledge and skills. The Dreyfus model of skill acquisition is also applicable to role development, role transition, and provides an exclusive model to study skill attainment (Ramsburg & Childress, 2012).

Benner's model outlines nursing skill acquisition from novice, advanced beginner, competent, proficient, on to expert (Benner, 1984). The principal concepts of the model are "competency, skill acquisition, experience, clinical knowledge, and practical knowledge" (McEwen & Wills, 2011, p. 223). The NICAT was developed to assess the baseline competency and skill of computer literacy, informatics literacy, and informatics management skills of nurses at these five stages of the skill acquisition model. NI competencies in each category would be stratified based on the novice to expert model. Schleyer, Burch, and Schoessler (2013) included novice level competency during orientation, advanced beginner level skills within three months of hire, and a competent level at one year. Proficient and expert levels were defined as part of professional growth and development and were not required to maintain employment. NI skills at the competent level were identified as requirements to nursing practice in order to deliver care safely and efficiently.

The Schleyer, Burch, and Schoessler (2011) study explained a nursing practice initiative that ensured the use of the informatics system, supported clinical decision-making, optimized workflow, and improved communication between the care team in an acute care institution. The authors defined computer and informatics management skills for the CIS, implementation, evaluation, and ongoing professional development of informatics competencies for the bedside nurses and organizational processes. Schleyer,

Burch, and Schoessler (2011) described the novice level as learning the tools and thinking like a nurse. The advanced beginner nurse is beginning to apply knowledge and clinical judgments in delivering care. A competent nurse can use the tools and reason through problems familiar with the patient population. A proficient nurse can use all tools, has experience to recognize a pattern of patient conditions, and anticipate patient needs. An expert nurse, in addition to all the above, has the vision to compose a team, look beyond the current moment, analyze system issues, and seek continuous improvements in practice. These authors stressed the importance of the competency assessment, identifying individual learning objectives and leadership support for bedside nurses. Bedside nurse must attain and maintain NI competency to strengthen clinical decision, to enhance the patient experience, and to improve patient outcome.

Based on the Staggers, Jassert, and Curran (2001) study, the ANA categorized nursing informatics competencies in four educational levels of practice: beginning, experienced, informatics specialist, and informatics innovator (ANA, 2008). Benner's model consists of novice, advanced beginner, competent, proficient, and expert levels. Benner applied the Dreyfus model of skill acquisition to nursing (Gentile, 2012). A self-assessment tool, the NICAT, was developed through this DNP QI to measure nurses' perceived NI competencies based on Benner's theory.

Conceptual Model

RLCM (1999) was utilized for the NICAT tool development process. RLCM was derived from the literature exploration related to evidence-based practice (EBP), research utilization, and change theory (Rosswurm, & Larrabee, 1999). This six-step EBP model facilitated a shift from the current traditional method of "one size fits all" NI education

practice to a competency-based education based on the need assessment evidence. This model guided the project through the entire process of change implementation with a need assessment in order to sustain the change in practice. The RLCM has been tested in acute care clinical settings to facilitate implementation of evidence-based change into practice (White & Dudley-Brown, 2012).

The RLCM (1999) is based on assessing and evaluating the need for change, linking the problem with an intervention, gathering and synthesizing the best evidence, designing the change, implementing and evaluating, and sustaining the change in practice. Utilizing this model, the need for change was assessed by discussing with stakeholders, collecting information about current practice, synthesizing the available research studies and identifying the problem. The problem was linked to a potential intervention using the standardized classification system and language. Identification of intervention of developing a self-assessment tool included literature review, critiquing evidence, synthesizing best evidence, and assessment of feasibility and value. The project plan included proposed changes, needed resources, a plan for an implementation process, and defined outcomes. The NICAT was evaluated by experts and stakeholders. Based on the last stage of the conceptual model, the tool was endorsed to stakeholders with the recommendation of implementing and integrating the instrument as a baseline assessment for the bedside nurses and new hires. The implementation of the model is scheduled to occur after I have graduated from my DNP program.

Summary

This section presented a scholarly review of the literature exploring the current nursing workforce, need for NI competencies, and the RLCM that the QI project was

based on. The literature review also included Benner's Dreyfus model of skill acquisition and how this model was utilized in the translation of NI competency into professional nursing practice.

Section 3: Methodology

Introduction

The purpose of this Doctor of Nursing Practice (DNP) quality initiative (QI) project was to develop a nursing informatics competency assessment tool (NICAT). The use of such a tool will ultimately be used to provide nurses with a tailored educational plan for nursing informatics (NI) competencies that include computer skills, informatics literacy, and informatics management. A pilot study using this tool is scheduled for implementation at the study site after my graduation from DNP program.

I led the tool development process with the support of a multidisciplinary team that included a project mentor, clinical nursing members, educators, stakeholders, and experts in the field. The purpose of this section is to explain the project plan including project design, method, and testing of the tool's validity. This section also presents the project approach including the method of tool development, content validations, and evaluation by experts and stakeholders, as well as the plan for a pilot study after graduation. Furthermore, this section explores the competency assessment categories that are applicable to bedside nurses in computer literacy, informatics literacy, and informatics management skills based on the American Nurses Association (ANA) standards (2008) and the Technology Informatics Guiding Education Reform (TIGER) Summit recommendations (2009).

Project Design/Method

The NICAT was developed and evaluated by a multidisciplinary team including stakeholders, bedside nurses, and experts gathered to determine the acceptability and applicability of the content. I modified the assessment tool based on evaluation and

content review feedback received from the team in three rounds. The completed tool includes questions to assess computer literacy, informatics literacy, and nursing informatics management skills. The NICAT assesses psychomotor use of technological equipment and computers, electronic health record, and nursing informatics skills. The construct of the NICAT draws on the Benners' Dreyfus model of skill acquisition and assesses competency at the beginner and experienced level in NI. Questions pertaining to the informatics specialist and informatics innovator levels were not included in this tool since the intent of this tool was to assess the NI competency of nurses at the bedside.

A 5-point Likert scale was used for all responses:

- 1 - novice, not competent;
- 2 - advanced beginner, somewhat competent;
- 3 - competent;
- 4 - proficient, very competent; and
- 5 - expert (see Figure 2).

The questions in the NICAT were developed based on the TIGER recommendations and literature review. Additionally, the information from face-to-face discussions with clinicians and leaders in specialties, sit down sessions, clinical experience, and previous health information technology (HIT) implementation experiences was also used to guide the tool development.

Benner's Dreyfus Model of Skill Acquisition					
Self-Report of Perceived Competency level	1 - Not Competent	2 - Somewhat Competent	3 - Competent	4 - Very competent	5- Expert

Figure 2. Construct of NICAT based on Benner's Dreyfus model of skill acquisition.

Content Validation

The NICAT was validated by three groups: experts on the nursing informatics team at the study site; the Department of Education, Practice, and Research team; and the hospital's Clinical Outcome Department. Reliability refers to the accuracy and consistency of the data acquired in a study and internal consistency, and is a widely used parameter in nursing research (Polit & Beck, 2012). Assessing reliability and validity are necessary steps in tool development. I assessed internal consistency and reliability by designing the NICAT to measure specific NI competencies including computer literacy, informatics literacy, and nursing informatics management skills at the beginning and experienced levels. To improve reliability, more items were initially added in order to tap into the same content and similar responses were eliminated during the second session. The stability of the NICAT will be evaluated by assessing the reliability of the tool by test-retest method in the future. The NICAT was administered twice to the same nurse at different occasions and the scores obtained for the items were the same, as suggested by Polit and Beck (2012).

Validity assesses the degree to which a designed tool properly evaluates gathered data (Polit & Beck, 2012). Clarity, relevance, and appropriateness of the item were rated during the content validation and expert review. Item analysis for questions in the tool was rated on the scale of 1 to 5 for relevance:

- 1 - irrelevant,
- 2 - slightly relevant,
- 3 - moderately relevant,
- 4 - very relevant, and
- 5 - extremely relevant.

Revision, deletion, and addition were done under the guidance of the experts. A smaller group of experts from nursing education and nursing informatics validated the revised set of items and the items in the tool were rated for relevancy by item analysis. Items rated at an average of 3 and above were included in the tool. Content validity was enhanced by using direct quotes from experts, face-to-face discussions, and comments.

The next step for this project is to administer the tool to more bedside nurses in a pilot to assess the construct validity of the tool. Fully testing a new instrument and conducting a validation is a full study requiring a larger sample pool (Polit & Beck, 2012). As a result, pilot testing is scheduled to commence at the study site after my DNP program graduation.

Pilot Project Analysis

After my graduation, the NICAT tool will be administered to bedside nurses at the study site as a pilot study with institution research board (IRB) approval from the institution. This pilot study's data collection will include demographic information such

as age range, educational level, time in profession, and gender. Data will be analyzed to identify nurse's competency levels, after which the NICAT and pilot study information will be presented to:

- nursing leadership;
- nurse recruitment;
- the Department of Practice, Education and Research; and
- the CNS group.

This presentation will include recommendations to integrate NICAT into the study site's the hiring process, orientation for new graduates, and new HIT training.

Summary

End user satisfaction and confidence in using HIT and NI are essential for improving the quality of care, ensure patient safety, and reduce healthcare costs. Assessing nurses' computer and informatics literacy is vital in order to provide an education that is tailored to nurses from various levels of educational preparation and demographic areas. This section addressed the process of the NICAT development, project timeline, content review, and evaluation.

Section 4: Findings, Discussion, and Implications

Introduction

The purpose of this Doctor of Nursing Practice (DNP) quality initiative (QI) project was to develop a nursing informatics competency self-assessment tool. The use of such a tool will ultimately provide nurses with a tailored educational plan for nursing informatics (NI) competencies that includes computer skills, informatics literacy, and informatics management.

The overall goal of this QI project was to support NI practices at the bedside by providing an education that is tailored to individual nurses' educational needs by developing a standardized, evidence-based nursing informatics competency assessment tool (NICAT). The objectives of the DNP project was to develop an evidence-based NICAT that assesses nurses' computer literacy, informatics literacy, and informatics management skills applicable to patient care at the bedside based on the American Nurses Association (ANA) standards (2008) and the Technology Informatics Guiding Education Reform (TIGER) recommendations (2009). The tool developed for this project was also validated for acceptability and applicability of the items by a team of experts in NI, the education department, and bedside nurses at the study site. This section explains the process of tool development, project timeline, evaluation, and content review for clarity, relevance, and appropriateness of the tool to the bedside nurses.

Evaluation/Findings and Discussion

This QI project of NICAT development utilized a formative evaluation. Verifying the applicability of the NICAT and ensuring acceptability of the tool to the target populations were the essential steps of program planning and evaluation, as noted by

Hodges and Videto (2011). I developed the project timeline in a Gantt chart starting from the literature review to the project completion phase (Figure 3).

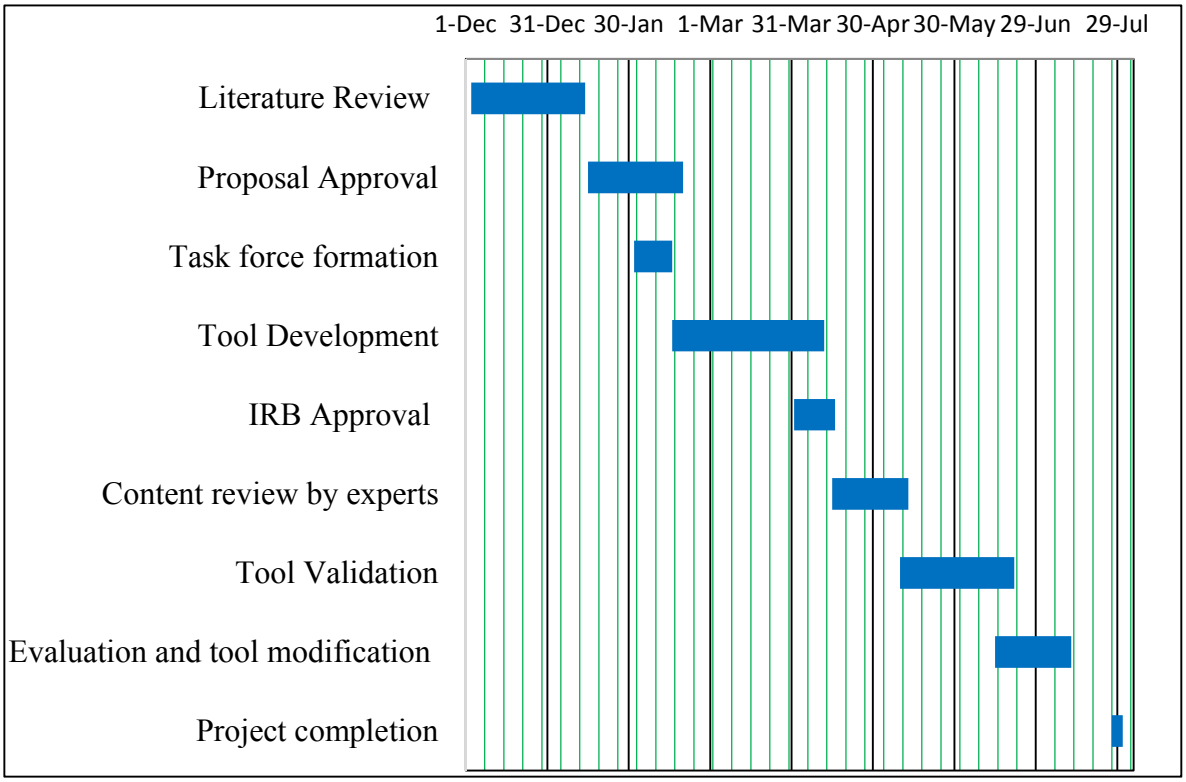

Figure 3. The project timeline in Gantt chart format.

This evaluation included five major components, as advised by White & Dudley-Brown (2012): the project goals, outcome, structure and process, barriers and limitations, and sustainability of the project. The formative evaluation of NICAT development occurred during the planning phase with specific evaluation questions. The biggest strength of a formative evaluation is the integration of ongoing evaluation into the entire lifespan of a project including goals, implementation, and sustainability of the program (Miake-Lye et al., 2011). Evaluation of the NICAT development started during the first step of Rosswurm and Larrabee's conceptual model (RCLM) assess and evaluate the need for change and continued throughout the six steps. The project evaluation timeline

was developed with evaluation questions and rationales based on the RLCM (see Appendix A).

In order to meet the objective of developing an evidence-based NICAT and content analysis of the tool, clinical and content experts were invited to participate on a voluntary team that I led. I initiated the tool development project after Institutional Review Board (IRB) approval from Walden University was granted (Appendix B), and pursued the project with the support of a project mentor, members from clinical nursing, educators, and NI experts. I met with the Vice President of Patient Care Services at the study site and obtained written permission of cooperation. I also discussed the project design and approach with the study site IRB, which decided that this QI project did not have to go through the IRB process. IRB approval will be required in future for the pilot study that I will conduct after the graduation.

I sent out study invitations in person and through email to selected clinical, informatics, and educational experts for 60-minute sessions at the study site. The invitation included a brief overview of the project, project goal, and agenda. Although participation was voluntary, I selected the invitees based on their expertise, commitment to the project, and interest in evidence based practice (EBP). The team as a whole and each individual member were the foundation for the project's success. This effective team was thoughtfully and purposefully designed. The small QI team worked together in an environment with a set purpose, investment in improvement of the NICAT, and interdependence of the team in order to meet the project goals, in alignment with Kelly's (2011) recommendations. The tool was developed, reviewed, and revised by the taskforce and content experts at the study site.

Expert Review and Content Validation

Project Objective 1

Project Objective 1 was to develop an evidence-based NICAT that self-assesses nurses' perceived competency in computer literacy, informatics literacy, and informatics management skills applicable to patient care at the bedside based on the ANA standards and TIGER initiatives. I developed the NICAT questions based on a scholarly review of literature, ANA standards, and TIGER recommendations regarding computer literacy, informatics literacy, and informatics management skills for bedside nurses at the beginning and experienced levels. Three one-hour-long review sessions were then scheduled with the team and QI team members were notified of dates and times through email. I presented an overview of the project, definitions of computer literacy, informatics literacy, and informatics management skills, and the proposed NICAT questions at each review session. The group then discussed the clarity, relevance, and appropriateness of each NICAT item. Following this discussion, I eliminated items with the same content and added questions recommended by content experts.

Project Objective 2

Project Objective 2 was to review the items and questionnaires in the NICAT assessment tool for clarity, acceptability, and applicability to the nurses at the bedside by a team of NI experts, the education department, and bedside nurses at the study site. In order to assess NI competency in bedside nurses, this newly developed NICAT tool needed to be tested in order to determine the acceptability and applicability of the questions to bedside nurses. I presented my proposed NICAT questions to the team to

validate the tool for clarity, acceptability, and applicability through an item analysis during Session 2 (Appendix B).

Selected questions from session 1 were rated for relevancy to patient care at the bedside. Each question was scored on a relevancy scale of 1 to 5 for where:

- 1 - irrelevant,
- 2 - slightly relevant,
- 3 - moderately relevant,
- 4 - very relevant, and
- 5 - extremely relevant.

A total of 27 nurses, ranging from new graduate nurses with no experience to nurses with more than 30 years' of clinical experience and stemming from all specialties were ultimately included in the review group. This review team also included 12 experts consist of clinical nurse specialists, professional development specialists, educators, informatics specialists, and patient care managers.

Session 3 was the final phase of the tool development process. Items rated 3 and above were included in the tool. The group of experts included the Director of Clinical Informatics; the Director of Nursing Practice Education and Research; the Clinical Outcome Coordinator; and the practicum preceptor, all of whom validated the revised item set. Face-to-face discussions, comments, and feedback were also used as formative evaluation in the process of tool development. I used a 5-point Likert scale to elicit a summative evaluation for relevancy. The tool included a 5-point Likert scale to self-assess competency in nursing informatics responses: 1 - novice, not competent, 2 - advanced beginner, somewhat competent, 3 - competent, 4 - proficient, very competent,

and 5 - expert. The revised, validated, and approved final NICAT questions were added to the tool (see Appendix C).

The final total number of questions was 30, with 10 questions in the category of computer literacy, 13 question in informatics literacy, and 7 questions in informatics management skills. The total score possible on the NICAT scale is 150, with a minimum of 30 and maximum of 150. Scoring the questions determines competency levels in NI as per Benner's model. A score of 30 is categorized as novice, a score between 31 - 59 as an advanced beginner, 60 - 89 as competent, 90 - 119 as proficient, and 120 - 150 as expert in NI competencies. NICAT has three sections with the categories of computer literacy, informatics literacy, and informatics management skills, sub scores for each category, and interpretation of the scores (see NICAT in Appendix D). The categorization NI competency based on the scores, Benner's Model, and self-assessment of the NI competencies are shown below (Figure 4).

Benner's Dreyfus Model of Skill Acquisition					
Self-Report of Perceived Competency level	1 – Not Competent	2 – Somewhat Competent	3 – Competent	4 – Very Competent	5- Expert
NICAT Scoring	30	31 – 59	60 – 89	90 – 119	120 – 150

Figure 4. Categorization of competency level based on the scores.

Applicability to Healthcare Practice

Health information technology (HIT) and NI have created a safer working environment for both healthcare professionals and patients in the United States. For example, electronic medical records have helped decrease human errors, reducing overall workload and lowering the burden of storing confidential records safely. The electronic plan of care, bar code medication system, infusion pumps, bedside lab verification, and electronic medication administration records have changed the nursing world and practice at the bedside. Integrating NI and technology into nursing practice and supporting nurses at the bedside have improved patient safety, decreased cost, reduced medical errors, and enhanced quality of care (Ball at al., 2011).

The TIGER Summit in 2006 defined a collective vision in educating nurses to use technology and informatics with the goal of improving patient care delivery (DuLong, 2008). Nursing organizations and healthcare institutions are advocating incorporating ANA standards and TIGER recommendations. In order to transition new nurses into a knowledge based-workforce, training in nursing informatics skill is essential. A baseline assessment is vital in nursing practice and education in order to implement a process of improvement. This process can be accomplished through developing and evaluating training programs, based on basic self-rated competency assessment results. However, there was no available NI competency assessment for nurses at the bedside in the existing nursing literature, and as such, individualized training in NI was not possible. Thus, the development of a validated tool for NI assessment, the NICAT, will be instrumental in filling the gaps in NI training and education tailored to the needs of each individual nurse.

Literature Support

Literature supports the need for developing a nursing informatics assessment tool relevant to patient care at the bedside. Lack of studies at the bedside and the nonexistence of an NI competency assessment tool (Hunter, McGonigle, & Hebda, 2013), as well as the lack of NI competency in bedside nurses and the current "one size fits all" education (Campbell & McDowell, 2011) showed the gap in integrating NI competencies within the current workforce. Campbell and McDowell (2011) noted that community hospital nurses had little or no knowledge in NI based on a self-perceived computer literacy study.

The NICAT, a NI self-assessment tool, was developed to measure nurses' perceived NI competencies based on Patricia Benner's Dreyfus Model of Skill Acquisition (Benner, 1984). Benner's novice-to-expert theory was appropriate for the project of addressing the lack of nursing informatics knowledge and skills in bedside nurses. Self-report of perceived competency has been used as a measure of NI competencies by multiple researchers since direct measures of competencies are time intensive and not feasible with large volumes (Choi & Zucker, 2013; Fetter, 2009; McDowell & Ma, 2007; Yoon, Yen, & Bakken, 2009). Measuring nurses' perceptions in NI skills and knowledge is an important step in creating and evaluating effective educational and training programs.

Implications

Developing and administering the NICAT to bedside nurses to identify the NI educational needs for beside nurses has many policy, practice, and social change effects on institutions, nurses, and systems.

Policy

Providing knowledge and tools to ensure safe patient care and support nurses at the bedside is an ethical responsibility for all healthcare institutions and leaders. Organizations should be responsible for training and supervising the development of staff to provide safe services (Community Tool Box, 2014). NI is a core competency for safe patient care and nursing leaders should be responsible for establishing policies and protocols to support NI practices at the bedside.

As leaders in healthcare, DNP-prepared nurses have greater responsibilities to build consensus by influencing the policy process through advocacy efforts, principled negotiation, and continuous dialogue (Pulcini, & Hart, 2007). Leadership support at the study site is needed to make changes in the new hire policy and NI educational curriculum in order to assess the nurses' self-perceived competencies in NI and implement this assessment tool as part of the new hire orientation process, and evaluation of education and training. The stakeholders are the Director of Nursing Education, Research, and Practice; the Director of Nurse Recruitment; and Clinical Informatics. According to Bigelow et al. (2010), sustainability of any EBP project requires strong leadership, a structured plan for accountability, ongoing education, support, and frequent celebration of success. As strategic system thinkers, APRNs should always plan a program strategically with a business plan that includes a budget. Strategic planning is a periodic check, in which organizations or programs step back and decide the future direction of the institution, set goals and objectives, and assess the acquisition of resources (Kettner, Moroney, & Martin, 2013).

Business planning was a crucial part of the organization's strategic planning and this project was aligned with the organization's plan. The health system strategic plan titled "Leading the Change - Five Years Strategic Plan" is comprised of six priorities: people, biomedical discovery, patient and family centered care, education, integration, and performance (Hopkinsmedicine.org, 2013). In order to be an international leader in healthcare, patient safety, and quality, developing and preparing staff to provide the best care is essential. With restricted payments and healthcare reform, hospitals are under pressure to improve their performances by benchmarking against their competitors. In order to succeed in this venture, leaders need programs that are timely, comparable, clear, consistent, and achievable (Wolfskill, 2013). Supporting NI practice at the unit level was timely, as the institution and the health system as a whole were preparing to implement a more comprehensive clinical informatics system across five entities. The project was well supported by the leadership because of the need and timeliness of the project.

Social Change

APRNs play an important role in transforming healthcare systems to achieve cost effective care with better patient outcomes. Doctoral level knowledge and skills are essential for creating social change, and implementing system-wide changes to make healthcare systems safe, and efficient. Implementing electronic health record (EHR) and information systems plays a crucial role in providing safe care, improving patient outcomes, and reducing healthcare costs (Ball et al. 2011).

Awareness in finance and understanding of the economic impact of nursing practice is of utmost importance for leaders in healthcare today. The Centers for Medicare and Medicaid (CMS) have revised their approach to hospital reimbursement

through the Hospital Value-Based Purchasing (VBP) Program. The reimbursement is centered on outcomes, patients' experience, and best clinical practices instead of provided services. The Joint Commission (TJC) partners with CMS to ensure that healthcare organizations are providing the best clinical practices (Kelly, 2011). In accordance with the TJC and CMS, this project will improve NI confidence for nurses at the bedside, therefore increasing efficacy in patient care and safety by elevating nurses' knowledge, skill, and ability to provide higher quality of care at all levels. A pilot study and assessment of the current nursing force was proposed to the vice president of the organization. The proposal was approved and I am planning for a pilot study after the graduation. Resources and funds are required for the follow-up after the baseline assessment and for education based on the needs assessment.

Healthcare in the United States is in crisis. While more than 16% of the country's gross domestic income is spent on healthcare, over 48 million Americans are still not insured or are underinsured (Todd & Sommers, 2012). There is, therefore, a significant fiscal pressure to decrease the cost of healthcare while at the same time improving the safety and quality of care at every level. As a result, HIT, health enabling technology (HET), and e-health are becoming solutions to address the healthcare burdens of chronic diseases and healthcare costs worldwide (Knight & Shae, 2014). NI competencies are becoming an essential tool for bedside nurses to work in an e-health environment. Although developing and administering the NICAT to assess new hires and individualize training costs money to healthcare organizations initially, this cost should be examined based on the return on investment (ROI), safety, and quality of care and costs averted.

The financial analysis for the pilot study of the project will be proposed to the Vice President Patient Care services after the graduation with a cost-benefit financial analysis method. Cost-benefit analysis will measure the effectiveness of the project by calculating cost of the pilot study and juxtaposing this cost with the decreased unsafe patient conditions, improved patient outcome, staff retention, and decreased turnover. Cost-benefit analysis is frequently utilized in new interventions or treatments that may cost money initially but will generate revenue over time (Milte, Ratcliffe, & Crotty, 2013).

The benefit of any program should be determined by cost-benefit analysis and ROI analysis. A cost-benefit analysis is an evaluation of alternative measures compared to cost and benefit in monetary terms (Walsh, Levin, Jaye, & Gazzard, 2013). Although cost-benefit analysis should be a guiding parameter, patient safety must remain utmost priority. The financial implications of not addressing the identified problem, and implications of NI incompetent nurses, will be discussed with the stakeholders**.** Informatics is a core competency for nurses. Therefore, preparing a workforce in NI is crucial in providing safe patient care (Boykins, 2014). The implications of unprepared nurses at the bedside include unsafe patient conditions, poor outcome, increased nursing turnover, and a nursing shortage. With the national nurse turnover rate of 13% to 75% (Trepanier et al., 2012) and the estimated turnover cost over $64,000 per nurse (Jones & Gates, 2009), a system that supports patient safety and effective healthcare such as NICAT and educational programs based on the individual needs are non-negotiable at the term of cost.

Practice

As the healthcare system constantly increases in complexity, nursing practice is rapidly progressing with advanced technology influencing the nursing practice. NI is becoming a popular and demanding field that integrates information technology to patient care. NI is a core competency for nurses and preparing the nursing workforce with the necessary knowledge, skills, and attitude is crucial to providing safe patient care (Boykins, 2014). NI is a "specialty that integrates nursing science, computer science, and information science to manage and communicate data, information, knowledge and wisdom in nursing practice" (American Nurses Association, 2008, p. 99).

A baseline self-assessment is vital in preparing and evaluating effective educational programs for nurses from different levels of educational preparation and various demographical backgrounds. The implications of unprepared nurses in NI at the bedside include unsafe patient conditions, poor outcome, nursing burnout, increased nursing turnover, and nursing shortages. End user satisfaction and confidence in using health information system would depend on the informatics knowledge, computer skills, educational support, and readiness to learn (Campbell & McDowell, 2011). With the estimated cost of turnover over $64,000 per nurse, the deficit for healthcare organizations adds one million dollars every year (Jones & Gates, 2009). According to the Bureau of Labor Statistics projection for 2012-2022, the nursing shortage will reach 1.05 million by 2022 (AACN, 2014). Supporting the nursing workforce in NI practices at the unit level is vital for patient care, safe nursing practices, nurse retention, and improved nursing confidence in HIT. NICAT is instrumental in assessing NI competency so nurses can be

better prepared through education and training as well as in evaluation of training programs for their efficiency by pre and post assessment.

Research

Nursing has evolved throughout history, with multiple faces and multiple roles. From the era of Florence Nightingale to the current day, nursing has grown into a profession with many theories, frameworks, technologies, specialties, and researches. This same pattern has proven true in the health sciences and overall healthcare. Healthcare is now in a revolutionary era of e-health due to advances in information, telecommunication and networking technologies (Victor, & Shao-Wei, 2013). NI is a relatively new field of nursing and the pace of NI integration to the nursing field has been slow. Although NI integration is recommended by ANA, professional organizations, and the TIGER initiatives a lack of research studies still exists, especially at the bedside. As in any nursing field, research in nursing informatics studies the science of nursing, computer technology, and information science to enrich the quality of nursing practice (Carrington at al., 2013). Development of the NICAT and assessment of NI competency is a starting point for NI research at the bedside. Further studies and pilot tests are needed to validate the NICAT and analyze the results among nurses from various demographics, different settings, and educational curriculums.

Strength and Limitations of the Project

The strengths of this QI project were the organizational forces such as readiness for new clinical information system (CIS), EPIC implementation, stakeholder engagement, leadership support, and ongoing evaluation process. There was a huge interest in incorporating NI competencies into the bedside at all levels. This interest

included stakeholders and bedside nurses due to the implementation of EPIC in the health system level. Frontline nurses were the subject matter experts and involved in building content for the organization. There are two types of forces involved in change, “driving forces and restraining forces” (McEwen & Wills, 2011, p. 337). Driving forces facilitate new movement whereas restraining forces have the opposite effect on the change process.

The project was evaluated continuously to assess the significance of the project to the nursing force at the clinical site. Assessing program plans, modifying the process, verifying applicability, and ensuring acceptability of the program to nurses at the bedside were essential phases of project implementation. Content review of the NICAT from a team of experts in nursing informatics, education, and clinical experts were the most powerful driving force of the project.

The barriers to this project were the lack of research studies on how to assess the bedside nurses' NI competencies and the lack of a precise definition for required NI competencies for bedside nurses in the literature. A limitation of the NICAT itself was that this tool was developed based on the need of an acute care setting and might not be generalizable to all healthcare settings. As such, the tool needs to be validated within large, diverse nurse populations in other clinical settings. Based on the Glasgow and Emmons categories of barriers, the biggest restraining forces to implement the project will be time demand, competing priorities, and limited resources. Strong leadership, mentors, and a clear organizational vision for creating change were the driving forces for knowledge translation (White & Dudley-Brown, 2012).

Recommendations

Further studies should include testing of this newly developed instrument and evaluation of the content validity with a larger number of nurses from various backgrounds and different settings. In addition, the results should be used for formal and independent education in NI to enhance competency in nurses. Pilot testing will commence after the graduation of this DNP candidate. Further publication will focus on the quantitative analysis of data from the pilot study, including reliability estimates.

Analysis of Self

As Scholar

DNP-prepared nurses play important roles in all four areas of scholarship that Glassick (2000) expanded upon: discovery, integration, application, and teaching. To serve the current, complex patient population and healthcare system, preparation and education are necessary for an APRN at the highest level in order to meet challenges and function in multiple roles. Although DNP-prepared nurses are involved in all four areas of scholarship, as a practice-focused doctorate prepared nurse, this CNS's main role will be in the scholarship of integration and application. Since the Institutes of Medicine called for the need for evidence-based practices and quality improvement, the necessity for more practice based doctorates has increased (Zaccaginini & White, 2011).

This DNP project enabled me to realize the contributions of an APRN to the profession. As Robert and Pape (2011) explained, "nursing scholars are present in many shapes and sizes, and are often unaware how they have improved patient care" (p. 44). The contributions of nursing professionals and EBP were introduced during NI training, managing change, and implementing new practices. The DNP project of supporting NI

practice at the unit level and the NICAT fits right into the nursing scholarship of integration and application.

As Practitioner

A CNS is an APRN whose function is to improve outcomes in patient care (Zaccagnini & White, 2011). CNSs play very important roles in system change, providing cost effective care and quality improvement. The CNS is an expert in clinical practice, patient education, research, and consultation and influencing all the three spheres of practice: patient care, nursing, and systems. My role as a CNS is multifaceted, wearing multiple hats in everyday practice. Many are involved in the scholarship of integration and application of new knowledge and best practices in collaboration with other disciplines. I am involved in a multitude of clinical practice issues, performance improvement projects, organizational leadership councils, and policy development boards. This DNP project has enriched every aspects of my role.

As Project Manager

My role as the project manager played a crucial role in building an effective and energetic team. The project required collaboration with nursing informatics, nursing education, management, recruitment, and administration. Establishing a multidisciplinary task force and involving clinical staff, end users, and stakeholders from the beginning was also necessary. A team approach stressing mutual understanding, articulation of individual reasoning with respect, and facilitation of open dialogue were utilized during the team building stage. As a transformational leader, I empowered the team to work together and attain the goal. Transformational leadership is an effective framework for nursing leadership. Transformational leadership places nurses as key leaders in attaining

optimum patient outcomes and workplace improvement (Hutchinson, & Jackson, 2013). Transformational leadership skills were helpful for me in sharing the vision, inspiring others, collaborating with a multidisciplinary team, and bringing the team together. I followed the five successful practices of transformational leadership: model the way, inspire a shared vision, challenge the process, enable others to act, and encourage the heart (Kouzes & Posner, 2007). As the project leader, I created standards of excellence by setting good examples, providing education in NI competency, and changing the practice standards based on evidence.

Professional Development

The DNP degree is designed to a practitioner with all the necessary tools needed to navigate complex systems while fully utilizing the most current available knowledge (Zaccaginini & White, 2011). This DNP project provided me with skills in decision-making, change- management, leadership, collaboration, and knowledge. These leadership qualities were directly related to the DNP Essential II: Organizational and system leadership for QI and systems thinking and Essential IV: Information Systems/Technology and Patient Care Technology for the improvement and transformation of healthcare (AACN, 2006). I had the opportunity to witness and experience exceptional leadership qualities at the system level in supporting staff during crisis, financial struggle, and budget cuts. During the field experience and practicum hours, I learned theory application, integration of best practices, and uncompromised patient safety despite problems with a new CIS transition. This accomplishment was achieved through unwavering leadership and collaborative efforts which help ensure positive impacts and ultimately lead to a better system. Most of all, as a DNP student I

had multiple opportunities to make system changes through dialogue, policy changes, interdisciplinary collaboration, and networking to be a CNS prepared at the doctoral level.

Summary

NI competency is a core competency for nurses at the bedside to provide safe quality patient care. The nursing workforce should be equipped with the knowledge and skills in NI in order to perform their duties safely and efficiently. The goal of this project was to support NI practices at the bedside by providing an education that is tailored to individual nurses' educational needs by developing a standardized, evidence-based NICAT. This project started with the objectives of developing and reviewing a standardized self-assessment tool to support NI practices at bedside to provide an education that will be tailored to individual nurses' educational needs. Assessing bedside nurses' self-confidence and competency in computer literacy, informatics literacy, and informatics management skills is necessary in order to develop and evaluate education that is tailored to nurses with different levels of educational preparation, skill sets, and various demographics. As such, the NICAT was developed and reviewed by the experts.

The NICAT is a self-assessment tool that measures nurses' self-perceived competency and categorizes nurses into competency levels ranging from novice to expert. Lack of studies at the bedside and the nonexistence of an NI competency assessment tool for bedside nurses (Hunter, McGonigle, & Hebda, 2013), as well as the lack of NI competency in bedside nurses and the current "one size fits all" education (Campbell & McDowell, 2011) showed the gap in integrating NI competency to the current workforce. This DNP project was instrumental in filling the gap in literature on NI competency

assessment in nurses by developing an evidence-based NICAT and content review validated by experts and stakeholders.

Section 5: Scholarly Product

Introduction

The purpose of this Doctor of Nursing Practice (DNP) quality initiative (QI) project was to develop a nursing informatics competency self-assessment tool. The use of such a tool will ultimately provide nurses with a tailored educational plan for nursing informatics (NI) competencies that includes computer skills, informatics literacy, and informatics management.

The overall goal of this project was to support NI practices at the bedside by providing an education that is tailored to individual nurses' educational needs by developing a standardized, evidence-based nursing informatics competency assessment tool (NICAT). The objectives of the DNP project was to develop an evidence-based NICAT that assesses nurses' computer literacy, informatics literacy, and informatics management skills applicable to patient care at the bedside based on the American Nurses Association (ANA) standards (2008) and the Technology Informatics Guiding Education Reform (TIGER) recommendations (2009). This objective was achieved by developing and validating the NICAT for acceptability and applicability by a team of NI experts, the education department, and the bedside nurses at the study site. The purpose of this section is to explain the dissemination process of the DNP project and the scholarly product at the organizational and community level.

In order to share the scholarly product generated from this DNP project, I discussed this project and the NICAT multiple forums at the organizational level at the study site. The NICAT was presented to managers, professional development staff, clinical informatics team, and the CNS team, as well as in staff meetings at the unit level.

I also presented the NICAT to the hospital's Vice President of Patient Care and its Divisional Directors.

In order to share the project with a broader community, I submitted the project abstract to the 2015 Academy of Medical-Surgical Nurses (AMSN) convention that was held from September 23–27 in Las Vegas (see Appendix E). The abstract was accepted for a poster presentation and was placed into the AMSN online library (see Appendix F). I gave a PowerPoint presentation (Appendix G) and showed a poster (Appendix H) at this convention.

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Appendix A: Evaluation Timeline Based on the Rosswurm and Larrabee Conceptual Model (RLCM)

RLCM - six steps	Evaluation question	Rationale	Timeline
1. Assess and evaluate the need for change in practice	Is there evidence for a lack of NI competencies in the bedside nurses?	The need for practice change was assessed by stakeholders, collecting information about current practice, comparing the available research, and reviewing the literature.	10/1/14 - 11/1/14
2. Link the problem with an intervention	How can we move to competency based education?	A standardized classification system and assessment would facilitate a shift from the current traditional practice of "one size fits all" education practice to a competency-based education based on the need assessment and evidence.	11/2/14 - 12/1/14
3. Synthesize the Best Evidence	What is the evidence?	A scholarly literature search was conducted using the databases of Cumulative Index to Nursing and Allied Health Literature (CINAHL), Medline, ProQuest, PubMed and Cochrane review. The multidisciplinary team reviewed the literature critically, and weighed the evidence in conjunction with the project lead DNP student.	12/2/14 - 01/20/15
4. Design the practice change	How can we design a standardized	The NICAT was designed based on reviewing literature, critiquing	02/01/15 -

	competency assessment tool?	evidence, synthesizing best evidence, and assessing the feasibility and value.	03/14/15
5. Implement and evaluate	How can we evaluate this newly designed tool?	The NICAT was reviewed and evaluated by experts and stakeholders.	03/15/15 - 06/30/15
6. Integrate and maintain	How can we integrate and sustain the practice change and utilize the tool?	The tool was presented to the stakeholders with the recommendation of implementing and integrating the tool as a baseline assessment for the bedside nurses and new hires. The pilot study will begin after the graduation of the learner.	07/01/15 - 08/15/15
Notes. Nursing Informatics Competency Assessment Tool (NICAT)			

Appendix B: Institutional Review Board (IRB) Approval Letter

Dear Ms. Rahman,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Supporting Nursing Informatics Practice at the Unit Level: Nursing Informatics Competency Assessment Tool (NICAT) Development," meets Walden University's ethical standards. Our records indicate that your project does not include the types of activities that require a traditional IRB review. This Confirmation of Ethical Standards (CES) has an IRB record number of 05-08-15-0404697.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the IRB materials that have been submitted as of this date. This includes maintaining your current status with the university and this confirmation of ethical standards is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your project, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for projects conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with these policies and procedures related to ethical standards in research.

When you submitted your IRB application, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to you.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained at the IRB section of the Walden web site or by emailing irb@waldenu.edu:

http://researchcenter.waldenu.edu/Application-and-General-Materials.htm

Please note that this letter indicates that the IRB has approved your project. You may not move forward with your project, however, until you have received the **Notification of Approval to Conduct the Project** e-mail. Once you have received this notification by email, you may move forward with your project.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

http://www.surveymonkey.com/s.aspx?sm=qHBJzkJMUx43pZegKlmdiQ_3d_3d

Sincerely,

Libby Munson

Research Ethics Support Specialist

Office of Research Ethics and Compliance

Email: irb@waldenu.edu

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Appendix C: Questionnaire Item Analysis

Competency assessment of computer literacy, informatics literacy, and informatics management skills in Nurses at the Bedside

For each item, please indicate your score of relevance to care at the bedside
on the scale of 1 to 5, where:
1-irrelevant, 2-slightly, 3-moderate, 4-very, 5-extremely relevant
These questions are based on the Technology Informatics Guiding Educational Reform (TIGER) recommendations & ANA Standards

Computer Literacy Questionnaire

Computer literacy skills include the psychomotor skills to use computer tools, as well as knowledge of basic hardware and software functionality; these are all required for effective bedside nursing (Schleyer, Burch, & Schoessler, 2011).

1. Recognize the basic components of the computer system such as mouse, screen, and workstation.

1 2 3 4 5

2. Use of telecommunication tools such as electronic mail and facsimile (fax)

1 2 3 4 5

3. Use of remote communication tools such as adobe connect, skype, and Lync

1 2 3 4 5

4. Create, rename, move, and delete files using computer operating systems such as Microsoft Windows.

1 2 3 4 5

5. Use word processing function such as save, categorize documents, copy, paste, and delete.

1 2 3 4 5

6. Navigate computer operating systems to access installed application and choose active printer.

1 2 3 4 5

7. Use software to create presentations such as Microsoft PowerPoint.

1 2 3 4 5

8. Use external devices such as USB flash drive, digital camera, CD-ROM.

1 2 3 4 5

9. Perform basic computer systems' troubleshooting such as checking power source, rebooting computer, and printing.

1 2 3 4 5

10. Manage computer systems security to protect data, devices, and passwords.

1 2 3 4 5

Informatics Literacy Questionnaire

Informatics literacy skills are the nurses' abilities to recognize the need for information and to retrieve, evaluate, and use information for patient care appropriately (Schleyer, Burch, & Schoessler, 2011).

1. Use the Internet to locate and download items of interest.

1 2 3 4 5

2. Navigate the electronic health record.

1 2 3 4 5

3. Review and acknowledge patient orders in the electronic health record.

1 2 3 4 5

4. Develop and document care plan in electronic health record.

1 2 3 4 5

5. Review point of care data such as urine dipstick, glucose check, and hemoglobin meter to make timely decisions.

1 2 3 4 5

6. Respond appropriately to alerts from clinical decision-making tools such as algorithms, best practice alerts.

1 2 3 4 5

7. Conduct literature searches in the accessible proprietary database systems such as CINAHL, EBSCO, etc.

1 2 3 4 5

8. Use medication administration tools such as barcode medication verification and scanning.

1 2 3 4 5

9. Use of medication dispensing system such as Pyxis and Omni cell.

1 2 3 4 5

10. Collect and document patient data relevant to care such as vital signs, height, and weight.

1 2 3 4 5

11. View trended electronic documentation to understand the effectiveness of nursing interventions.

1 2 3 4 5

12. Use systems to assist with admission and discharge process.

1 2 3 4 5

13. Continue patient care documentation and patient identification when computer system is down.

1 2 3 4 5

Informatics Management Questionnaire

Information Management Skills are applying the data to support clinical decisions, documentation, ensuring data integrity, confidentiality, and security. Information management skill is the knowledge to articulate the value of information system in improving patient safety, quality, and outcome (Schleyer, Burch, & Schoessler, 2011).

1. Protect confidential patient data by logging out, suspending sessions, and password protection.

1 2 3 4 5

2. Use information technology as a primary means of patient safety such as bedside laboratory verification, barcode scanning etc.

1 2 3 4 5

3. Use electronic health record and other clinical information system as per organizational policy for documentation.

1 2 3 4 5

4. Use electronic communication with colleagues, patients, or other departments.

1 2 3 4 5

5. Find information stored in the clinical information system to guide patient care such as standardized care plans and guidelines.

1 2 3 4 5

6. Use nursing data for improving practice and for clinical decision-making.

1 2 3 4 5

7. Use data and statistical reports for unit based quality improvement initiatives and practice evaluation.

1 2 3 4 5

- Please suggest any additional items you feel would improve the assessment of nursing informatics

Appendix D: Nursing Informatics Competency Assessment Tool (NICAT)

For each statement, report your perceived competency on a scale of 1 to 5

Self-Competency Assessment	Not Competent	Somewhat Competent	Competent	Very Competent	Expert
I. Computer Literacy Assessment					
1. Recognize the basic components of the computer system such as mouse, screen, and workstation.	1	2	3	4	5
2. Use of telecommunication tools such as electronic mail and facsimile (fax).	1	2	3	4	5
3. Use of remote communication tools such as adobe connect, Skype, and Lync.	1	2	3	4	5
4. Create, rename, move, and delete files using computer operating systems such as Microsoft Windows.	1	2	3	4	5
5. Use word processing function such as save, categorize documents, copy, paste, and delete.	1	2	3	4	5
6. Navigate computer operating systems to access installed application and choose active printer.	1	2	3	4	5
7. Use software to create presentations such as Microsoft PowerPoint.	1	2	3	4	5
8. Use external devices such as USB flash drive, digital camera, CD-ROM.	1	2	3	4	5
9. Perform basic computer systems troubleshooting such as checking power source, rebooting computer, and printing.	1	2	3	4	5
10. Manage computer systems security to protect data, devices, and passwords.	1	2	3	4	5
Total					
Computer Literacy Total Scores (Out of 50)					
II. Informatics Literacy Assessment					
11. Use the Internet to locate and download items of interest.	1	2	3	4	5
12. Navigate the electronic health record.	1	2	3	4	5
13. Review and acknowledge patient orders in the electronic health record.	1	2	3	4	5
14. Develop and document care plan in electronic health record.	1	2	3	4	5
15. Review point of care data such as urine dipstick, glucose check, and hemoglobin meter to make timely decisions	1	2	3	4	5
16. Respond appropriately to alerts from clinical decision-making tools such as algorithms, best practice alerts.	1	2	3	4	5
17. Conduct literature searches in the accessible proprietary database systems such as CINAHL, EBSCO, etc.	1	2	3	4	5
18. Use medication administration tools such as barcode medication verification and scanning.	1	2	3	4	5
19. Use of medication dispensing system such as Pyxis and Omni cell.	1	2	3	4	5

20. Collect and document patient data relevant to care such as vital signs, height, and weight.	1	2	3	4	5
21. View trended electronic documentation to understand the effectiveness of nursing interventions.	1	2	3	4	5
22. Use systems to assist with admission and discharge process.	1	2	3	4	5
23. Continue patient care documentation and patient identification when computer system is down.	1	2	3	4	5
Total					
Informatics Literacy Total Scores (out of 65)					
III. Informatics Management skills Assessment					
24. Protect confidential patient data by logging out, suspending sessions, and password protection	1	2	3	4	5
25. Use information technology as a primary means of patient safety such as bedside laboratory verification, barcode scanning, etc.	1	2	3	4	5
26. Use electronic health record and other clinical information system as per organizational policy for documentation.	1	2	3	4	5
27. Use electronic communication with colleagues, patients, or other departments.	1	2	3	4	5
28. Find information stored in the clinical information system to guide patient care such as standardized care plans and guidelines.	1	2	3	4	5
29. Use nursing data for improving practice and for clinical decision-making.	1	2	3	4	5
30. Use data and statistical reports for unit based quality improvement initiatives and practice evaluation.	1	2	3	4	5
Total					
Informatics Management Skill Scores (out of 35)					

Nursing Informatics Competency Scores

Categories	**Scores**	**Total Scores**
Computer Literacy		
Informatics Literacy		
Informatics Management Skills		
Nursing Informatics Competency Score Total		

Nursing Informatics Competency Scoring Interpretation:

Novice: 30. Advanced Beginner: 31-59. Competent: 60-89. Proficient: 90-119. Expert: 120 -150.

Appendix E: 2015 Academy of Medical-Surgical Nurses (AMSN) Convention Abstract

Author: Alphonsa Rahman, MSN, APRN-CNS, CCRN

Participants: Alphonsa Rahman, MSN, APRN-CNS, CCRN; Joyce Maygers, DNP, RN; Joan Moon, RN, Ed. D.

Presenter: Alphonsa Rahman, MSN, APRN-CNS, CCRN

Title: Supporting Nursing Informatics Practice at the Unit Level: Nursing Informatics Competency Assessment Tool (NICAT) Development

Background: Nursing informatics, (NI) is a core competency for bedside nurses and preparing a workforce with essential knowledge and skills is crucial to providing safe patient care. However, integration of NI into a nursing workforce with different educational backgrounds, diverse informatics skill sets, various years of experience, and different generations has posed challenges. With no baseline competency assessment, developing and evaluating education and training programs that meet individual needs and provide maximum benefits are difficult. An extensive literature search failed to find an existing NI assessment tool relevant to nurses at the bedside. ***Objective*:** The goal of this project was to support NI practices at the bedside by developing a standardized NICAT that assesses computer literacy, informatics literacy, and informatics management skills applicable to the patient care at the bedside based on the ANA (2008) standards and TIGER recommendations (2009). ***Method:*** The tool development process was led by a multidisciplinary team that included a project mentor, members from clinical nursing, educators, clinical nurse specialists, and NI experts. NI competency questions were developed based on scholarly literature review and were validated for acceptability and applicability. Questionnaire items were evaluated through the relevancy

scale for clarity, relevance, and appropriateness of the tool for the bedside nurses. A self-assessment tool that measures nurses' self-perceived competency level using a 5-point Likert scale was developed and validated by the content experts. The NICAT categorizes nurses into novice to expert level in NI competency based on their scores, in accordance with Benner's model. This quality improvement (QI) project was based on the Rosswurm and Larrabee framework. ***Outcome:*** The NICAT was developed and validated by content experts. ***Significance*:** The NICAT will assist in preparing a workforce that is ready to deliver healthcare safely, efficiently, and cost-effectively by assessing nurses' baseline competency and developing educational strategies based on individual needs. The NICAT will also be utilized for evaluation of education and training programs. This tool has the potential to become an assessment and evaluation tool for all nurses during the new hire process, orientation, education, and clinical informatics system implementation.

Appendix F: Acceptance Letter from AMSN

AMSN
Academy of
Medical-Surgical Nurses
Compassion. Commitment. Connection.

June 2015
Dear Primary Poster Presenter: Ms. Rahman,

Congratulations! The Academy of Medical-Surgical Nurses (AMSN) is pleased to inform you that your abstract entitled ***"Supporting Nursing Informatics Practice at the Unit Level: Nursing Informatics***" has been accepted for poster presentation at the 24th Annual Convention in Las Vegas, NV. We look forward to the presentation of your findings during the poster sessions. Below are some important details that relate to the presenting of your poster during the convention.

Poster Construction/Poster Viewing
Poster Size and Display Hanging posters utilize one (1) side of a 4' high x 8' wide cork board for a hanging poster. You will need to bring appropriate hanging devices (thumb tacks, push pins, etc.) or any other supplies needed to secure the display. There will be NO TABLES PROVIDED as we have a large number of posters and will not have space to accommodate tables for you. The program book you receive when you sign in at the convention registration desk will include the display number for your poster. Please place your poster on the cork board in the exhibit hall with the corresponding display number.
Poster Viewing Times/Poster Assignment Poster presenters are asked to be in attendance with their posters during the opening of the Exhibit Hall on Thursday evening. Poster presenters should also be in attendance with their poster as follows depending on the display number provided to them in the onsite program book: 1. Thursday, September 24th, 6:30 pm - 8:45 pm: all poster presenters should be in attendance 2. Friday, September 25th, 9:15 am - 11:15 am: even-numbered posters should have presenters in attendance (ex. 2, 28, 76) 3. Friday, September 25th, 1:45 pm - 3:30 pm: odd-numbered posters should have presenters in attendance (ex. 3, 27, 63)
Poster Set Up and Removal Posters may be **set up** on Thursday, September 24, from 12:00 pm (noon) to 4:00 pm in Rivoli. Posters may be **removed** on Friday, September 25, from 3:30 pm to 3:30 pm, in Rivoli. (Please do not remove your poster prior to 3:30 pm on September 25th.) Any posters not removed by the presenters will be discarded by the decorating company. AMSN does not take responsibility for the disposing of your poster materials.

Required Forms and Registration
Biographical data/conflict of interest disclosure forms All presenters for your poster must complete a biographical data and conflict of interest disclosure form, which is supplied with this letter IF we did not already receive the forms from you at the time of your abstract submission. Any presenter who does not supply the forms will not be listed in the program materials and is not considered a poster presenter. The primary presenter will receive the form and should provide it to presenters for return to Kristina Moran, Education Coordinator. These forms should be returned by **July 24, 2015**, to

kristina.moran@ajj.com.

Registration

Presenters are responsible for all expenses incurred and must pay the applicable registration fee for the convention. **Primary poster presenters** receive a $100 discount off the cost of full convention registration and should be registered for the entire convention.

Please mark on your registration form that you are a primary poster presenter. Co-presenters will not be entitled to the discount.

If you are an AMSN member, this discount automatically will be reflected when you use your login/password to sign into the online registration site.

If you are not an AMSN member, you would be eligible for the discount once you created a login/password for the site. Your profile information is tied into the email address we have on file for you, so if you have any issues or questions about the process, please let Kristina Moran know (kristina.moran@ajj.com).

Room Reservation

You are responsible for making your own room reservation directly with the hotel for the convention: Paris Las Vegas. Please visit our website at http://convention.amsn.org for more information/to make reservations online or call 877-603-4389 and request a room under AMSN. Reservations must be received by August 24, 2015, in order to be guaranteed the special convention room rate.

Online Poster Display Following Convention

Post-Convention Display

Poster presenters have the opportunity for post-convention virtual display of their poster in the AMSN Online Library (http://www.amsn.org/library). Posters will be available for online viewing for one (1) year.

This display is a valuable tool for presenters to share their current research and findings. Medical-surgical colleagues may wish to view material they missed during the convention.

Posters are displayed in Adobe Acrobat pdf format, but can be submitted in any kind of readable file format (.jpeg, .doc, .ppt, .doc). Please send your poster file to Kristina Moran for posting in the AMSN Online Library.

Display Authorization

We must have your authorization to make the poster available for viewing in the AMSN Online Library. You are not required to display your poster online.

X☐ Yes, I would like my poster presentation to be available in the AMSN Online Library for display following the convention and grant my permission to AMSN to post this material.

Alphonsa A Rahman Electronic signature of primary poster presenter

7/11/15 Date of authorization

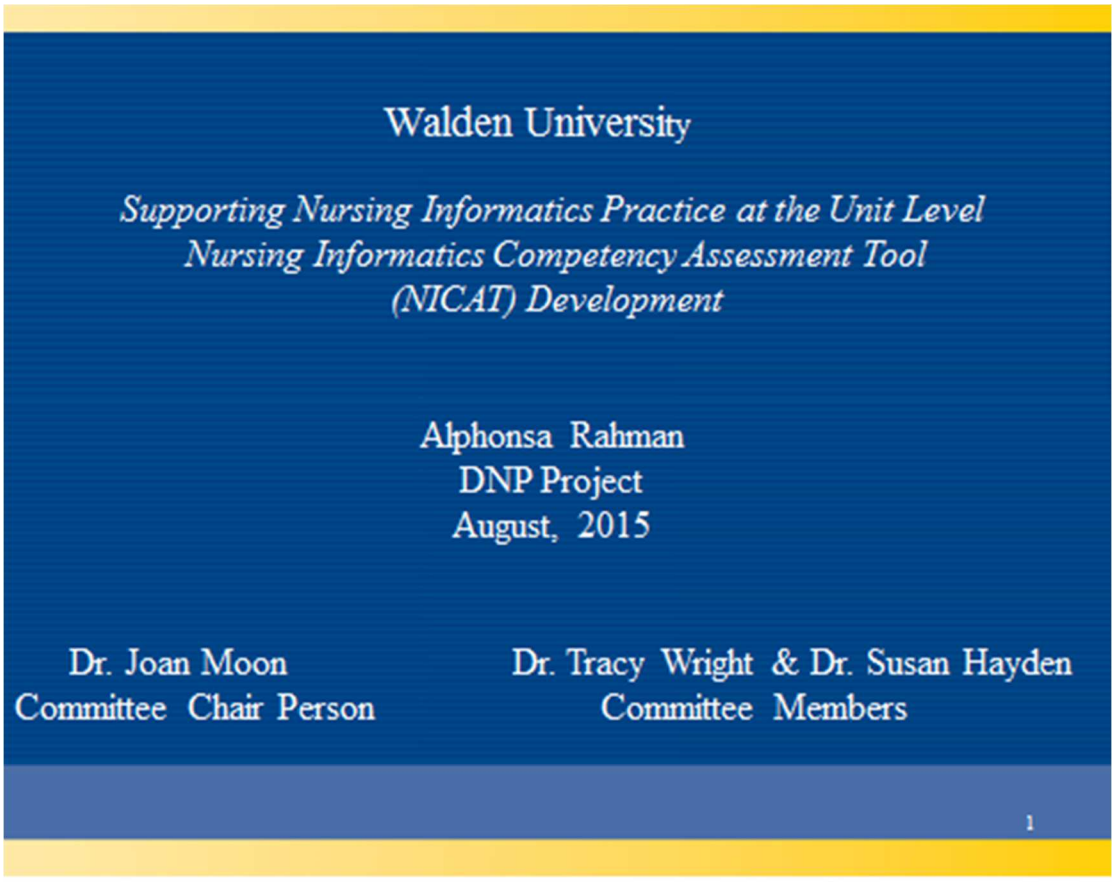
Sincerely,

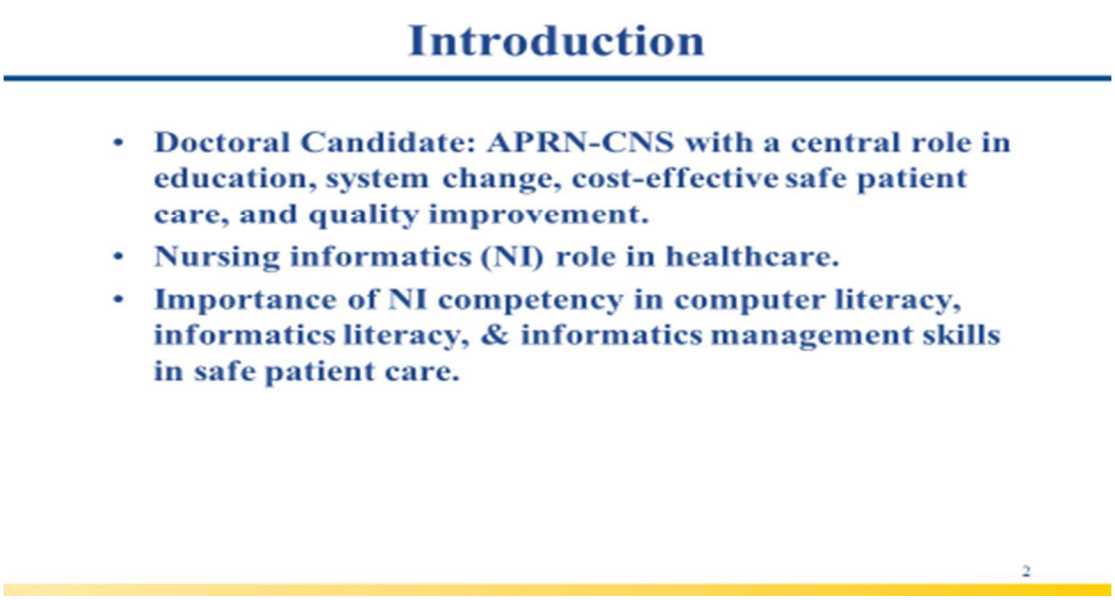
Rosemarie Marmion

Rosemarie Marmion, MSN, RN-BC, NE-BC

Education Director

Appendix G: PowerPoint Presentation





Background

- Challenges in planning NI education & training programs due to lack of baseline knowledge assessment.
- Unable to develop and evaluate a curriculum that meets individual needs.
- "One size fits all" training approach.
- Uneven NI competencies in new graduates & gaps in NI integration into nursing education.

3

Problem Statement

- Lack of NI competency assessment for bedside nurses.
- Challenges of integrating NI into a nursing workforce with different educational backgrounds, diverse informatics skill sets, various years of experience, and different generations.
- An extensive literature search failed to find an NI competency tool applicable to nurses at the bedside.

4

Purpose

- The purpose of this QI project was to develop a standardized NICAT for nurses at the bedside based on scholarly literature review, content review by experts, and clinical nurses.

5

Project Goals

- The goal was to support NI practices at the bedside in providing an education that is tailored to individual nurses' educational need by developing a standardized evidence-based NICAT that assess nurses' perceived NI competency.

6

Project Objectives

- Development of NICAT for nurses that self assesses nurses' perceived competency in computer literacy, informatics literacy, & informatics management skills applicable to patient care at the bedside based on the ANA (2008) standards & TIGER recommendations (2009).
- Content validation by expert review for acceptability, clarity, & applicability of the items and questionnaire to clinical nurses.

7

Assumptions/Limitations

Assumptions:

- Nurses are not assessed for NI competencies.
- Healthcare organizations should provide education & training based on nurses' educational needs.

Limitations

- May not be generalizable to all healthcare settings.
- May not be applicable to bedside nurses who are prepared with advanced degrees.

8

Significance

- 125 million people with at least one chronic condition (Nash, Reifsnyder, Fabius,& Pracilio, 2011).
- Healthcare arena: Health information technology (HIT), health-enabling technologies (HET) & electronic health (e-health) solutions (Knight & Shae, 2014).
- Pressure to cut healthcare costs, improve access to care & patient safety/quality.
- Nursing programs and entry levels.
- Varying NI curricula.
- Current nursing workforce.
- ANA and TIGER recommendations.

10

Scholarly Evidence

- Current Nursing Workforce: Educational backgrounds & demographics.
- TIGER initiatives did not operationalize competency into an instrument.
- Gap in NI education & nursing workforce in US is not ready for EBP related to lack of NI knowledge (Hart, 2008).
- NI competency evaluations in nursing programs were rarely studied (McDowell & Ma, 2007).
- Hunter, McGonigle, & Hebda (2013) developing an assessment tool for students & faculty.

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Scholarly Evidence

- Lack of studies at the bedside & nonexistence of NI competency assessment tool (Hunter, McGonigle, & Hebda, 2013).
- Lack of NI competency in bedside nurses & the current "one size fits all" education (Campbell & McDowell, 2011).
- Self-perceived computer literacy study: Community hospital nurses had little or no knowledge in NI (Campbell & McDowell, 2011).

Gap: Lack of NI assessment tool for nurses relevant to patient care at the bedside.

12

Rosswurm & Larrabee's Conceptual Model (RLCM)

Adapted RLCM for NI practice at the bedside

1. Assess: need for change in practice	2. Link: problem intervention and outcomes	3. Synthesize: best evidence	4. Design: practice change	5. Implement and evaluate: change in practice	6. Integrate and maintain: change in practice
Lack of NI competency Need for competency-based education NI competency varies in nurses	Need for standardized classification system and assessment Traditional "one size fits all" education	Scholarly literature review Critical review of evidence	Development of NICAT based on ANA & TIGER standards & available evidences	Evaluation from experts, leaders, and clinical nurses Future pilot study	Integrate NICAT as a baseline assessment tool newly hired nurses

13

Theoretical Framework

Benner's Dreyfus Model of Skill Acquisition

Benner's Dreyfus Model of Skill Acquisition					
Self-Report of Perceived Competency level	1 - Not Competent	2 - Some what Competent	3 - Competent	4 - Very competent	5 - Expert

13

Project Design/Method

- The NICAT was developed & evaluated by a multidisciplinary expert team.
- Assesses nurses' computer literacy, informatics literacy, & NI management skills in bedside nurses.
- A 5-point Likert scale categorizes competency level in NI as per Benner's model based on the scores.

Self-Competency Assessment	Not competent	Somewhat competent	Competent	Very competent	Expert
Self Report of Perceived Competency	1	2	3	4	5

14

Content Validation

- Clarity, relevance, and appropriateness of the item were rated during the review and content validation in 3 sessions.
- Items analysis for questions was rated on a 1 to 5 relevancy scale: 1 - irrelevant, 2 - slightly, 3 - moderate, 4 - very, 5 - extremely relevant.
- Items rated three and above were included in the tool.
- Revisions, deletions and additions under the guidance of the experts.
- Categorization of competency level in NI as per Benner's model based on the scores.

16

Categorization of competency level based on the scores.

Benner's Dreyfus Model of Skill Acquisition	Novice	Advanced Beginner	Competent	Proficient	Expert
Self-Report of Perceived Competency level	1 - Not Competent	2 - Somewhat Competent	3 - Competent	4 - Very Competent	5 - Expert
NICAT Scoring	30	31 - 59	60 - 89	90 - 119	120 - 150

16

NICAT

For each statement, report your perceived competency on a scale of 1 to 5

Self-Competency Assessment	Not Competent	Somewhat Competent	Competent	Very Competent	Expert
I. Computer Literacy Assessment					
1. Recognize the basic components of the computer system such as mouse, screen, and workstation.	1	2	3	4	5
2. Use of telecommunication tools such as electronic mail and facsimile (fax).	1	2	3	4	5
3. Use of remote communication tools such as adobe connect, Skype, and Lync.	1	2	3	4	5
4. Create, rename, move, and delete files using computer operating systems such as Microsoft Windows.	1	2	3	4	5
5. Use word processing function such as save, categorize documents, copy, paste, and delete.	1	2	3	4	5
6. Navigate computer operating systems to access installed application and choose active printer.	1	2	3	4	5
7. Use software to create presentations such as Microsoft PowerPoint.	1	2	3	4	5
8. Use external devices such as USB flash drive, digital camera, CD-ROM.	1	2	3	4	5
9. Perform basic computer systems troubleshooting such as checking power source, rebooting computer, and printing.	1	2	3	4	5
10. Manage computer systems security to protect data, devices, and passwords.	1	2	3	4	5
Total					
Computer Literacy Total Scores (Out of 50)				18	

NICAT continued

II. Informatics Literacy Assessment					
11. Use the Internet to locate and download items of interest.	1	2	3	4	5
12. Navigate the electronic health record.	1	2	3	4	5
13. Review and acknowledge patient orders in the electronic health record.	1	2	3	4	5
14. Develop and document care plan in electronic health record.	1	2	3	4	5
15. Review point of care data such as urine dipstick, glucose check, and hemoglobin meter to make timely decisions	1	2	3	4	5
16. Respond appropriately to alerts from clinical decision-making tools such as algorithms, best practice alerts.	1	2	3	4	5
17. Conduct literature searches in the accessible proprietary database systems such as CINAHL, EBSCO, etc.	1	2	3	4	5
18. Use medication administration tools such as barcode medication verification and scanning.	1	2	3	4	5
19. Use of medication dispensing system such as Pyxis and Omni cell.	1	2	3	4	5
20. Collect and document patient data relevant to care such as vital signs, height, and weight.	1	2	3	4	5
21. View trended electronic documentation to understand the effectiveness of nursing interventions.	1	2	3	4	5
22. Use systems to assist with admission and discharge process.	1	2	3	4	5
23. Continue patient care documentation and patient identification when computer system is down.	1	2	3	4	5
Total					
Informatics Literacy Total Scores (out of 65)				18	

NICAT continued

III. Informatics Management skills Assessment					
24. Protect confidential patient data by logging out, suspending sessions, and password protection	1	2	3	4	5
25. Use information technology as a primary means of patient safety such as bedside laboratory verification, barcode scanning, etc.	1	2	3	4	5
26. Use electronic health record and other clinical information system as per organizational policy for documentation.	1	2	3	4	5
27. Use electronic communication with colleagues, patients, or other departments.	1	2	3	4	5
28. Find information stored in the clinical information system to guide patient care such as standardized care plans and guidelines.	1	2	3	4	5
29. Use nursing data for improving practice and for clinical decision-making.	1	2	3	4	5
30. Use data and statistical reports for unit based quality improvement initiatives and practice evaluation.	1	2	3	4	5
Total					
Informatics Management Skill Scores (out of 35)					

19

Nursing Informatics Competency Scoring & Interpretation

Categories	Scores	Total Scores
Computer Literacy		
Informatics Literacy		
Informatics Management Skills		
Nursing Informatics Competency Score Total		

Scoring Interpretation:

Novice: 30. **Advanced Beginner: 31-59.** **Competent: 60-89.**

Proficient: 90-119. **Expert: 120 -150.**

20

Pilot Study

- Pilot study with bedside nurses in an acute care hospital in future.
- IRB approval from the facility.
- Data collection: Competency assessment & demographics.
- Further publication will focus on the quantitative analysis of data from the pilot study, including reliability estimates.

22

Future Plan

- Include NICAT in developing and evaluating successful educational strategies for clinical nurses in NI.
- Integrate NICAT in the hiring process, nurses' orientation, and new HIT training.
- Further studies for the content validity with a larger number of nurses from various backgrounds and different settings.

21

Implications for Social Change

- Safe patient care, better outcomes, & reduced costs.
- APRN as a change agent addressing the gap in nursing practice.
- Improve nurse satisfaction, self confidence in HIT & maximize the use of HIT in healthcare.
- Policy/ practice changes & research

- DNP Essentials of the AACN standards (AACN, 2006).
  - DNP Essential II:

Organizational and system leadership for QI & systems thinking.

  - DNP Essential IV:

Information system/technology to improve patient care & transform the healthcare.

25

References

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

Supporting Nursing Informatics Practice at the Unit Level: Nursing Informatics Competency Assessment Tool (NICAT)

Alphonsa Rahman, MSN, APRN-CNS, CCRN; Joan Moon, EdD, CNM; Joyce Maygers, DNP, RN

Background

- Lack of baseline knowledge assessment
- Challenges in planning NI education & training programs.
- Unable to develop and evaluate a curriculum that meets individual needs.
- "One size fits all" training approach.
- Uneven NI competencies in new graduates & gaps in NI integration into nursing education.

Problem Statement

- Lack of NI competency assessment for nurses on new hire.
- Challenges of integrating NI into a nursing workforce with different educational backgrounds, diverse informatics skill sets, various years of experience, and different generations.
- An extensive literature search failed to find an NI competency tool applicable to clinical nurses.

Project Goals

- To support NI practices at the bedside in providing an education that is tailored to individual nurses' educational needs.

Project Objectives

- Development of NICAT that self assesses nurses' perceived competency in computer literacy, informatics literacy & informatics management skills applicable to patient care at the bedside based on the ANA (2008) standards & Technology Informatics Guiding Educational Reform(TIGER) recommendations.
- Content validation by experts in NI, nursing education, & clinical nursing for acceptability, clarity & applicability of the questionnaire to clinical nurses.

Significance

- 125 million people with at least one chronic condition (Nash, Reifsnyder, Fabius & Pracilio, 2011).
- Healthcare arena: HIT, health-enabling technologies (HET) & electronic health (e-health) solutions (Knight & Shae, 2014).
- Pressure to cut healthcare costs, improve access to care, & patient safety/quality.
- Nursing programs and entry levels.
- Varying NI curricula.
- Current Nursing workforce.
- ANA and TIGER recommendations

Rosswurm & Larrabee's Conceptual Model (RLCM)

1. Assess: need for change in practice	2. Link: problem intervention and outcomes	3. Synthesize: best evidence	4. Design: practice change	5. Implement and evaluate: change in practice	6. Integrate and maintain: change in practice
Lack of NI competency Need for competency-based education NI competency varies in nurses	Need for Standardized classification system and assessment	Scholarly literature review Critical review of evidence	Development of NICAT based on ANA & TIGER standards & available evidences	Evaluation from experts, leaders, and clinical nurses Future pilot study	Integrate NICAT as a baseline assessment tool newly hired nurses

Categorization of NI Competency Level Based on Benner's Model

Benner's Dreyfus Model of Skill Acquisition	Novice	Advanced Beginner	Competent	Proficient	Expert
Self-Report of Perceived Competency level	1 - Not Competent	2 - Somewhat Competent	3 - Competent	4 - Very Competent	5 - Expert
NICAT Scoring	30	31 - 59	60 - 89	90 - 119	120 - 150

NICAT at a glance

Self-Competency Assessment	Not Competent	Somewhat Competent	Competent	Very Competent	Expert
I. Computer Literacy Assessment					
1. Recognize the basic components of the computer system such as mouse, screen, and workstation.	1	2	3	4	5
2. Use of telecommunication tools such as electronic mail, and facsimile (fax).	1	2	3	4	5
3. Use of remote communication tools such as adobe connect, Skype, and Lync.	1	2	3	4	5

Methods/Review

- Clarity, relevance, & appropriateness of the items rated during the content review & validation using a 1 to 5 relevancy scale
- Items rated 3 and above were included in the tool.
- Revisions, deletions & additions under the guidance of the content experts.
- Categorization of NI competency level based on the scores as per Benner's model.

Implications

- Safe patient care, better outcomes, & reduced costs by individualized training
- Improve nurse satisfaction, self confidence in HIT & maximize the use of HIT in healthcare
- APRN as a change agent addressing the gap in nursing practice.
- Policy & practice changes and research

References

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

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