



ASSESSING KNOWLEDGE OF EVIDENCE-BASED PRACTICE AMONG NURSES

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ABSTRACT

Evidence-based practice (EBP) is used worldwide to improve the quality of patient care to provide cost-effective care. EBP is a mandate for nursing practice combining individual clinical judgment with available expertise to generate a positive outcome for the patient. Investigators have documented that nurses have varying degrees of confidence and knowledge about EBP. The purpose of this project was to improve knowledge of EBP among registered nurses (RNs). The ACE Star Model of Knowledge transformation was used as the conceptual model. The key project question was to assess the level of knowledge and confidence about EBP among RNs in a cardio-thoracic (CT) intensive care unit (ICU) before and after viewing a computer-based EBP educational module. The quasi-experimental project used a 1 group pretest–posttest design. In the pretest, a convenience sample ($n = 29$) completed ACE-ERI competencies to self-assess confidence in EBP and an EBP Knowledge Test. The participants then viewed an EBP educational module based on major steps in EBP practice. Afterward, they repeated both tests. As a group, the paired t test showed a significant increase in scores for the ACE-ERI competencies between pretest and posttest scores. Using the Wilcoxon Signed Rank Test, knowledge scores increased but were not statistically significant. These findings suggested that there was improvement in both confidence and knowledge supporting the use of the educational module. In order to effectively implement EBP, nurses require knowledge to assess the quality and evidence for improved patient outcome. These results can guide administrators and educators to enhance RN EBP by the use of educational modules to improve the quality of patient care creating positive social change.

KEYWORDS: Evidence-based practice (EBP), ACE-ERI, Wilcoxon.

INTRODUCTION

Evidence-based practice (EBP) is recognized globally. The translation of evidence into practice has a role in ensuring quality care, patient safety, and improved patient outcomes (Smith & Donze, 2010). Nursing care is advancing to the point where it is not enough to deliver treatment interventions. Rather, it is essential that it provide significant role in ensuring quality care, essential that it provide quality care using the best available evidence. EBP, therefore, is emerging as a widely accepted paradigm for professional nursing practice. Numerous researchers claim the fact that EBP fosters quality health care, improved health outcomes, and reduced health care costs (Melnik, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012; Melnik, Gallagher-Ford, Long, & Fineout-Overholt, 2014; Pravikoff, Tanner, & Pierce, 2005). In addition to the three benefits listed above, EBP can also reduce rising health care costs, assist changes in professional roles with updated

current knowledge to identify clinical problems. It incorporate new evidence into clinical practice reduce medication errors, implement the best care knowledge for patient care for the proper clinical decision making and patient outcomes (Rycroft-Malone & Bucknall, 2010; Stevens, 2013; White & Dudley-Brown, 2012).

The Institute of Medicine (IOM) reported in *To Err is Human* (2000) that health care in the United States was in a poor state. The report has since become a rallying call for evidence-based, knowledge-driven improvements in health care in order to improve more desirable outcomes. The EBP movement was accelerated by the publication of two landmark reports, *Crossing the Quality Chasm* (IOM, 2001), and *Future of Nursing* (IOM, 2011). They have become key components in the redesign of health care. IOM also sponsored a landmark summit on education in the health professions and recommended five competencies for nurses: (a),

providing patient-centered care, (b), applying QI principles, (c), working in interprofessional teams, (d), using EBP, and (e) using health information technologies (IOM, 2003, p. 49).

EBP is a systematic approach to problem solving that enables RNs to use the best evidence available for clinical decision-making in order to provide the best patients outcomes (Pearson, Field, & Jordan, 2007). As health care and nursing practice advance to accommodate today's demanding health care needs, the 2005-2007 Research and Scholarship Advisory Committee of the nursing society Sigma Theta Tau International (2008), described evidence-based nursing as an incorporation of the best evidence available, nursing expertise, and the values and preferences of the individuals, families, and communities who are served .To deliver care based on evidence, nurses need to know how to access, evaluate, integrate it. Evidence-based interventions facilitate optimized patient outcomes that have the greatest chance of success (Melnyk & Fineout-Overholt, 2011).

Problem Statement

EBP means integrating best evidence with clinical expertise and patient values (Sackett, Strauss, Richardson, Rosenberg, & Hynes, 2000). Implementing EBP is challenging, because it depends on the willingness of the individual RN and senior leadership to embrace and promote practice in a changing health care environment that is based on research (Titler, 2010). According to Pravikoff et al. (2005), RNs are not ready for EBP due to the gaps in their information literacy and computer skills, their limited access to high quality information resources, and their attitudes towards research. Since nurses graduate from different academic programs, there is typically a gap between training and practice, and this creates variations in their knowledge. As a result how they practice, is based on what they learned in school and on their shared experiences in the clinical settings (Melnyk & Fineout-Overholt, 2011). There are several obstacles to implementing EBP in nursing practice: lack of education about EBP in academic settings, lack of knowledge among nurse leaders, attitudes about EBP, use and future use of EBP, are multiple barriers (Melnyk & Fineout-Overholt, 2011; Shirey, 2006; Gerrish, Ashworth, Lacey, & Baily, 2008). A reduction in the gap between theory, practice, and EBP skills is essential for all nurses. Because EBP integrates the best research evidence with clinical expertise and patient preference (Melnyk & Fineout-Overholt, 2011; Sackett et al., 2000), it is the key for QI (IOM, 2001)

Every day, nurses participate in patient care actions and interventions that lead to questions about the evidence supporting their use. The IOM (2011) has set a goal by 2020, 90% of all health care decisions in the United States will integrate evidence-based research with clinical expertise and patient values, and that nurses will participate in learning and research activities as much as

feasible The IOM Future of Nursing report (2011) focuses on knowledge in clinical decision-making, quality, interpersonal team development, and EBP to transform health care. The recommendations focus on knowledge, quality, and new functions in nursing to lead interprofessional teams to improve health care delivery (Stevens, 2013).

EBP is a problem-solving approach to clinical care that integrates the meticulous use of current evidence from well-designed studies, clinical expertise, and patient values and preferences. Fundamental to EBP is the nurse's ability to practice critical thinking, clinical judgment, and clinical synthesis (Malloch & Porter-O'Grady, 2006; Melnyk & Fineout-Overholt, 2011; Sackett et al., 2000; White & Dudley-Brown, 2012). EBP is a process that begins with research and ends with practice. With advancement in EBP, will come documented practice changes, practice guidelines, utilization patterns, advanced use of informatics, and workforce retention (Melnyk, et al, 2014). As EBP integrates clinical expertise with external clinical evidence, nurses will better understand the systematic approaches to rational decision-making to facilitate best practices (Newhouse, Dearholt, Poe, Pugh, & White, 2005).

According to the IOM report of 2001, *Crossing the Quality Chasm*, the gap between the health care we have and the care we could have is in actuality a chasm. Ineffective, costly, and harmful health care led to the EBP movement, to redesign health care to be efficient, cost effective, timely, and patient-centered by using evidence from best practices (Stevens, 2013; White & Dudley-Brown, 2012). The key factors acknowledged for all health care professionals to bridge the quality chasm (IOM, 2003) are provision of patient-centered care, multidisciplinary team work, evidence-based care, quality improvement, and the utilization of informatics (Stevens & Staley, 2006). Nurses are crucial members of the EBP team because of their clinical knowledge and expertise; thus, successful implementation of EBP, creative thinking, and advancement in technology can promote health care quality. EBP, a process in which clinical research findings or best available evidence is enhanced by clinical expertise and patient preferences and incorporated into practice settings, is widely promoted internationally (Smith & Donze, 2010).

Increasing demand for patient safety, quality, and cost-effective care requires a change in healthcare and the transformation of best evidence into practice. EBP is a major health care initiative worldwide, recommended by the IOM, the Joint Commission, and the American Nurses Credentialing Center, which awards Magnet status as essential to practice by healthcare (AACN, 2008). Nursing education has a vital role in preparing future nurses for integrating best evidence and practice. It is crucial to educate RNs to acquire EBP knowledge and competencies in order to deliver safe, high quality,

patient centered care. In an era of health care reform, an acceleration of EBP is essential to improve quality health care and patient outcomes, along with lower health care cost (Sredl, Melnyk, Hsueh, Ding, & Durham, 2011).

The preparation and education of the nursing workforce is crucial for the success of a new paradigm in health care safety and QI as EBP becomes integrated into practice (Stevens & Staley, 2006). The paradigm shift will take place when nurses begin to think about research results and plan for improvement and the transformation of health care. Adopting the EBP movement will provide a high quality of care, better health outcomes, reduced health care costs, greater nurse autonomy in their practice and greater job satisfaction for nurses ,but preparation for nurses to engage in EBP is limited (Melnyk, Fineout-Overholt, Stillwell, & Williams, 2009). According to White and Dudley-Brown (2012), critical thinking is the foundation for EBP and a systematic search for solutions; a critical appraisal of the most relevant evidence and the evaluation of current practice are needed to answer clinical, educational, or administrative questions.

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Purpose Statement

The purpose of this project is to assess EBP knowledge among nurses in a cardio-thoracic intensive care unit (ICU). The call for nurses to become full partners in redesigning health care emphasizes the potential impact of EBP in nursing (Stevens, 2013). Health care is a complex and it is a rapidly changing industry with advances in technology and research and a growing gap between knowledge and practice (Melnyk & Fineout-Overholt, 2011). EBP represents a paradigm shift that requires nurses to think about research results and better patient care and thus transform health care (Stevens, 2013). Evidence needs to be incorporated into practice to provide effective patient outcomes. Introducing EBP knowledge into a 23-bed cardio-thoracic unit is imminent to identify the nurses' gaps in knowledge about evidence in nursing practice in a cardiology unit as well as how this knowledge can enhance nurses' confidence in clinical decision making.

Project Question and Objectives

The project question for this study was as follows:

Is there a lack of knowledge about EBP process among RNs in cardiothoracic unit?

The project has two objectives

- Assess the level of knowledge and confidence about EBP among RNs) in a CTU after viewing the educational module about EBP.
- Differentiate EBP, quality improvement, and research.

With regard to the first objective, it is important to note that the founder of modern nursing, Florence Nightingale, used statistical evidence to guide policy decisions and health care reform to improve mortality rates (McDonald, 2001). Nightingale used her time and energy to determine the best available evidence (McDonald, 2001). As mentioned before, the IOM established a goal that by 2020, 90% of all health care decisions made in the United States will be evidence-based, with nurses able to practice to the full extent to their education (IOM, 2010). Advancing knowledge and skills in the EBP process will equip nurses to take ownership in their practice and help to transform health care. EBP provides a process for changing practice to improve patient care, but to redesign healthcare, nurses need to embrace EBP as a best clinical practice for 21st century health care (Melnyk, et al, 2014; White & Dudley-Brown, 2012). EBP is a process that nurses can confidently employ to improve patient care because nurses are essential members of the EBP team given their clinical knowledge and expertise (Smith & Donze, 2010). Although EBP improve patient outcomes, EBP mentors are needed to provide continuing education to enhance nurses' EBP knowledge and skills (Melnyk, et al, 2012).

The second objective of this project was to determine the knowledge nurses have to differentiate among the key features of research, EBP, and QI) for providing the best evidence. EBP is the key to QI (IOM 2001) and is defined as the integration of best research evidence with clinical expertise and patient preference (Sackett et al., 2000). QI is the systematic approach to improving specific internal systems, processes, performance, and productivity for optimal delivery of care and optimal patient outcomes. Research is a scientific process that validates and refines existing knowledge. It directly and indirectly influences nursing practice or health systems (Shirey et al., 2011). QI, EBP, and research are interrelated and RNs can avoid confusion with appropriate knowledge of terms (Hedges, 2009).

According to Melnyk and Fineout-Overholt (2011, p11), the EBP process consists of seven steps: Cultivating a spirit of inquiry to know the evidence related to the practice, Formulating a clinical question in PICOT format (patient population intervention or issue of interest, comparison intervention or group, outcome, and

time frame), Searching for and collecting the most relevant best evidence, Synthesizing the evidence to develop recommendations, Integrating the best evidence with one's own clinical expertise, Patient preferences and practice decisions, Evaluating outcomes of the practice decision or change based on evidence and disseminating the outcomes of the EBP decision or change.

Significance and Relevance to Practice

Though there is a spirit of inquiry for EBP, health systems worldwide are moving towards spreading EBP, the baseline knowledge and readiness of nurses need to be determined (Pravikoff et al., 2005).

According to Stevens (2013) new knowledge must be transformed into clinically useful forms and it must be implemented across the health care system. Finally, EBP must be measured in terms of its impact on performance and health outcomes. Traditionally, nurses have used research in clinical setting poorly due to (a) lack of time, (b) lack of understanding of research findings, (c) inability to relate findings to clinical practice, and (d) insufficient power to bring about clinical changes (Upton, 1999). For EBP to be implemented successfully and sustained, it must be adopted by individual providers, microsystems like high performing clinical units, system leaders, and policy makers (Stevens, 2014).

The blueprint for health care redesign was advanced in the IOM (2001) quality chasm report; a key recommendation from the nation's experts was to bridge the chasm between knowledge and practice using EBP. Nurses are challenged to stay current with advanced information to provide the highest quality of care (IOM, 2011). The IOM and the Robert Wood Johnson Foundation strongly recommend that nurses practice to the full extent of their education and achieve higher levels of education and training to meet the competencies required for patient care. To redesign health care, nurses must move out of their comfort zone, and use evidence-based knowledge to care for their patients and their families.

According to Melnyk and Fineout Overholt (2011), EBP is crucial in the overall health care delivery system because it can help reduce escalating health care costs, save time, afford better patient outcomes, and provide nurses with more autonomy in their practice, (which can ultimately lead to greater job satisfaction and increased retention). However, even though EBP as a theoretical framework has the potential to enhance nursing practice, a majority of nurses do not avail themselves of opportunities to find practice information because they have little or no training in using database searches to find evidence for their practice (Bertulis, 2008).

The Quality and Safety Education for Nurses (QSEN) initiative has adapted the IOM competencies to improve quality and safety in the health care system (Cronenwett

et al., 2007). These competencies include patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. Faculty members have addressed the challenge of preparing nurses to improve quality and safety, helping educate nurses to develop EBP competencies and recognize patient preferences and values as part of their clinical expertise (Cronenwett et al., 2007).

To build substantial support for EBP, according to Stevens (2013), requires new evidence forms, new roles, new teams, new practice cultures, and a new field of science. Implementation of a practical approach to EBP should be considered, to assist staff nurses to evaluate evidence and then translate evidence into practice. Time, resources, and support from the nursing leadership is needed, along with collaboration between hospital leaders and academic nursing (Newhouse et al., 2005).

Elements of Evidence-Based Practice

EBP is the integration of best evidence with clinical expertise and patient values (Sackett et al., 2001). The best research evidence is based on patient-centered research studies; clinical expertise requires one's own knowledge and skills to determine each individual patient's unique problems and values, bringing the patient's perspectives into health care decisions (Melnik & Fineout-Overholt, 2011). EBP is the foundation for excellent patient care, quality improvement, and best patient outcome (Burns & Grove, 2010). *Figure X* illustrates the interaction of EBP elements.



Figure 1: The elements of EBP. (Sackett, et al, 2001).

It is Evidence-Based Significance of the Project

This research sought to determine if there is a lack of knowledge regarding EBP process among RNs in cardiothoracic unit. According to Pravikoff et al. (2005), RNs are not ready for EBP due to the gaps in their information literacy and computer skills, their limited access to high quality information resources, and their attitudes toward research. EBP is the integration of best evidence with clinical expertise and patient values (Sackett, et al., 2001). Implementing EBPs is challenging and complex; the success of implementation depends on

individual RNs, senior leadership, and the changing health care arena, which has been averse to embracing and promoting an EBP environment (Titler, 2010).

According to the IOM (2011) by 2020, 90% of all health care decisions in the United States will be evidence-based. To provide a high-quality patient care, nurses need to incorporate evidence into their practice (Newhouse et al., 2005). Evidence can be used for effective and efficient patient care practices such as health care processes, policies and procedures, clinical practice guidelines and administrative practices (Houser & Oman, 2011). The gap between nurses graduating at different levels creates a difference in their knowledge and their practice, their experiences and what is shared in their clinical practice areas. Every day, nurses are involved in actions and interventions that raise questions about the evidence supporting their use. The average time to translate published research evidence into practice takes about 17 years (Balas & Boren, 2000). The shift toward EBP reduces the research-practice gap and improves the quality and safety of patient care. Integrating the principles of EBP can be used as a problem solving framework to the best evidence. According to Melnyk & Fineout-Overholt (2011). Given its effective translation of evidence into practice, EBP can reduce cost, save time and result in better patient outcomes. As noted earlier with the effective practice changes with EBP, patients will get a high quality of care, better health outcomes, reduced health care costs, and nurses will experience greater autonomy in their practice and a higher job satisfaction. (Melnik, et al., 2009).

Implications for Social Change in Practice

Critical thinking is the foundation for EBP and a systematic search for solutions. Critical appraisal of the most relevant evidence and the evaluation of current practice is required to answer clinical, educational, or administrative questions (White & Dudley-Brown (2012). The *Future of Nursing* report focuses on knowledge in clinical decision-making, quality, interpersonal team development and evidence and EBP to transform health care (IOM, 2011). Innovation, creative thinking and advancement in technology can promote health care quality and a positive social change in health care. EBP is widely promoted internationally and it is a process in which clinical research findings or best available evidence is enhanced by clinical expertise, patient preferences and is incorporated into practice settings (Smith & Donze, 2010). In today's complex health care environment, nurses need a comprehensive understanding of the quality and safety issues that affect patient outcomes. To make a social change in the society, nurses need to embrace EBP in their daily practice. The resulting knowledge and competency will transform health care delivery so that it is safer, higher quality, and more cost effective (American Association of Colleges of Nursing [AACN], 2008).

Stevens (2013) suggested that although the impact of EBP has initiated a spirit of inquiry in nursing practice, education, and science, evidence-based QI is key to redesigning health care so that it is effective, safe, and efficient. Stevens asserted that any initiative should include practice adoption, education, and curricular realignment, model and theory development, scientific engagement in the new fields of research, and the development of a national research network to study improvement. In addition, Stevens asserted that the EBP movement has great potential for improving care and health outcomes and closing the chasm between the health care environments as it exists now and to transform the health care environment. Stevens noted that in a recent survey of the state of EBP, nurses had positive attitudes toward EBP and wished to gain more knowledge and skills, despite significant barriers in practice. To accomplish these challenges, Stevens argued that nurses need to be creative and master teamwork to redesign the health care system, be persistent in education, employing awareness, skills, and power to improve systems of care and systems research from multiple perspectives and with sound evidence. Stevens (2013) noted that to move EBP forward and bring about change, nurses will need to become powerful leaders of interprofessional groups.

Definitions of Terms

The following terms are used in this research project

Registered nurse (RN): An RN is a graduate nurse who has passed a state board examination and been registered and licensed to practice nursing (*Mosby's Medical Dictionary*, 2009).

EBP (EBP): EBP is the integration of best evidence with clinical expertise and patient values (Sackett et al., 2001).

EBP knowledge: defined as self-reported EBP knowledge, it will be measured by using the EBP knowledge questions in the ACE-EBP Readiness Inventory (ACE-ERI) (Stevens, 2004). It will represent the pretest knowledge phase.

EBP readiness: defined as self-reported confidence to perform EBP competencies (Stevens, 2004).

Evidence-based decision making: the integration of best research evidence in decision making about patient care, clinician's expertise, and patient preferences and values (Melnik & Fineout-Overholt, 2011).

Level of evidence (hierarchies): a ranking of evidence by the type of design or research methodology that would answer the question with the least amount of error and provide the most reliable findings (Melnik & Fineout-Overholt, 2011).

The Star Model of Knowledge Transformation: a model for understanding the cycles, nature, and

characteristics of knowledge that are utilized in various aspects of EBP (Stevens, 2004).

Inventory (ACE-ERI): This inventory will allow self-assessing of one's confidence in EBP (EBP) competencies (Stevens, 2004).

Knowledge transformation: "Knowledge transfer is a systematic approach to capture, collect, and share knowledge to obtain explicit knowledge" (White & Dudley-Brown, 2012).

Assumptions and Limitations

In this project it was assumed that the RNs in the project setting, a cardio-thoracic unit, had no exposure to EBP education. The limitations of this study was the selection of nurses in one particular unit and the fact that some nurses might have had prior learning/ experience on EBP. The generalizability of this study is limited since the project was to be implemented in one selected unit, which might or might not be representative of other units.

Summary

The concept of evidence-based nursing practice is predicated on sustaining safe and quality health care and is key to quality and excellence in nursing. To enhance knowledge and skills among nurses in different health care systems, there is a need to implement interventions to promote EBP mentors for safe and quality care based on the best evidence. Implementation of evidence is essential so that patients can have quality and safe care in order for them to receive the best outcomes possible. Adoption of EBP competencies for nurses can assist organizations to achieve high-quality, low-cost, evidence-based health care outcomes.

GENERAL REVIEW OF LITERATURE

This section aims to present a review of the literature on EBP knowledge among nurses. EBP is a problem-solving approach in clinical practice that closes the gap between theory and practice and emphasizes effective nursing care (Upton & Upton, 2006; Youngblut & Brooten, 2001; Stevens, 2013; Newhouse et al., 2005; Stevens & Staley, 2006; Rosswurm & Larrabee, 1999; Brady & Lewin, 2007; Leach, 2006). Several articles have reported that nurses' at all educational levels lack the knowledge to appraise research studies critically and the skills to effectively implement EBP in their clinical settings (Moore & Watters, 2012). In 2001, the IOM named EBP as one of the five core competencies for all health care professionals. Along with the IOM, the Joint Commission and the American Nurses Credentialing Center (AACN) recommend EBP as essential knowledge for health care providers in order to deliver the best patient care (Smith & Donze, 2010; Mallory, 2010).

The purpose of this literature review is to investigate the project question against existing evidence to assess EBP knowledge among nurses. Although EBP is proved as the

best medical practice to achieve optimum healthcare outcome, adoption of EBP among nurses is relatively low (Melnik et al., 2014; Melnik et al., 2012; Stevens, 2013; Pearson et al., 2005; Pravikoff et al., 2005; Neville & Horbatt, 2008; Jutel, 2008; Moch, Cronje & Branson, 2010). Effective managerial leadership, administrative support, change leadership and expert EBP mentors are essential to enable nurses to use research evidence in clinical practice to promote EBP (Sanares, Waters & Marshall, 2007; Shirey, 2006; Melnik et al., 2012; Sandstrom et al., 2011; Cherim et al., 2010; Cronje & Moch, 2010; Hastings & Fisher, 2014).

The search strategy was aimed at finding both published and unpublished studies in English for the period 2000-2014 [the more typical range is 5 years]. A three-step approach was used. An initial, limited search of MEDLINE/PubMed, Cochrane Database of Systematic Reviews, and CINAHL was undertaken, followed by analysis of key words contained in the titles, abstracts, and index terms used to describe the articles. There were 2,976 articles were reviewed. A second search was undertaken, using all of the identified key words and index terms identified across all included databases. Third, the reference lists of all identified reports and articles were further searched for studies that had been missed in the electronic searches. The following databases were used: CINAHL, Cochrane Database of Systematic Reviews, EMBASE, ERIC, PubMed, Turning Research into Practice (TRIP), ProQuest Dissertations and Theses, Health and MEDLINE Simultaneous Search, Ovid Nursing Journals, Database of Abstracts of Reviews of Effects (DARE), Joanna Briggs Institute EBP database, Google Scholar, and Web of Science. The following keywords were used:

Evidence-based practice, medicine, nursing, readiness, competence, process, skills, barriers, and knowledge transformation. Grey literature was sought in the Agency for Healthcare Research and Quality (AHRQ), QUEST, and Primary Care Clinical Practice Guidelines. The initial search resulted in 2,976 articles; the second search, which was limited to articles published from 2000-2014, yielded 30 articles.

Specific Review of Literature Systematic Reviews

The specific literature review uncovered systematic reviews about nurses' knowledge, skills, and attitudes for evidence-based practice, cross-sectional descriptive studies on assessing EBP knowledge among nurses, studies on developing EBP competencies, and the readiness of nurses for EBP.

Search Outcome

Among 30 relevant articles, 8 articles met the inclusion criteria: (Leung, Trevena, & Waters, 2014; Upton & Upton, 2006; Squires et al., 2011; White-Williams et al.,

2012; Melnyk et al., 2014; Bostrom, et al., 2009; Thiel & Ghosh, 2008; Sredl et al., (2011).

A review conducted by Leung, Trevena, and Waters (2014) on instruments for measuring nurses' knowledge, review skills, and attitudes for EBP included 91 studies identified for full-text; 59 studies representing 24 different instruments met the inclusion criteria. This systematic review summarizes the psychometric properties of instruments used to measure EBP knowledge, skills, and/or attitudes of nurses. The authors postulate that EBP knowledge and skills refer to one's ability to formulate a question in response to a clinical problem, retrieve the best available evidence from various sources, appraise the strength of evidence, apply evidence in the client's best interest and values, and assess the effectiveness to determine improvement in patients or practice. The study concluded that valid and reliable instruments are required to measure EBP competence of nurses, to develop curricula, and to evaluate the effectiveness of various educational competencies for EBP. The revised Evidence Based Practice Questionnaire (EBPQ) (Upton & Upton, 2006) was found to have adequate validity and feasibility to be used in practice. The questionnaire relies on self-report; however, the authors suggested that a performance-based instrument is needed to measure EBP knowledge, skills, and attitudes in nursing.

A systematic review by Squires et al. (2011) included 51 cross-sectional/survey and 4 quasi-experimental designs. The study was designed to determine the extent to which nurses use research in their practice. The majority of the 55 articles ($n = 39$, 71%) were conducted in North America; 12 were conducted in Europe with 3 conducted in Asia and 1 conducted in Oceania. The study highlighted multiple major limitations in the use of research, including the quality of the methodology, lack of robust quasi-experimental studies, lack of standardized language, use of self-report measures, and a lack of standard measures for comparison. The authors concluded that an awareness of the EBP movement has influenced research use in nurses' daily practice

Assessing EBP Knowledge among Nurses

A cross-sectional descriptive study was conducted by White-Williams et al. (2013) to assess use, knowledge, and attitudes toward EBP among nursing staff; data were collected from 593 nurses. This study used the Advancing Research and Clinical Practice through Close Collaboration (ARCC) model as a theoretical framework. Subjects completed a 15-item demographic instrument and the Evidence Based Practice Questionnaire (EBPQ) (Upton & Upton, 2006). Correlations and multivariate analysis of covariance were used for statistical analysis. Internal consistency reliability was reported for the EBPQ. Overall Cronbach's alpha was 0.87; for the Practice, Attitude, and Knowledge/Skills subscales, Cronbach's alphas were 0.85, 0.79, and 0.91, respectively. The results of this survey showed that 96%

of nurses reported that they were aware that an EBP and Research Council existed. Average scores were highest on the Attitude subscales, followed by the Knowledge/Skills and Practice subscales. The authors concluded that education level and leadership status have a positive correlation with increased practice, knowledge, and attitudes regarding EBP and that an EBP workshop has a positive effect on practice and attitude change.

The Establishment of EBP Competencies

Though research supports that EBP promotes high-value health and high quality health care, improves patient outcomes and reduces cost, EBP is not the standard of care globally. Melnyk, Gallagher-Ford, Long, and Fineout-Overholt (2014) reported that seven national EBP leaders developed an initial set of clear EBP competencies for practicing RNs and APNs through a consensus-building process. The authors concluded that incorporation of EBP competencies into a health care system can lead to higher quality of care, greater reliability, improved patient outcomes, and reduced costs. The main limitation of this study was the use of a convenience sample of nurses who attended an EBP immersion workshop; this sample could have rendered biased results.

Readiness of U.S. Nurses for Evidence-Based Practice

A search of CINAHL plus Full Text of the initial search using the search terms EBP and EBP readiness revealed 32 peer-reviewed articles. Limiting the search to 2000-2014 yielded seven articles. A review of articles related to the need for EBP supported the lack of readiness on the part of nurses and the various barriers to teaching EBP as a process.

In 2005, Pravikoff et al. examined perceptions regarding access to evidence-based tools in a random sample of 3,000 RNs across United States. The authors evaluated nurses' awareness of the importance of using EBP, availability of information resources, and individual and institutional barriers to the use of research and EBP. Pravikoff et al. concluded that RNs were not prepared to use the information resources available to them, had little or no education or training in database search, and were not prepared for a practice built on evidence. The primary individual barriers to nurses' use of research practice were found to be lack of time, lack of value for research in practice, lack of understanding of electronic databases, difficulty accessing research materials, limited computer skills, difficulty understanding research articles, limited access to computers and access to a library, lack of search skills, poor understanding about research, and lack of skills to critique or synthesize the literature. Institutional barriers included difficulty recruiting and retaining staff, other priority goals, budgetary issues, and lack of knowledge about EBP. The authors concluded that RNs in the United States are not ready for EBP for these reasons and strongly recommended integrating EBP curricula into nursing

education, stating that a multifaceted approach that involves students, educators, clinicians, and administrators is needed to facilitate change.

In 2008, Thiel & Ghosh (2008) assessed readiness for EBP in a moderate-sized acute care hospital in the Midwestern United States before implementation of a hospital-wide nursing EBP initiative. This cross-sectional survey included 121 RNs who completed a 64-item nurses' readiness for EBP survey completed a 64-item nurses' readiness for on information needs, knowledge, skills, culture, and attitudes. The survey is a streamlined tool with established reliability and validity; it can be used at individual sites for baseline assessment and to provide direction in planning EBP initiatives. The survey found that in the sample had access to technological resources and had the ability to engage in basic information, but not in higher level evidence gathering.

Factors Influencing the Development of Evidence-Based Practice

Melnyk et al. (2004) conducted a descriptive survey with a convenience sample of 160 nurses who were attending EBP conferences or workshops in four states in the Eastern region of United States. The survey demonstrated that there is a negative correlation between participants' beliefs about the benefits of EBP and knowledge of EBP. The authors affirmed that although federal agencies are ready to proceed with EBP changes, the motivation among nursing staff is slow due to various reasons, including misconceptions about evidence-based care, lack of EBP knowledge and skills, and implementation barriers. The Trans-theoretical Model of Organizational Change and the Control Theory were used to guide this research. The authors recommended that health care systems implement interventions to increase EBP knowledge and skills, provide access to EBP mentors to facilitate implementation, and overcome barriers for proper targeting of interventions.

McCloskey (2008) used a descriptive, non-experimental mailed survey designed to explore nurses' perceptions of research utilization in a corporate health care system. The survey postulated that educational level and hospital position can be positively integrated to promote research utilization and EBP initiatives among all nurses. Nurses in five hospitals were surveyed using the Research Utilization Questionnaire (RUQ). The RUQ measures nurses' perception of research utilization, attitudes toward research, availability of research resources, and perceived support for research activities. ANOVA analysis of the data showed a significant difference in the use of research, attitude, and availability. No significant differences were found among participants based on their years of experience. The author concluded that educational level is an important factor in research.

Gerrish, Ashworth, Lacey, and Bailey (2008) reported on factors influencing the development of EBP as identified

by junior and senior nurses. This study took place at two hospitals in England, using the EBPQ. The questionnaire was given to 1,411 nurses; 598 responded. It was found that nurses depend on personal experience and communication rather than on formal source of knowledge. The authors recommended the development of a nursing culture to empower change and to engage in supporting EBP activities.

Cronenwett, et al. (2007) addressed the challenge of preparing nurses with the requisite competencies to improve quality and safety of patient care. The Quality and Safety Education for Nurses (QSEN) competencies for quality and safety are based on patient-centered care, teamwork and collaboration, evidenced-based practice, quality improvement, and informatics. They emphasized the importance of knowledge, skills, and attitude improvement in all aspects of nursing care to enhance patient-centered care and safety and stressed the role of nursing education developing these competencies in nursing students. To transform care at bedside and to improve patient care and safety, nursing education must be in line with QSEN competencies.

EBP Models

A framework or model facilitates a systematic translation of new knowledge into practice and enhances the chances of successful implementation (White & Dudley-Brown, 2012). It can provide a skeletal set of variables applicable for all types of individuals, groups, and a wide variety of situations (Rycroft-Malone & Bucknall, 2010). Schaffer, Sandau, and Diedrick (2013) summarized the important features and assessed the usefulness of six EBP models with regard to their fit for practice settings. They evaluated: 1) the ACE Star Model of Knowledge Transformation, 2) Advancing Research and Clinical Practice through Close Collaboration (ARCC), 3) the Iowa Model, 4) the Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP), 5) Promoting Action on Research Implementation in Health Services Framework (PARIHS), and 6) the Stetler Model. The Johns Hopkins and the ACE Star models were deemed useful for highlighting the process of finding and evaluating evidence that is beneficial for nurse educators, but the authors noted that organizations may prefer the PARIHS framework, ARCC, or the Iowa Model for their emphasis on team decision-making. The evidence-based program, Team Strategies and Tools to Enhance Performance and Patient safety (Team STEPPS, AHRQ, 2008) has proven effective in reducing patient safety issues.

Quality Improvement and EBP

Evidence-based QI is a systematic approach to improve specific internal systems, processes, performance, and productivity for optimal care delivery and patient outcomes (Shirey, et al.). QI, EBP and Research have interrelated like a three legged stool and nursing practice is the seat of the stool (Hedges, 2006). QI incorporates the knowledge, EBP translates the knowledge and

research generates knowledge. To improve the quality and standards of nursing care the expectations to articulate QI, EBP and research development continues to excel (ANCC, 2009). QI strategies need to base on strong evidence to close the gap between clinical researches and practice and to build the evidence on EBP (Shojania & Grimshaw, 2005).

In conclusion, studies reviewed in this literature review highlights the significance of need for EBP knowledge and skills among nurses, importance of implementation of EBP be key solution in health care reform, and implications for nurse leaders to be powerful leaders in interprofessional disciplines to redesign healthcare delivery. All studies recommended the need for EBP knowledge and skills among nurses to improve quality and safety of patient care.

Theoretical Basis

The conceptual model most appropriate for this project is the ACE Star Model of Knowledge Transformation (Stevens, 2004). This model was developed by Kathleen Stevens and staff at the University of Texas Health Science Center in San Antonio to provide a framework for understanding the cycles, nature, and characteristics of knowledge used in the EBP process. It provides an inclusive framework to organize EBP processes and approaches to convert evidence into clinical decision-making. The model explains how various stages of knowledge transformation reduce the volume of scientific literature and provide forms of knowledge that can be directly incorporated in care and decision-making.

The model is a five-point star (Figure 2), with each point representing a stage in the EBP process as follows (Stevens, 2012).

1. Discovery of new knowledge is found through traditional research. In this stage knowledge is generated by research methodologies.
2. During this stage, evidence from all research knowledge is synthesized into a single, integrative review and a meaningful statement of knowledge.
3. Translation of research evidence is converted to clinical practice recommendations. At this stage of transformation, the knowledge reflects best practice based on best research evidence.
4. Integration is accomplished through clinical decision-making that leads to a change of practice.
5. Evaluation is done according to patient outcomes, provider/patient satisfaction, and efficiency. This step is crucial to verify the success of EBP. It is important to include patient, health care provider, and system outcomes in evaluation.

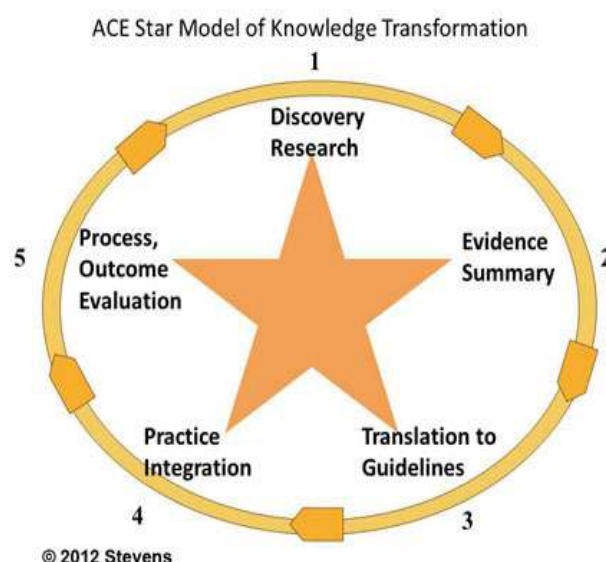


Figure 2: The ACE Star model of knowledge transformation. “Copyrighted material (Stevens, 2012). Reproduced with expressed permission.”

The ACE-EBP Readiness Inventory (ACE-ERI) is an assessment tool that measures the students’ or nurses’ self-report of confidence in the ability to apply EBP. Reliability, validity, and use of the ACE-ERI indicate that the instrument is sound and can be administered via online survey or through the use of pencil-and-paper to students and participating nurses (Stevens, 2013).

The ACE Star model is related to this project in five different stages. During the first stage of discovery, new knowledge will be discovered through traditional research. In the second phase, nurses will gather evidence and appraise the evidence, synthesizing the research into a single meaningful statement of knowledge. During the third phase of translation, research evidence will be translated to develop recommendations for clinical practice. The integration/implementation phase is applicable for change of individual/organizational practices and policy changes. The evaluation stage will explore the outcome of the implementation, patient health outcomes, provider satisfaction, economic analysis, efficacy, efficiency, and impact on patient status. Effective outcomes can be incorporated into system policy and procedure protocols as appropriate. The ACE-ERI competencies are identified for each of the five stages reflected in the model of demonstrating knowledge of the full process of EBP. These competencies provide guidance for nursing education programs and professional programs to prepare nurses to embrace EBP (Melnik & Fineout-Overholt, 2011).

Project Design and Methods

The purpose of this project was to assess EBP knowledge among nurses in cardio thoracic intensive care unit. A quantitative approach, which looks for patterns to investigate the effectiveness of an intervention (Terry, 2012), used a pretest-posttest design to measure

outcomes. The project design is a blueprint for conducting a study to increase control over factors that could interfere with validity of the findings (Groves, Burns, & Gray, 2013). The assessment test was given initially followed by knowledge tests were taken electronically. The findings of this project will be used to educate RNs in EBP initiatives and research utilization, nurses to action to make evidence-based changes to improve patient outcomes, to identify and abandon ineffective healthcare practices.

All full-time and part-time RNs in the cardiothoracic unit were included in the study. A set of demographic questions were collected (Appendix B) including age, gender, nursing degree, race/ethnicity, role, most recent nursing degree, and years in nursing. The ACE EBP Readiness Inventory (ACE-ERI) (Appendix C) was used to allow RNs to complete a self-assessment about their confidence in evidence-based competencies. The level ranged from (1 (very little) to 6 (a great deal)). The ACE-ERI basic competencies 1-20 (Appendix C), along with a 15-question knowledge test (Appendix D), were included in the pretest. The 15-question knowledge test had multiple-choice questions about the definition of EBP, systematic reviews, ACE Star model stages, strength of evidence, and clinical practice guidelines.

I mailed an informational letter (Appendix A) to all staff RNs in the CTU. When a staff RNs agreed to participate, it was considered implied consent. The study was done in two phases.

Phase 1 (pre-survey) - After obtaining consent from all participants, the initial data collection of demographic questions, ACE-ERI basic competencies to self-assess confidence in EBP, and the EBP knowledge test (pretest) were e-mailed to all participants by the DNP student.

Phase 2 (post-survey): - After completion of the pretest, participants viewed an educational module developed by the Research Department, Institute for Nursing, NSLIJHS on EBP (Appendix F). The module was available on i-Learn (an online learning management system for administering, documenting, and tracking employee education, training, and professional development); it was in PowerPoint format and placed on clinical unit computers by the system IT department. The core content is based on the major steps in EBP practice, namely, the recognition of the significance of EBP, the ability to describe EBP, the aptitude to differentiate between quality improvement, research and EBP, the capacity to outline the process of EBP, the ability to describe the ACE-Star Model, and competence in identifying examples of EBP in nursing practice. After successful completion of this teaching module, the knowledge test was repeated for comparison of knowledge assessment (posttest). The questions on the pre- and posttest were identical. All data were confidential and respondent identification remained anonymous.

Population and Sampling

This project was conducted in a 23-bed CTU in a suburban tertiary hospital. The target population included full-time and part-time nurses working in this unit (50 full-time and 12 part-time RNs). The institution is committed to enhancing nursing knowledge and practice through nursing research and evidence-based practice, QI and continuous evaluation of nursing care. The staff nurses of the CTU were the population of this project, regardless of their educational status. A convenience sample of full-time and part-time RNs in this unit was included in this project. The pretest acted as control group in this design. No financial compensation given to participants, and nurses continued with their routine shift.

Data Collection

The structure of the proposed project was presented to the director of cardiac services and the unit manager. After IRB approval was obtained from Walden University and NSLIJ Health system, all RNs and nurse managers in the CTU were informed about the project by the principal investigator during a collaborative care meeting and unit staff meetings. Subjects were informed via e-mail that confidentiality will be observed according to institution IRB protocol, that participation is voluntary, and that they can withdraw at any time during the duration of the project. Informed consents were obtained from all participating nurses.

The RNs in this unit received an informational letter via e-mail from the DNP student about voluntary participation about the project. If the members agree to participate, it was considered as an implied consent. They were asked to complete a demographic profile with questions about age, gender, nursing degree, race/ethnicity, role, most recent nursing degree, and years of experience (Appendix B). They also completed an ACE EBP Readiness Inventory (ACE-ERI), a self-assessment about their confidence in evidence-based competencies and EBP (Appendix C), and a knowledge test to assess their knowledge about EBP (Appendix D). After this pretest was completed, the EBP educational module (Appendix D) was uploaded by the health system information technology to the hospital health port as a teaching module (developed by the Research Department, Institute for Nursing, NSLIJHS). The intervention period was approximated to run for thirty days and all participants to complete the posttest after viewing the educational module. The educational module consists of a self-study module in power point format which was uploaded by the health system information technology to unit computers and all safety regulations were maintained. The DNP student was available on the floor during the phase 2 section of the study. The knowledge test (posttest) was repeated for comparison of knowledge assessment schedule for assessing EBP knowledge is described in Table 1.

Table 1: Timeline for Assessing Evidence Based Practice Knowledge.

April 23, CT ICU Collaborative Care Committee was officially notified about the IRB approval of the EBP survey in this unit. RNs were informed about receiving an email concerning the survey. RNs were advised to complete a pre and post knowledge survey and view an educational module on EBP.
April 28-May 31 Informational letter was e-mailed to all full-time and part-time staff RNs in the CTICU. If the staff RNs agree to participate, it was considered as an implied consent. The pre-survey was linked to the informational letter. All participants completed demographic information, ACE EBP Readiness Inventory (ACE-ERI) and an EBP Knowledge Test.
June 1-8 EBP Education Module was sent through i Learn to all participants who completed the pre-survey.
June 8-July 8 Participants completed ACE-ERI and EBP Knowledge Test.

Instrument

An instrument is a device used to collect data (Polit & Beck, 2013). A simple pretest and posttest study design using a convenience sample of RNs in the unit was used in this project. The following forms were used to collect data:

1. Demographic Information (Appendix B) - Participants completed 12 multiple-choice questions related to demographics.
2. ACE EBP Readiness Inventory (ACE-ERI) (Appendix C) – A 20 item inventory to self-assess confidence in EBP competencies.
3. EBP Knowledge Test-A 15 multiple-choice questions to assess their knowledge was used as the pre-and post-assessment tool (Appendix D).

Approval to use the ACE-ERI tool was received via e-mail (Appendix F). The tool exhibits strong psychometric properties (reliability, validity, and sensitivity). The ACE-ERI instrument is scored as a summated scale yielding interval data. The tool has high reliability validity, and reliability coefficient exceeded .90. The independent t test revealed a higher self confidence in primary research competencies ($p < 0.01$) (Stevens, Puga & Low, 2012).

Protection of Human Subjects

This study abided all rules and regulations of Walden University Institutional Review Board (IRB). Once the Institutional Review Board (IRB) of Walden University approved the study (Approval No., it was submitted to the Scientific Review Committee (NSLIJHS) and later to the IRB of the health system where the study was implemented. Informed consent was obtained from all participating nurses as per institution IRB protocol. Privacy of subjects and confidentiality of the project data were maintained according to institution IRB protocol. The RNs and nurse managers in the CTU will be

informed about the project by the principal investigator during a collaborative care meeting and unit staff meetings. The assessment and test were taken electronically. An informational letter was e-mailed to all staff RNs in the CTU by the DNP student. If the staff RNs agree to participate, it was considered as an implied consent. Subjects were informed via e-mail that confidentiality will be observed according to institution IRB protocol, that participation is voluntary, and that they can withdraw at any time during the duration of the project. All data were confidential, some responses could be used in combination to identify participants, and the investigator did not make no effort to do so. Data collection was done by a secure web-based application (RED Cap) to promote HIPAA compliance.

The DNP student informed the participants' right to withdraw from the project at any time if they desire. All participants' data was maintained with a high level of confidentiality and security. Each nurse had a unique identifier to access the computer-based intranet educational module. All data were confidential and respondent identification remained anonymous.

Data Analysis

The data collected was analyzed with the assistance of a data analyst using Statistical Package for the Social Sciences (SPSS) for Windows, (Version 22, NY: IBM Corp). Descriptive statistics will describe means and standard deviations on the pretest pretests and post-tests (confidence and knowledge tests), demographic variables and Excel-based graphs of pertinent data. Paired sample t-tests will be conducted to analyze the pretest and posttest results of the 15-question knowledge survey. The total mean (pre and posttest) was compared using a paired *t*-test analysis. This project required $n = 27$, one-tailed, $\alpha .05$, power .80, effect size 0.5. The unit has 50 full-time and 12 t-time RNs and all members are encouraged to participate in this project to minimize attrition issues. The difference in scores between pretest and posttest was calculated and compared to the demographic data using independent samples *t* tests, and ANOVA to determine relationships between increased knowledge of EBP and demographic variables.

Project Evaluation Plan

Program evaluation is an ongoing process and a sum of implementation, effectiveness, efficiency, cost-effectiveness and acknowledgement (Hodges & Videto, 2011). The purpose of this evaluation plan was to assess the quality and success of the project in achieving the stated goals. The impact of this educational intervention was measured by comparing the pretest and posttest results of the 15-question survey of knowledge related to EBP. Revision of the project will be based on review of the posttest completed by the RNs in the cardiothoracic unit.

A plan will be developed based on the metrics to develop recommendations to facilitate a culture of EBP, schedule journal clubs to discuss research articles, and to enhance EBP and research education. The evaluation of the outcome of this project will be used to improve practice guidelines to improve evidence-based nursing, and to develop a research and EBP fellowship program. Implementation of EBP will promote nurses to lead an interdisciplinary team to provide safe and patient centered quality care and to redesign an effective healthcare system.

SUMMARY

The main aim of this project is to assess the knowledge of RNs to develop EBP competencies in clinical settings for high quality and safe patient care and to achieve high performing systems that consistently implement and sustain EBP. Advanced knowledge in EBP among RNs will provide a problem-solving framework to use best evidence to improve quality and safety in patient care. Since health care is always evolving and nursing is a progressive art, commitment to enhance EBP knowledge and skills will lead to high quality health care.

Summary of Findings

The purpose of this study was to assess EBP knowledge among nurses in cardiothoracic intensive care unit. All full-time and part-time RNs in this unit were included. Study data were collected and managed using REDCap electronic data capture tools hosted at The Feinstein Institute for Medical Research, North-Shore University Hospital, Manhasset REDCap (Research Electronic Data Capture) is a secure, web-based application designed to support data capture for research studies, providing (a) an intuitive interface for validated data entry; (b) audit trails for tracking data manipulation and export procedures; (c) automated export procedures for seamless data downloads to common statistical packages; and (d) procedures for importing data from external sources (Harris, Taylor, Thielke, Payne, Gonzalez, Conde, 2009).

Participants ($n = 43$) answered a 12-item demographic questionnaire, 20-item questionnaire to assess the confidence in EBP, and 15-item EBP knowledge test prior to the viewing the educational module on EBP. The EBP educational module was available to all participants who completed the pre-survey. The educational module was available in a self-study module in PowerPoint format, which included the following topics: (a) vision for NSLIJHS nurses, (b) module objectives (c) IOM reports, (d) QSEN competencies, (e) significance of EBP, (f) EBP definition, (g) differentiating QI, Research, and EBP, (h) implementing EBP; the EBP process, (i) the ACE star model, (j) NSLIJHS EBP implementation process, (k) examples of EBP, and (l) how to facilitate EBP.

After viewing the educational module the participants again completed the ACE-EBP Readiness Inventory (ACE-ERI)—a 20 item inventory to self-assess

confidence in EBP competencies—and the EBP Knowledge Test, with 15 multiple-choice questions to assess their knowledge. The following analysis was completed using IBM SPSS, version 22.

1. Normality of the data

a. The mean differences between the pre and posttest overall scores for both scales, i.e., posttest–pretest scores was assessed using the Kolmogorov-Smirnov test. The mean difference scores on the ACE scale were found to be normally distributed, but the scores of the Knowledge scale were not normally distributed due to a lower sample size and missing data.

2. Demographic Data.

Compared to the pretest, 12 out of 28 subjects scored lower on the Knowledge posttest and compared to the pretest, 13 out of 28 subjects scored within 1 correct answers on the posttest.

3. Sample Size and Missing Data

There were 43 subjects who submitted surveys. Three did not complete the demographic questions. Fifteen subjects did not complete the pre or posttest ACE scale and 15 did not complete the pre or posttest Knowledge scale. No pattern was apparent with respect to the data that were missing. Subjects either completed a scale or did not answer any of the questions. As a result, interpolation of the data was not possible for the substitution of values in order to maximize the sample sizes. The sample sizes for the analyses of the ACE and Knowledge scales were 28.

4. Primary Analysis

a. The scales were scored for each subject by determining a sum of the scores for each individual question.

b. The Paired t-Test was used to determine the presence of a significant change in the ACE scores. A significant increase in scores was noted for the ACE scale.

Table 2: Paired Sample Statistics for ACE Scale Pre-Survey and Post-Survey.

Test	Mean	N	SD	Std. Error Mean
Presurvey	61.2	29	21.9	4.06850
Postsurvey	79.4	29	26.6	4.94288

: $m = 61.2$, $sd = 21.9$; posttest: $m = 79.4$, $sd = 26.6$; $t = -3.27$, $df = 28$, $p < .01$). The pretest and posttest scores were not significantly correlated ($r = .25$, $p = .191$) suggesting that the increase in scores was not uniform among the subjects.

c. While Knowledge scale scores also increased, the difference was not statistically significant using the Wilcoxon Signed Rank Test (pretest: $m = 6.9$, $sd = 1.9$; posttest: $m = 8.1$, $sd = 6.1$, $df = 27$, $p = .457$). The Wilcoxon test was used due to the fact that it is a non-

parametric test and the mean Knowledge scores were not normally distributed.

d. The mean differences in the scores of the ACE scale and the Knowledge scale were compared to each of the demographic variables using the following tests:

1. Spearman Correlation Coefficients

a) Variables that are ordinal in nature

i) Age

ii) Experience

iii) Highest degree

iv) EBP knowledge

v) EBP experience

vi) ACE Star Model knowledge

b) None were found to be significantly related to the mean difference in the test scores.

Correlation Coefficients and Spearman Correlation Coefficients were used in analyzing the mean difference in ACE scores and Knowledge scores, respectively, and interval data

a) Work hours

b) Years of experience

c) Days between the pretest and posttest

1) None of the above data were found to be significantly correlated.

Table 3: Spearman Correlation Coefficients.

Spearman's rho	Meandiff	Hours Work	Years exp	Days between
Meandiff Correlation Coefficient	1.000	-.032	.216	-.235
Sig. (2-tailed)	.	.876	.279	.238
N	28	27	27	27
Hours work Cor Coefficient	-.032	1.000	-.290	-.229
Sig. (2-tailed)	.876	.	.069	.240
N	27	40	40	28
Years exp Cor. Coefficient	.216	-.290	1.000	-.086
Sig. (2-tailed)	.279	.069	.	.665
N	27	40	40	28
Days between Cor. Coefficient	-.235	-.229	-.086	1.000
Sig. (2-tailed)	.238	.240	.665	.
N	27	28	28	29

f. Independent samples t-Test and the Mann Whitney U Test were used to identify significant relationships between bivariate data, i.e., gender, ethnicity, and

magnet status; and the mean differences between the ACE scores and the Knowledge scores, respectively.

1) No significant relationships were found

T-Test

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	pre_ace_total	61.2069	29	21.90952	4.06850
	post_ace_tot	79.3793	29	26.61822	4.94288

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	pre_ace_total & post_ace_tot	29	.250	.191

Paired Samples Test

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval
					Lower
Pair 1	pre_ace_total - post_ace_tot	-18.17241	29.95362	5.56225	-29.56616

Paired Samples Test

		Paired ...	t	df	Sig. (2-tailed)
		95% Confidence Interval of the ...			
		Upper			
Pair 1	pre_ace_total - post_ace_tot	-6.77867	-3.267	28	.003

T-TEST PAIRS=pre_know_tot WITH post_kno_tot (PAIRED)

/CRITERIA=CI (.9500)

Table 4 g. ANOVA was used to determine significant relationships between the nominal variables and the mean difference in ACE scores. Those variables are

1. Role
2. Race.

1) No significant relationships were found

h. Kruskal Wallis Test was used to determine significant relationships between the nominal variables and the mean difference in Knowledge scores. Those variables are

1. Role
2. Race

1) No significant relationships were found

5. Evaluation of bias in the data

a. The reliability of the ACE scales were adequate with pretest and posttest Cronbach Alphas of .768, and .772, respectively. The format of the Knowledge scale does not permit the analysis of inter-item correlation, i.e., due to it's being a knowledge test with only one correct answer.

b. A post-hoc power analysis of the mean difference in the Knowledge scale scores identified an Effect size of 0.19 and Power of 0.25. This suggests that a larger sample size was needed to adequately determine the presence of a significant result using this scale. However, a comparison of the pretest scores to the posttest scores suggests inconsistent improvement.

Discussion of Findings in the Context of the Literature and Frameworks

There was an inconsistent improvement in knowledge and confidence scales of the pre survey and post survey. A significant increase in scores was noted for the ACE scale (pretest: $m=61.2$, $sd=21.9$; posttest: $m=79.4$, $sd=26.6$; $t=-3.27$, $df=28$, $p<.01$). These findings are consistent with the literature, supporting the need to improve EBP knowledge, use of EBP model to integrate scientific evidence with clinical expertise and patient values in nurses' clinical decision making (Upton & Upton, 2006; Leung, Trevena, & Waters, 2014; Squires et al., 2011; White-Williams et al., 2012; Melnyk et al., 2014; Bostrom, et al., 2009; Thiel & Ghosh, 2008; Sredl et al., 2011; White & Dudley-Brown, 2012; Moore & Watters, 2012; Stevens, 2013; Melnyk, Gallagher-Ford, Long, and Fineout-Overholt, 2014). Though EBP has become a major part in nursing, it is insufficiently integrated into daily practice. This study has provided some insights about the need for a simplified and pragmatic method of EBP knowledge. In order to effectively implement evidence, nurses require appropriate knowledge and skills to assess the quality and of evidence to result in improved patient outcomes.

The ACE Star Model of Knowledge Transformation was used as the conceptual model in the educational module. Since EBP has recognized as the gold standard of care, a frame work is a comprehensive approach to translate

evidence into practice. The ACE Star Model, competencies, and ACE EBP Readiness Inventory (ACE-ERI) have been incorporated to into practice and educational settings. The frameworks facilitates and guide new knowledge translation into successful implementation to robust evidence-based decision making (White & Dudley-Brown, 2012; Rycroft-Malone & Bucknall, 2010; Shaffer, Sandau, and Diedrick, 2013; Stevens, 2012). The objectives of the educational module recognize the significance of EBP, describe EBP to include the components of research evidence, clinical expertise, patient and family values, recognize the difference between QI, Research and EBP, describe the process of EBP, describe the ACE-star Model and identify the examples of EBP in nursing practice.

Implications

Implications for Practice/Action

This EBP knowledge assessment intervention supported the need of empowering nurses to implement EBP transform health care and to redesign care that is effective, safe, and efficient. A consistent implementation of the EBP process and use of evidence will improve the quality and safety of the health care system. The use of scientific evidence in clinical practice can be facilitated by implementing clinical practice guidelines. If nurses have a positive attitude towards EBP and willing to improve knowledge and skills, nursing practice, education, health policy, leadership, and research will transform health care.

Implications for Future Research

There are several implications for future research. Research on competency and knowledge assessment about EBP should be continued throughout the system hospitals to have a large number of sample size. Active participation in the EBP process and implementation of research evidence into practice, EBP mentorship, EBP fellowship program, formation of unit based journal clubs are various implications for future research and to critically appraise research evidence. EBP competencies should be integrated into both academic and clinical education programs to reinforce EBP as the foundation of practice.

Implications for Social Change

Participating in EBP knowledge competency assessment can lead nurses to enhance reasoning about practice changes. This will promote nurses to develop a framework to implement EBP, to increase awareness of EBP, provide nurses to be a crucial role in EBP process, and to drive changes in practice based on research evidence. Improvement in clinical practice with EBP implementation will change professional practice and make health care more effective, efficient, meaningful, patient-centered and affordable.

Project Strengths and Limitations

Strengths

The major strength of this evidence based project was providing knowledge and competency to RNs on EBP. The project provided an interesting opportunity to support EBP knowledge in CTICU. Apparent success of the intervention was noticed a significant difference in pre- and posttest scores. The use of online educational module in ilearn can be used as a refresher course at the individual convenience.

Limitations

The small sample size ($n=43$) was a significant limitation. The survey participation was voluntary and there was no penalty for non- participants. 15 subjects didn't complete pre or posttest. The various limitations include acuity of patient care, increased number of cardiac surgery, merging of two major units, lack of computer technology, upgrade of REDCap and difficulty to access survey link, and lack of interest in nursing research. Due to lack of time to review the EBP power point slides some participants had reviewed the printed copy of the power point.

Section 5: Recommendations and self-assessment

Recommendations for Remediation of Limitations

The EBP knowledge and competency assessment need to be a mandatory requirement for all RNs. Assessment of organization's and employee readiness for implementation of EBP competencies prior to implementation will provide a strategic plan for integration. Provision of educational and skill building programs to support the implementation of EBP. Establishment of EBP performance expectations for all nurse leaders and managers will facilitate EBP. Inclusion of EBP competencies in performance appraisals and clinical ladder programs will sustain EBP activities and culture.

Analysis of Self

Scholar

The doctoral scholar individual development plan (2010) has six competencies to develop self as a scholar

- Discipline-specific knowledge
- Research skill development
- Communication skills
- Professionalism
- Leadership and management skills
- Responsible conduct of research

This research provided opportunity to develop the above skills through interaction with nursing and EBP team, REDCap team leader, librarian, managerial staff and RNs in the unit. In the future an educational program on EBP, work shop, journal club, and a fellowship program on EBP will be implemented. The EBP knowledge assessment will be spread to all system wide hospitals for an increased number of participants. After completion of EBP knowledge assessment in the system hospitals, the nurses can take lead to select a problem from their own

unit to run EBP process and finally for an ultimate practice change by integrating the best evidence.

Practitioner

Hamric, Spross, and Hanson (2013) explain the competency of an Advanced Practice Nurse (APN) to offer essential care are

- Use of a holistic perspective
- Formation of therapeutic partnership with patients
- Expert clinical thinking and skillful performance
- Use of reflective practice
- Use of evidence as a guide to practice
- Use of diverse approaches to health and illness management.

With a background in critical care, community health, and primary practice, the preparation as DNP has provided this student an enhanced understanding and awareness of today's health care environment and to take leadership roles in health care, engage in advocacy, integrate skills of collaboration, use of informatics to demonstrate the value of nursing interventions, enhance clinical scholarship and practice evidence-based care.

Project Developer

The experience of developing and implementing this evidence-based project has empowered the ability of this student to promote skills and knowledge to program development, develop a project, and to critically evaluate the results of the project.

Summary and Conclusions

The project provided an interesting opportunity to support the need for EBP knowledge and EBP process. The need for a simplified pragmatic method EBP knowledge and skills is essential for front line nurses. Relevant, up-to date evidence-based information will allow nurses to communicate effectively to patients and health care team to achieve the highest patient outcome. EBP is the bridge between research and practice. It is a problem solving approach and has a long-term potential to improve nurses' clinical practice decisions using the best evidence to practice. Nurse leaders and executives need to be the change agents and role models to provide learning opportunities to invest in EBP education to improve health care quality and safety. The results of this project on knowledge assessment on EBP among nurses may increase the knowledge and skills among nurses about EBP process by integrating EBP competencies into daily practice to deliver the best care to patient and families.

The EBP movement has facilitated nurses to improve clinical effectiveness and to practice based on evidence. The health system has organizational practices facilitating the uptake of EBP. For example the institution is following clinical practice guidelines in electronic medical records, multiple initiatives such as preventing falls, Team Strategies and Tools to Enhance Performance and patient safety (Team STEPPS),

prevention of catheter associated urinary tract infection (CAUTI), central-line associated blood stream infection (CLABSI) along with policies based on evidence.

Scholarly Product

The student submit an abstract to the Annual Interdisciplinary EBP Expo meeting on November 2, 2015 and a presentation of the project at the Annual System Research meeting in 2016.

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APPENDIX A: Informational Letter

Dear Participant,

The overall purpose of this study is to assess an RN's knowledge about EBP. You are being invited to participate in a research study. As you know the translation of evidence into practice has a significant role in ensuring quality care, patient safety, and improved patient outcomes. Evidence based practice (EBP) impacts clinical decision-making and patient outcomes

Your participation is entirely voluntary. You can choose not to participate in this study; your employment status will not be affected. There are no risks or costs for participating in the study. If you agree to participate, please complete the attached survey. Your consent is assumed by completing the survey. Your responses are anonymous; do not put your name or other identifying information on this survey. Your completed survey will not have any personal identifying information, and therefore the investigator will not be able to distinguish who provided the data.

If you choose to participate in the study, you will be asked to complete ACE-EBP Readiness Inventory (ACE-ERI), which includes demographic questions. It may take 20 minutes to complete the questionnaire. After completion of pre-survey, you will be asked to review an educational module developed by the Research Department, Institute for Nursing, NSLIJHS. The module will be available on iLearn. The educational module consists of a self-study module in PowerPoint format and will take about 50-60 minutes to complete.

After completion of the EBP module, you will complete the post-survey.

Your responses are anonymous; all data will be confidential and will not be available to your employer or anyone else in the North Shore Long Island Health System. The results of this study may be used in reports, presentations or publications but your name will not be included.

You will not be using any personal information that can identify your responses. The focus of the study is not an individual responses, but on the relationship of variables compared to the study variables in the group. You will have the benefit of acquiring knowledge about EBP and information about best practices.

If you have any questions regarding your rights as a research subject or concerns about being in the study, you may contact the Office of the Institutional Review Board (the committee that oversees research at this institution) at 516-562- 0131. Thank you for your participation.

1. Please indicate your willingness to participate in the study:

I agree and give my consent to participate in this research project. I understand that participation is voluntary and that I may withdraw my consent at any time without penalty.

I do not agree to participate and will be excluded from the remainder of the questions

APPENDIX B: Demographic Information (Clinicians)

Please provide answers to the following questions

1. Your age: a. 19-25 years b. 26-35 years c. 36-50 years d. 51-60 years e. Over 60 years	2. Years of Nursing Experience a. 0-5 years b. 6-10 years c. 11-15 years d. 16-20 years e. 21+ plus years
3. Primary Role in Healthcare a. Educator (Academic & Staff development) b. Clinician/Practitioner c. Clinical Administrator d. Other, Specify _____	4. On average, how many hours per week do you work at this hospital (please provide a number)? _____
5. What year did you start working at this hospital? (Example 1999) _____	6. Race/Ethnicity a. Caucasian b. African-American c. American Indian/Alaskan Native d. Asian/Native Hawaiian/Pacific Islander e. Hispanic f. Other (please indicate) _____
7. Gender a. Female b. Male	8. Highest Degree Earned a. Associates Degree/Diploma b. Baccalaureate c. Masters d. Doctorate e. Other (please indicate) _____

9. Does your hospital have Magnet Recognition Status? a. Yes b. No c. Application in progress d. Not affiliated with a hospital	10. Rate your EBP knowledge: a. No knowledge b. Beginning level c. Intermediate level d. Advanced level
11. What is your experience with EBP (e.g., committee work in an institution, continuing education program on EBP, formal coursework on EBP, taught an EBP course)? a. No experience b. Beginning level c. Intermediate level d. Advanced level	12. Rate your knowledge of the ACE Star Model of Knowledge Transformation: a. No knowledge b. Beginning level c. Intermediate level d. Advanced level

APPENDIX C: ACE-ERI

Ace EBP Readiness Inventory (ACE-ERI) @ 2007

This inventory will allow you to self-assess your confidence in Evidence-Based Practice (EBP) competencies. Rate your confidence in your skill level for each of the following. There are no right or wrong answers. Please be sure to answer every question on

every page, otherwise you will be unable to proceed to the next page.

Instructions

Click on the number that represents your level of confidence ON THIS SCALE:

Confidence 1 2 3 4 5 6

I feel confident that I can: Define EBP in terms of evidence, expertise, and patient values.	Very Little A Great Deal 1 2 3 4 5 6
Critically appraise original research reports for practice implications in context of EBP with assistance and existing standards.	1 2 3 4 5 6
Use pre-constructed expert search strategies (hedges) to locate primary research in major bibliographic databases.	1 2 3 4 5 6
Recognize ratings of strength of evidence when reading literature, including web resources.	1 2 3 4 5 6
Classify clinical knowledge as primary research evidence, evidence summary, or evidence-based guideline.	1 2 3 4 5 6
Locate systematic reviews and evidence summaries on clinical topics from specific evidence summary databases (e.g., Cochrane Database of Systematic Reviews).	1 2 3 4 5 6
Identify key criteria in well-developed evidence summary reports using existing critical appraisal checklists.	1 2 3 4 5 6
List advantages of systematic reviews as strong evidential foundation for clinical decision making.	1 2 3 4 5 6
Identify examples of statistics commonly reported in evidence summaries.	1 2 3 4 5 6
Identify the major facets to be critically appraised in clinical practice guidelines (CPGs) with assistance and existing criteria checklists.	1 2 3 4 5 6
Access clinical practice guidelines on various clinical topics using specified databases.	1 2 3 4 5 6
Participate on team to develop agency-specific evidence-based clinical practice guidelines.	1 2 3 4 5 6
Compare own practice with agency's recommended evidence-based clinical practice guidelines.	1 2 3 4 5 6
Describe ethical principles related to variation in practice and EBP.	1 2 3 4 5 6
Participate in the organizational culture of evidence-based quality improvement in care.	1 2 3 4 5 6
Deliver care using evidence-based clinical practice guidelines.	1 2 3 4 5 6
Utilize agency-adopted clinical practice guidelines while individualizing care to client preferences and needs.	1 2 3 4 5 6
Assist in integrating practice change based on evidence-based clinical practice guidelines.	1 2 3 4 5 6
Choose evidence-based approaches over routine as base for own clinical decision making.	1 2 3 4 5 6
Participate in evidence-based quality improvement processes to evaluate outcomes of practice changes.	1 2 3 4 5 6

APPENDIX D: EBP Knowledge Test**Evidence-Based Practice (EBP) Knowledge Test**

Select the **best** answer for each question.

1. **In EBP, which of the following is considered the strongest basis for clinical decision-making?**
 - A. Experience from routine daily patient care
 - B. Summary of research generated knowledge
 - C. Expert opinion regarding best patient care
 - D. Results from a single research study
2. **Systematic reviews are the result of**
 - A. Randomized control design
 - B. Synthesis of all research
 - C. Case study
 - D. Review of literature
3. **The stronger level of evidence indicates**
 - A. Greater confidence that the intervention is effective
 - B. Larger sample was used
 - C. Cost of change is too high to integrate
 - D. Recommendation is based on expert opinion
4. **The least clinically useful EBP resource on the internet is**
 - A. Agency for Healthcare Research and Quality (AHRQ)
 - B. The Cochrane Library
 - C. National Guideline Clearinghouse
 - D. Journal article on a clinical topic
5. **The most rigorous systematic review on congestive heart failure would be found in**
 - A. Med Line
 - B. Cinahl
 - C. The Cochrane Library
 - D. Journal of Cardiology
6. **The EBP skill of critical appraisal involves**
 - A. Evaluating systematic reviews and guidelines
 - B. Knowledge transformation
 - C. Classifying strength of evidence
 - D. Expert opinion
7. **Which form of knowledge is most useful in the clinician's practice setting?**
 - A. Results from single research studies
 - B. Systematic reviews
 - C. Evidence-based clinical practice guidelines (CPGs)
 - D. Patient outcomes
8. **Which source of knowledge individualizes care during an evidence-based intervention?**
 - A. Clinical expertise to close the scientific gap
 - B. Patient preferences
 - C. Critical appraisal
 - D. Primary research study
9. **Evidence-based practice (EBP) is defined as Integrating**
 - A. Best research evidence into clinical practice.
 - B. Clinical expertise and research into practice.
 - C. Patient values and critical thinking into practice.
 - D. Best research evidence with clinical expertise and patient values.
10. **In addition to overcoming barriers posed by large volumes of research, EBP also overcomes the 2nd barrier of:**
 - A. Understanding statistics
 - B. Missing research
 - C. Lack of funds
 - D. Forms of knowledge unsuitable in care.
11. **According to the ACE Star Model, what is the order of the five stages of knowledge transformation?**
 - A. Integration, Evaluation, Summary, Translation, and Discovery.
 - B. Evaluation, Summary, Translation, Integration, and Discovery.
 - C. Discovery, Translation, Integration, Evaluation, and Summary.
 - D. Discovery, Summary, Translation, Integration, and Evaluation.
 - E. I am not familiar with the ACE Star Model.
12. **The most efficient database for locating clinical practice guidelines (CPGs) on handwashing is**
 - A. Cinahl
 - B. Medline
 - C. National Guideline Clearinghouse
 - D. American Journal of Nursing
13. **Translating evidence summaries into clinical practice guidelines (CPGs) may require**
 - A. Asking the patient about preferences
 - B. Increasing the rate of adoption
 - C. Incorporating expert opinion when research is absent
 - D. Searching CINAHL for quality measures
14. **Evaluation of impact of evidence-based quality improvement**
 - A. Guides adoption
 - B. Focuses on patient outcomes
 - C. Is not necessary
 - D. Is done only at the national level
15. **When an evidence-based clinical practice guideline (CPG) is introduced to the nursing unit, the following can be expected**
 - A. Improvement will be resisted
 - B. Cost benefit will be gained
 - C. Nurses are all early adopters
 - D. Change is readily made

APPENDIX E: EBP Educational Module.
EBP Overview Module -Table of Contents

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