WEB-BASED EVIDENCE BASED PRACTICE EDUCATIONAL INTERVENTION TO IMPROVE EBP COMPETENCE AMONG BSN-PREPARED PEDIATRIC BEDSIDE NURSES: A MIXED METHODS PILOT STUDY

by

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DEDICATION

This dissertation is dedicated to my three sons: Willens, Rasheed, and Quincy. My journey this far was predicated on the unique qualities each one of my boys possess and my perception of them. My oldest son, Willens, is an overcomer and he taught me how to be strong and dream big. My middle child, Rasheed, is a great thinker and he taught me how to be insightful and plan accordingly. My baby boy, Quincy, is a truth seeker and his propensity to ask questions about any and everything fuels my desire for knowledge.

Thank you Willens for inspiring me to push forward and for better, always. Thank you Rasheed for proofreading my papers while obtaining my MSN degree. And, thank you Quincy for reminding me it is never too early or too late to learn. I am honored to be your mom and fortunate to have sons of your caliber.
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ABSTRACT

NATASHA LAIBHEN-PARKES
WEB-BASED EVIDENCE BASED PRACTICE EDUCATIONAL INTERVENTION TO IMPROVE EBP COMPETENCE AMONG BSN-PREPARED PEDIATRIC BEDSIDE NURES: A MIXED METHODS PILOT STUDY
Under the direction of LAURA P. KIMBLE, PhD, RN, FAAN

For pediatric nurses, their competence in EBP is critical for providing high-quality care and maximizing patient outcomes. The purpose of this pilot study was to assess and refine a Web-based EBP educational intervention focused on improving EBP beliefs and competence in BSN-prepared pediatric bedside nurses, and to examine the feasibility, acceptability, and usability of implementing such an intervention.

Using a two-group randomized controlled experimental embedded mixed methods design, a convenience sample of 29 BSN-prepared nurses were recruited from a pediatric hospital in the Southeastern United States. Participants were randomized into an intervention (n=14) or attention control group (n=15) and both received approximately 2 hours of educational content. The intervention group reviewed the Web-based EBP module and the attention control group reviewed a Web-based module on a general topic relevant to pediatric nurses. Quantitative data were collected online from both groups using the Evidence-Based Practice Beliefs (EBPB) scale and the adapted Fresno test for
Pediatric Nurses. Qualitative data about feasibility, acceptability, and usability were collected via telephone interview. Data were collected online utilizing SurveyMonkey® technology with the exception of the adapted Fresno test which was administered to nurses via CourseSites by Blackboard. Quantitative analyses were conducted using parametric and non-parametric statistics, and effect size calculations. Qualitative data were analyzed using methods described by Creswell and Plano Clark (2011).

Results indicated the sample were predominantly White females with a mean age of 36.6 (SD 11.5) years. Demographic characteristics of the two groups were similar. A comparison of the intervention and attention control groups post-intervention indicated there was not a statistically significant difference in the groups on EBP competence. However, the mean of the intervention group was higher and the effect size estimate of Hedges’ $g$ was small to borderline medium in magnitude. EBPB scale scores post-intervention were statistically significantly different controlling for pre-intervention EBPB scale scores, with the intervention group demonstrating statistically significantly more positive beliefs about EBP. The estimated effect size for this difference was also small to borderline medium in magnitude. Participants’ interview data supported the intervention as being moderately feasible, acceptable, and usable for improving EBP competence in BSN-prepared pediatric nurses.

This study provides preliminary data on Web-based methodologies that can be helpful in improving EBP beliefs and competence among pediatric bedside nurses. Future studies are warranted that examine the relationship of EBP competence and EBP implementation rates using a national sample of pediatric nurses to increase
representativeness and generalizability of findings and to validate an evidence-based EBP teaching methodology.
CHAPTER 1

INTRODUCTION TO THE STUDY

This chapter provides a statement of the problem by describing the importance of evidence-based practice (EBP) competence within pediatric nursing. In addition, the purpose of the study and the associated research questions are presented. Accordingly, Dr. Patricia E. Benner's (1982) novice to expert theory along with the theory of planned behavior are delineated as they relate to the investigation of how to promote EBP competence and EBP use in pediatric nurses. Definitions for EBP, EBP competence, EBP use, pediatric bedside nurse, attitude toward EBP, social norms of EBP, and perceived behavioral control of EBP are provided. Finally, the chapter concludes with the significance of the study.

Statement of the Problem

The Institute of Medicine (IOM) has set a goal that by 2020, 90% of all healthcare clinical decisions in the U.S. will be supported by accurate, timely, up-to-date clinical information, and will reflect the best available evidence (IOM, 2008). This emphasis on EBP in healthcare delivery has increased the expectation that nurses utilize research findings to make informed clinical decisions in a constantly changing and increasingly complex healthcare environment. Furthermore, EBP is inherent in excellent nursing practice as the literature consistently purports that clinical outcomes are improved when
nursing implements an EBP approach to care (DiSalvo, Joyce, Tyson, Culkin, & Mackay, 2008; Haycock et al., 2005; Heater, Becker, & Olson, 1988; Mitchell, Beck, Hood, Moore, & Tanner, 2007; Tipton et al., 2007). To prepare nurses and other healthcare professionals for practice, the IOM specified five essential competencies for health professions' education, including employing EBP (IOM, 2003). In addition, earlier IOM reports urged health professionals to further develop specifics of EBP competencies for their respective professions (IOM, 2001).

Clinical practice based on the best available evidence is considered the expected standard of care in nursing (Stone, Curran, & Bakken, 2002) and endorsed by influential organizations throughout the world (American Nurses Credentialing Center [ANCC], 2004; IOM, 2001, 2003, 2008; Joint Commission, 2007; World Health Organization [WHO], 2007). However, the literature indicates a large proportion of nurses lack the knowledge and skill sets to provide evidence-based care (Granger, 2008; Pravikoff, Tanner, & Pierce, 2005; Smirnoff, Ramirez, Kooiplima, Gibney, & McEvoy, 2007).

For instance, in Pravikoff and colleagues' (2005) study, 760 clinical nurses were surveyed about their perceptions of the information resources available to them and their skills in using those resources. Findings from this descriptive, exploratory study indicated other than lack of time, the lack of value for research in practice was the most frequently selected barrier for using research in practice. They concluded nurses in the U.S. were not ready for EBP because of (a) the gaps in their information literacy and computer skills, (b) their limited access to high-quality information resources, and (c) their attitudes toward research.
Smirnoff and colleagues (2007) investigated the attitudes and beliefs of nurses at a large urban hospital in New York City toward nursing research and the research environment, as well as their experience with nursing research in preparation for launching a research initiative. The authors noted their study was a replication of an earlier study conducted by Rizzuto, Bostrom, Suter, and Chenitz in 1994. In Smirnoff et al.'s (2007) study, they surveyed 470 nurses and results were strikingly similar to the study by Rizzuto et al. (1994) in nurses' perceptions of implementing research findings into clinical practice. Nurses' positive attitudes about research were discordant with their actual involvement in research activities. These findings suggest over the intervening decade, despite a growing emphasis on EBP, there was little change in nurses’ use of research evidence to guide their practice.

Granger (2008) reported four pragmatic steps for achieving excellence in EBP in the clinical setting, despite the looming landscape of barriers that preclude nurses from effectively using research evidence in their practice. These included:

1. Develop a system for embracing inquiry and supporting it at the point of care.
2. Use a system or a strategy to capture inquiry when and where it occurs, using post-it notes or sticky-notes.
3. Determine the quality and quantity of the science that supports each question.
4. Use evidence by disseminating information to frontline staff.

The steps encompass a practical system to identify, evaluate, and prioritize clinical questions and existing research in a fast-paced nursing work environment. Additionally,
Granger (2008) maintained the most critical step in improving EBP competence in nurses is beginning with initiatives that increase the use of existing evidence in practice.

Time, administrative support, and convenient access to information still top the list in terms of barriers to identifying and implementing evidence into practice. Based on reports from the IOM, the Joint Commission, WHO, and professional organizations, many healthcare organizations are pushing to remove these barriers by identifying cost-effective, creative approaches to promoting and maintaining EBP for nurses. In addition, obtaining Magnet accreditation has been a major impetus for nursing administrators to lobby for increased time, resources, and training to support and integrate EBP within their nurses' work environment. Evolving from the American Nurses Association (ANA) professional standards, the quest for Magnet accreditation, particularly in the acute care setting, has been a major catalyst for the advancement of EBP in nursing (Gasda, 2002; Mueller, 2002; Schlag, Sengin, & Shendell-Falik, 1998; Steltzer, 2002).

The ANCC first established the Magnet Recognition Program in 1990 to recognize healthcare organizations that provided nursing excellence, and to help disseminate successful nursing practices and strategies to nursing administrators throughout the country (ANCC, 2004). As such, the ANCC designates an organization Magnet status if the organization can validate it provides evidence-based nursing care and favorable work environments (ANCC, 2007). The ANCC is the world’s largest and arguably the most prestigious nurse credentialing organization (ANCC, 2013), and a subsidiary of the ANA. Hence, its Magnet Recognition Program is the highest level of recognition that can be extended to healthcare organizations.
Although progress has been made to integrate EBP within nursing practice, the most effective means to help engage nurses in EBP is still unclear (Fineout-Overholt, Hofstettler, Shell, & Johnston, 2005; Green, 2000; Hatala & Guyatt, 2002; Hockenberry, Brown, Walden, & Barrera, 2009; Johnston & Fineout-Overholt, 2005; Rutledge & Skelton, 2011; Sciarra, 2011; Varnell, Haas, Duke, & Hudson, 2008). For example, in the pilot study conducted by Sciarra (2011), nurses who worked in the intensive care unit (ICU) became more proficient in their EBP application, attitudes, and skill level after attending five 2-hour educational sessions conducted at various times for staff convenience. EBP education in this pilot study was shown to be an effective catalyst to nurses beginning or already participating in EBP projects. Although the intervention in this study was successful, it had a small sample size (33 ICU nurses) and the participants reflected only those ICU nurses working in the ICU at a single site. Additionally, the authors reported that the nurses who attended the educational sessions may have had prior knowledge and interest in the topic of EBP, reflecting a desire to increase knowledge and skill level. Furthermore, nurses’ motivation for attending the educational program was not assessed. More importantly, there was not a control group to compare the effect of the EBP educational intervention. Consequently, it was unclear how EBP evolved over time because no intervention was reported.

Rutledge and Skelton (2011) implemented a 4-day course with specific follow-up activities that were tracked over 1 year in a sample of clinical nurse experts in a large acute care facility located along the Southwestern border. The goal of this educational
initiative was to empower clinical nurse experts to use EBP methods and to facilitate others to use evidence in making clinical decisions. The authors reported that nurses who attended the training verbalized enhanced comfort with EBP and perceived skills increased immediately after four classes, but changes were not maintained. In a final report at year end, almost all the clinical nurse experts who participated in the 4-day course mentioned feeling more comfortable in their roles as clinical expert facilitators of EBP. However, it was also reported they required ongoing consultation and support from hospital administration as well as access to EBP resources to maintain competence in particular EBP skills. Findings from this study suggest EBP education be targeted at clinical nurse experts working in community hospitals to enhance use of evidence in these types of organizations where advanced practice nurses appear to be scarce.

Similar to Sciarra’s (2011) study, the sample size was small with only 11 nurses who participated and there was no control group. However, study findings from Rutledge and Skelton (2011) provided tentative support for the use of trained bedside nursing staff as EBP mentors. Accordingly, EBP mentors have been found to increase the enculturation and sustainability of EBP use in nursing (Brewer, Brewer, & Schultz, 2009; Honess, Gallant, & Keane, 2009; Long, Burkett, & McGee, 2009; Strout, Lancaster, & Schultz, 2009) but barriers to training EBP mentors have also been identified related to scheduling conflicts, staffing conflicts, and changes in role. Nevertheless, EBP mentors are progressively being evaluated as an effective strategy for EBP training and to engage nurses in EBP (Dearholt, White, Newhouse, Pugh, & Poe, 2008; Hockenberry, Brown, Walden, & Barrera, 2009; Pierson & Schuelke, 2009).
Collectively, the barriers of time, administrative support, and convenient access to information, along with lack of clarity about how best to engage nurses in EBP may contribute to the lack of EBP competence within the profession of nursing. The underlying goal of EBP should be to increase nurse effectiveness and improve patient outcomes. However, a seamless transition from research evidence to practice must be made evident for nurses to effectively and efficiently use EBP. An emerging body of evidence suggests that nurses are not ready to implement EBP, partially because they are not using existing evidence to its full potential (Granger, 2008; Pravikoff et al., 2005; Smirnoff et al., 2007). Thus, the gap between research and practice still exists. Improving EBP competence in nurses can serve to narrow and possibly close this gap by increasing EBP use in nursing practice. Intervention studies to date that aim to promote EBP in nurses have been limited by small samples sizes, omitting a control group, and lack of consistency and accessibility in the delivery of EBP content. Furthermore, the specialty of pediatric nursing has lagged behind in evidence-based pediatric resources when compared to resources available for other specialties (Bourgeois et al., 2012; Cohen et al., 2010; Cohen, Uleryk, Jasuja, & Parkin, 2007; Hamm et al., 2010; Martinez-Castaldi, Silverstein, & Bauchner, 2008). This disparity may create greater barriers in EBP competence and EBP use in pediatric nursing practice.

Finally, the development of EBP competence in nurses can be the determining factor in securing a workforce steeped in best practice. A healthcare delivery system that employs EBP has been emphasized by many expert leaders and projected to be ubiquitous in the 21st century. For pediatric nurses, their competence in EBP is critical
for providing high-quality care to their patients and families. This study was a logical first step toward facilitating the capacity for pediatric nurses to improve the overall quality of healthcare by providing care that is evidence-based.

Purpose of the Study

The purpose of this mixed methods pilot study, using a randomized controlled experimental embedded design, was twofold: (a) to assess and refine a Web-based EBP educational intervention on improving EBP competence in BSN-prepared pediatric bedside nurses, and (b) to examine the feasibility, acceptability, and usability of implementing a Web-based EBP intervention with respect to intervention content and delivery method, measures, and data collection procedures. Effect sizes obtained in this study, along with information about feasibility, acceptability, and usability have the potential to inform a larger intervention study focused on improving EBP competence in pediatric nurses.

Research Questions

This study addressed the following research questions:

1. Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP educational intervention demonstrate greater EBP competence compared to nurses receiving the attention control content?

2. Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP educational intervention report stronger beliefs about the value of EBP and their ability to implement it compared with nurses receiving the attention control content?
3. What are the feasibility, acceptability, and usability factors of implementing a Web-based EBP educational intervention with respect to intervention content and delivery method, measures, and data collection procedures?

Conceptual Framework

EBP competence is a skill acquisition that occurs over time and as such, Benner’s (1982) novice to expert theory was the conceptual basis for this study. A central focus of this study concerned promoting EBP competence in pediatric nurses. Benner’s theory was an appropriate framework to guide the development and implementation of the EBP educational intervention in this study because it describes degrees of competence and performance in the process of EBP skill acquisition.

Benner’s novice to expert theory is the Dreyfus and Dreyfus (1980) model of skill acquisition applied to nursing. The Dreyfus model was developed in 1980 by Stuart Dreyfus, a mathematician and system analyst, and Hubert Dreyfus, a philosopher, and based upon the study of chess players and airline pilots (Benner, 1984/2001). The Dreyfus model posited in the acquisition and development of a skill, a student passes through five levels of proficiency and these different levels reflect changes in four general aspects of skilled performance:

1. Movement from relying on abstract principles to using past concrete experiences to guide actions.

2. Change in the learner’s perception of situations as complete whole parts rather than separate pieces.
3. Passage from detached observer to involved performer in which the performer no longer stands outside the situation but is now actively engaged in the situation.

4. A shift from reliance on analytic, rule-based thinking to intuition. (Benner, Tanner, & Chesla, 1992, pp. 13-14)

Benner's groundbreaking theory facilitated the formal recognition of nurses' experiences in nursing practice as a significant source for nursing knowledge (Benner, 1984/2001; Benner & Wrubel, 1989). Consequently, Benner's (1982) novice to expert theory was formulated as a result of her descriptive qualitative study of (a) 21 pairs of nurses consisting of a preceptor and newly graduated nurses, (b) 51 additional experienced nurse clinicians, (c) 11 newly graduated nurses, and (d) five senior nursing students. Through the analysis of their experiences and the participant observations, and following the Dreyfus model, Benner was able to describe the performance characteristics at each level of development. Additionally, she was able to identify, in general terms, the teaching/learning needs at each proposed level. Benner identified the following five levels of nursing experience: novice, advanced beginner, competent, proficient, and expert. Each level builds on the previous level as principles are refined and expanded by experience and clinical expertise.

As noted, the first level is the novice stage. Nurses at this stage have had no experience of the situations in which they are expected to perform. They are taught general rules to help perform tasks, and their rule-governed behavior is extremely limited and inflexible (Benner, 1984/2001). The second level is the advanced beginner stage. Nurses at this stage can show marginally acceptable performance, and have gained prior
experience in actual nursing situations. This helps them recognize recurring meaningful situational components so principles, based on those experiences, begin to formulate in order to guide actions (Benner, 1984/2001). Advanced beginners need support in the clinical setting with setting priorities, since they operate on general guidelines and are only beginning to perceive patterns in their clinical practice. The third level is the competent stage. Nurses at this stage generally have been on the job in the same or similar situations for 2-3 years. These nurses are more consciously aware of their long-term goals, and they gain perspective from planning their own actions, which helps them achieve greater efficiency and organization (Benner, 1984/2001). Nurses in the competent stage can benefit from decision-making games and simulations that give them practice in planning and coordinating multiple, complex patient care demands. The fourth level is the proficient stage. Nurses at this stage perceive situations as whole parts, and have a more holistic understanding of nursing, which improves decision-making. These nurses learn from experiences what to expect in a given situation and how plans need to be modified in response to these events (Benner, 1984/2001). Nurses at the proficient stage are best taught by use of case studies where their ability to grasp the situation is enhanced. The fifth and final level is the expert stage. Nurses at this stage no longer rely on an analytic principle to connect situations and determine actions. They have a deeper background of experience and an intuitive grasp of clinical situations. Their performances are fluid, flexible, and highly proficient (Benner, 1984/2001).

Although Benner does not present a visual representation of her theory, the diagram in Figure 1 is often used to illustrate Benner's (1982) novice to expert theory:
Figure 1. Novice to expert progression. Obtained from Google Images Online.

The diagram depicts the relationship between the central concepts in Benner’s theory and clearly shows the stages of skill acquisition along a continuum. Progression along this continuum is sequential from novice to expert, but may include regression along the continuum when the nurse is in an unfamiliar situation (Benner, 1984/2001).

Benner’s (1982) novice to expert theory was considered to be a sound theoretical framework for this study because it has been used most frequently by those authors whose studies focused on knowledge and skill acquisition (Courtney, Alexander, & Demiris, 2008; Furlong et al., 2007; Judkins, Oleynikov, & Stergiou, 2009; Lamond & Farnell, 1998; Marzen-Groller, 2007; Nardi & Kremer, 2003; Nedd, Nash, Galindo-Ciocon, & Belgrave, 2006; Ramsburg & Childress, 2012; Rischel, Larsen, & Jackson, 2008; Winchcombe, 2000). For example, Nardi and Kremer (2003) used Benner’s theory in a non-experimental field study to investigate how students in a beginning nursing course self-assessed their learning of course competencies through the process of critical reflective inquiry. Lamond and Farnell, (1998) used Benner’s theory to investigate how novice and expert nurses’ knowledge of pressure sore treatments affect their decision-
making skills. Courtney, Alexander, and Demiris (2008) used Benner's theory as a framework in their study to explore the challenges of and opportunities for planning and implementing a clinical decision support system in nursing practice. Lastly, a quantitative study conducted by Judkins, Oleynikov, and Stergiou (2009) used Benner's theory in the field of surgical endoscopy where objective measures were used to compare robotic surgical performance between novices and experts, specifically after a short training period.

A unique principle of Benner's (1982) novice to expert theory was her position that nurses' development of skills and understanding of patient care occur over time, and transpire from a combination of strong educational foundation and personal experiences. Likewise, it was theorized that nurses in this study would develop EBP competence over time as a result of participating in the Web-based EBP educational intervention.

It was this investigator's assumption that being able to use EBP knowledge and skills in clinical practice perpetuates the cycle of EBP and further increases EBP competence. This assumption is consistent with Benner's (1982) novice to expert theory as she hypothesized that it is from "the assumptions and expectations embedded in expert clinical practice that questions are generated for scientific testing and theory building" (p. 36). Thus, the long-term impact anticipated from this study will be that nurses who demonstrate EBP competence will be able to translate research into practice seamlessly.

Theory of Planned Behavior and EBP

To this point, a discussion has been presented on the application of Benner's (1982) novice to expert theory to explain how knowledge acquisition over time can
influence behavior change, specifically the development of EBP competence. However, a particular emphasis needs to be placed on the wide range of factors, other than knowledge, likely to influence the behavior or behavior change in individuals. These include an individual’s motivational predisposition to change as well as economic, political, and organizational contexts. Numerous psychological or social cognitive theories have been used to explore the determinants of healthcare professionals’ behavior (i.e., theory of reasoned action or theory of planned behavior, theoretical domains framework, theory of goal-oriented behavior, transtheoretical model, social cognitive and social learning theory, and Triandis’ theory of interpersonal behavior). The theory of planned behavior was selected as an additional theoretical foundation for this study among the other social cognitive theories because it has consistently been used in studies examining nurses’ behavior and intention (Bernaix, 2000; Feng & Wu, 2005; Godin, Naccache, Morel, & Ébacher, 2000; Ko et al., 2011; O’Boyle, Henly, & Larson, 2001; Payant, Davies, Graham, Peterson, & Clinch, 2008; Puffer & Rashidian, 2004; Sauls, 2007; Zhou, Stoltzfus, Houldin, Parks, & Swan, 2010). Consequently, within this dissertation research, components of the theory of planned behavior were used to account for the social cognitive factors that may impact the nurses’ capacity for EBP competence in this study.

The theory of planned behavior has its origin from the scholarly work of Icek Ajzen (1985) and is an extension of the theory of reasoned action. In 1975, the theory of reasoned action was first reported in Martin Fishbein and Icek Ajzen’s landmark book, Belief, attitude, intention, and behavior: An introduction to theory and research, and
enriched the understanding of the relationship that exists between individuals’ attitude and behavior. Until then, earlier research failed to observe the principle of compatibility and the principle of aggregation together. Fishbein and Ajzen (1975) showed that when these two principles were adhered to, the attitude-behavior relationship was stronger. Thus, in the theory of reasoned action, behavior is influenced by an individual’s attitude and perceptions of social norms toward a specific behavior. In the theory of planned behavior, a third determinant of behavior change identified as perceived behavioral control was introduced. Perceived behavioral control is described as the amount of control the individual perceives they have over the opportunities, resources, and skills to make the change (Ajzen, 1985).

According to the theory, behavior change is determined by the intention to perform a behavior and individuals consider the consequences of the behavior before change. Based on this assumption and the research that suggests nurses’ attitudes toward EBP influences EBP use, the constructs of nurses’ attitude, perception of social norms, and perceived behavioral control toward EBP were analyzed as processes of EBP belief by which the EBP intervention in this study increased EBP competence. Actual EBP implementation or EBP use was not addressed or measured in this study. However, findings from this study can contribute to the evidence base on the precursor variables that must be present for EBP implementation or EBP use to occur.
Definition of Terms

The following terms are defined in context of how they were used in this study:

- *EBP* refers to "a problem-solving approach to clinical practice that integrates (a) a systematic search for and critical appraisal of the most relevant evidence to answer a burning clinical question, (b) one's own clinical expertise, and (c) patient preferences and values" (Melnyk & Fineout-Overholt, 2005, p. 6).

- *EBP competence* refers to an ability to ask clinically relevant questions for the purposes of acquiring, appraising, applying, and assessing multiple sources of knowledge within the context of caring for a particular patient, group, or community.

- *EBP use* refers to the frequency at which EBP behaviors are implemented in the clinical setting.

- *Pediatric bedside nurse* refers to a nurse working in a pediatric acute care setting in which his/her primary role is to provide care to patients/families and the majority of his/her work shift is spent at the point of care.

- *Attitude toward EBP* refers to the degree to which EBP is positively or negatively valued by the nurse.

- *Social norms of EBP* refer to nurses' perception of whether relevant others think EBP should be implemented or not implemented within their current clinical setting.
Perceived behavioral control of EBP refers to nurses’ perception of their ability to implement EBP within their clinical setting.

Significance of the Study

The fact that many nurses lack EBP competence, despite long standing recommendations for EBP (American Association of Colleges of Nursing [AACN], 1995, 1996; ANA, 1994; IOM, 2001, 2003, 2008; Joint Commission, 2007; Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000; Stetler, 2001; WHO, 2007), suggests rigorous studies are needed to test interventions that improve EBP competence among nurses. Several studies have examined the barriers that exist for engaging nurses in the utilization of EBP (Bevans et al., 2011; Bozzette, 2011; Chummun & Tiran, 2008; Edwards, Webber, Mill, Kahwa, & Roelofs, 2009; Higgins et al., 2010; Jacobson, Warner, Fleming, & Schmidt, 2007; Mantzoukas, 2008; Miller, Johnson, Mackay, & Budz, 1997; Parker, Giles, & Higgins, 2009; Rauen, Makic, & Bridges, 2009; Turale, Klunklin, & Chontawan, 2010). However, there are limited studies that focus on the conundrum of barriers precluding pediatric nurses from engaging in EBP and establishing EBP competence. In addition to the common barriers experienced and perceived by nurses in general, the barriers in EBP competence are greater for nurses practicing within the specialty of pediatrics because there are fewer evidence-based pediatric resources available when compared to resources available for other specialties (Bourgeois et al., 2012; Cohen et al., 2010; Cohen et al., 2007; Hamm et al., 2010; Martinez-Castaldi et al., 2008).
This pilot study represents the first step toward developing and testing interventions to promote EBP competence that are potentially accessible on a wider scale. The significance of having a nursing workforce competent in EBP is directly related to healthcare delivery outcomes because when nurses can demonstrate EBP competence, this translates to the highest quality of care being delivered to meet the multifaceted needs of their patients and families. Specifically, for pediatric nurses, being able to demonstrate EBP competence will facilitate the use of current research evidence to improve clinical decision making and improve the quality of nursing care for children, adolescents, and their families (Christian, 2010).

Summary

This chapter delineated how nurses continue to lack the knowledge and skills to provide quality evidence-based nursing care despite the growing emphasis of an EBP healthcare climate. A logical argument for why EBP competence is critical for nurses and particularly important for pediatric nurses was provided. Additionally, evidence indicating the lack of interventions available to promote EBP competence and EBP use among nurses was substantiated. The pilot study's purpose and associated research questions were delineated. Benner's novice to expert theory and the theory of planned behavior were presented as conceptual frameworks to help understand the phenomena of EBP competence among nurses, as well as guide interventions for establishing EBP competence among pediatric nurses. The chapter concluded with definitions of terms.
CHAPTER 2

LITERATURE REVIEW

In this chapter, the literature related to EBP competence and EBP use among bedside nurses is presented. The main topics included in this review are: (a) the current state of nurses’ knowledge and skill sets in EBP, (b) barriers to EBP competence among pediatric nurses (c) the emphasis on BSN-prepared nurses and expected level of EBP competence, (d) institutional approaches to improving EBP competence and EBP use in nurses, (e) empirical instruments that measure EBP competence, (f) EBP models that influence EBP competence and EBP use, and (g) the growth of Web-based educational delivery methods for training bedside nurses in EBP. This chapter builds the evidence supporting a pilot investigation of how a Web-based EBP educational intervention developed specifically for BSN-prepared pediatric nurses can improve their competence in EBP.

Current State of Nurses’ Knowledge and Skill Sets in EBP

EBP is an approach to healthcare in which healthcare professionals use the best evidence available in combination with clinical expertise, patient preferences and values, and healthcare resources available to guide their clinical decisions and practice (Melnyk & Fineout-Overholt, 2005). EBP is inherent in excellent nursing practice and the literature has consistently purported clinical outcomes are improved when nurses
implement an EBP approach to care (DiSalvo, Joyce, Tyson, Culkin, & Mackay, 2008; Heater, Becker, & Olson, 1988; Haycock et al., 2005; Mitchell, Beck, Hood, Moore, & Tanner, 2007; Tipton et al., 2007). For example, Heater et al. (1988) conducted a meta-analysis of studies to determine the contribution that research-based nursing practice made to health care by comparing patient outcomes from experimental nursing interventions with patient outcomes from routine, procedural nursing care. A major finding from this study revealed research-based nursing practice was found to offer patients better outcomes than routine, procedural nursing care. Thus, patients who received research-based nursing interventions were found to have better outcomes than 72% of patients who received routine nursing care, and those outcomes were 28% better than those of patients receiving routine nursing care.

Within the field of oncology, DiSalvo et al. (2008) reported how a team of oncology nurses made recommendations that improved cancer-related dyspnea in their patient population after they examined the literature, ranked the evidence, and summarized findings. Mitchell et al. (2007) described how a team of oncology nurses reviewed the literature and made recommendations that reduced fatigue and promoted functional well-being in patients experiencing cancer-related fatigue. Finally, Tipton et al. (2007) demonstrated how a team of oncology nurses reviewed the literature and made recommendations for evidence-based interventions that helped prevent, manage, and treat chemotherapy-induced nausea and vomiting.

Within the field of cardiac surgery, Haycock et al. (2005) reported an evidence-based initiative to standardize wound care management in patients following open heart
surgery to decrease site infections. Nurses were key drivers of patient-centered change and integral to enhancing postoperative recovery and reducing the risk of premature mortality in that population of patients.

Clinical practice based on the best available evidence is considered the expected standard of care in nursing (Stone, Curran, & Bakken, 2002) and endorsed by influential organizations throughout the world (American Association of Colleges of Nursing [AACN], 1995, 1996; ANA, 1994; Institute of Medicine [IOM], 2001, 2003, 2008; Joint Commission, 2007; World Health Organization [WHO], 2007). However, a groundbreaking nationwide study conducted by Pravikoff, Tanner, and Pierce (2005) found that majority of U.S. nurses were still not implementing EBP in their clinical settings on a consistent basis, despite the growing emphasis on EBP. This study specifically examined RNs’ perceptions of the information resources available to them and their skills in using those resources. The authors concluded that RNs in the U.S. were not ready for EBP because of gaps in their information literacy and computer skills, their limited access to high-quality information resources, and their attitudes toward research, as it was noted that they did not understand the value of research (Pravikoff et al., 2005). While there are reports of how nurses’ use of EBP improves patient outcomes, Pravikoff et al. (2005) suggest widespread use of EBP remains elusive among nurses.

Multiple studies conducted in the U.S. and other countries have demonstrated nurses’ sources for clinical decision-making are not based on evidence but are grounded in personal experience and collegial relationships. In addition, findings are inconsistent about whether nurses value research. Furthermore, citations in the literature around
nurses in the workforce not implementing EBP within their practice often identify personal/individual and/or organizational factors as barriers that impede consistent use of EBP within their practice (Chummun & Tiran, 2008; Stetler, Ritchie, Rycroft-Malone, Shultz, & Charms, 2007).

Estabrooks, Chong, Brigidear, and Profetto-McGrath (2005) conducted a descriptive study with a sample of nurses (n=230) in five adult and two pediatric surgical units from four hospitals in the Canadian provinces of Alberta and Ontario. A major finding revealed nurses preferred to use knowledge gained through personal experience and interactions with co-workers and individual patients to guide their practice rather than journal articles or textbooks.

In a more recent study, Yadav and Fealy (2012) used a descriptive cross-sectional design to investigate the sources of knowledge or evidence for practice as reported by Irish psychiatric nurses. Similar to Estabrooks et al. (2005), findings revealed the majority of the sample based their practice on information derived from interactions with patients, from their personal experience, and from information shared by colleagues and/or members of the multidisciplinary team, rather than from published sources of empirically derived evidence.

Thiel and Ghosh (2008) conducted a descriptive cross-sectional study to determine nurses’ readiness for EBP with a convenience sample of 205 nurses before implementation of a hospital-wide EBP initiative in a moderate-sized teaching hospital in the U.S. Findings from this study were consistent with Pravikoff et al. (2005) and indicated the primary method of obtaining information to guide nurses’ practice decisions.
at the hospital was through peers and colleagues, followed by journals and books, conferences and workshops, databases, and then librarians. Furthermore, the number of nurses in this study who actually used research reports to guide their clinical practice decisions was low.

Gerrish, Ashworth, Lacey, and Bailey (2008) conducted a cross-sectional study of a sample of RNs (n=598) from two hospitals in England to compare factors influencing the development of EBP as identified by less experienced and more experienced nurses. Findings revealed nurses across all levels of experience relied greatly on personal experience and communication with colleagues rather than published sources of knowledge or evidence. Another important finding in this study was information obtained from the Internet was reported as the least-used source of evidence. This is particularly concerning considering the use of information technology in the healthcare setting has escalated and the database of most up-to-date evidence-based literature has, for the most part, become readily available via the Internet.

Rolfe, Segrott, and Jordan (2008) conducted a cross-sectional survey of all qualified nurses in one National Health Service (NHS) in the United Kingdom (UK). Due to the low response rate, the study included a qualitative component using semi-structured interviews and a focus group to explain some of the inconsistencies found in the quantitative component. The purpose of this study was to explore nurses’ interpretations of EBP and its impact on EBP implementation. Findings from this study revealed the primary influences most frequently used by nurses to make practice decisions was from national guidelines, their own past experience, local policies, and
patients' preferences. Additionally, nurses regarded their own previous experiences as exerting greater influence and being more important on their clinical practice decisions than to all types of research evidence, including evidence from RCTs.

Beke-Harrigan, Hess, and Weinland (2008) conducted a descriptive correlational study on a sample of bedside nurses (n=443) in a large medical center in northeast Ohio to explore their opinions about readiness for, access to, and utilization of EBP resources as well as to identify barriers that might prevent EBP from being implemented. Findings from this study revealed (a) only two thirds of the nurses reported they had access to the library services at the hospital and of those who had access, 70% reported they did not use it, (b) of those who had access to electronic databases for research, 42% reported they seldom needed research evidence to support their nursing roles, and (c) when in need of research, 49% reported that they searched databases like CINAHL and MEDLINE but 43% reported they started their searches using Google. The top five barriers (organizational and personal) to EBP reported were: (a) lack of understanding of electronic databases, (b) difficulty accessing resource materials, (c) difficulty understanding research articles, (d) limited access due to hospital’s computer filtering system, and (c) lack of research value in nursing practice.

Brown, Wickline, Ecoff, and Glaser (2009) conducted a descriptive, cross-sectional study with a convenience sample of nurses (n=458) at an academic medical center in California to explore nurses' practices, knowledge, and attitudes related to EBP as well as perceived barriers to and facilitators of EBP. Findings from this study revealed (a) nurses' attitudes, knowledge, and practice had a significant impact on their
implementation of EBP, with attitudes being the greatest predictor followed by knowledge than practice; (b) limited time, lack of knowledge around finding and understanding research reports and data, inadequate support for clinical nurses to be involved in EBP, and unsupportive culture for EBP were identified as the greatest barriers; and (c) learning opportunities and mentorship, supportive culture, and availability and simplicity of evidence were viewed as facilitators of EBP.

Cadmus et al. (2008) replicated Pravikoff et al's (2005) national study to determine if a sample of New Jersey (NJ) RNs from 32 acute care hospitals were different from the national sample of RNs with respect to EBP. A descriptive, exploratory survey was undertaken to assess NJ nurses' perceptions of their skills in obtaining evidence and access to information as well as to identify any barriers to EBP. Findings from this study revealed that (a) nurses most often accessed information from their peers and secondly accessed the Internet to obtain information, (b) the library was rarely used by RNs to obtain information, (c) clinical RNs rarely identified, participated, or evaluated research, and (d) nurses valued research, even if they did not know how to use it. The top three personal barriers to EBP reported by RNs from a list of 10 options provided in this study were: (a) lack of skills to critique or synthesize the literature (or both), (b) lack of understanding pertaining to electronic databases, and (c) difficulty accessing research material. The top three organizational barriers to EBP reported by RNs from a list of six options provided in this study were: (a) organizational budget for training in resource utilization, (b) presence of other goals with a higher priority, and (c)
organizational budget for acquisition of information resources. These findings suggested the need for education and building EBP competencies among nurses are still warranted.

Another critical finding from Cadmus et al’s (2008) study was evidence that nurses are placing greater value on research as compared to Pravikoff et al’s (2005) study. This finding may be due to the growing emphasis on EBP in nursing programs and in the nursing literature, as more recent studies have revealed nurses’ positive attitudes toward EBP (Fink, Thompson, & Bonnes, 2005; Hart et al., 2008; Munroe, Duffy, & Fisher, 2008; Thiel & Ghosh, 2008). Future research focused on improving nurses’ EBP competence and EBP use may benefit from nurses’ valuing of research because a growing body of literature suggests nurses’ attitudes and beliefs, along with EBP skills, are critical factors for successful EBP implementation (Brown, Wickline, Ecoff, & Glaser, 2008; McSherry, Artley, & Holloran, 2006; Thiel & Ghosh, 2008; Varnell, Haas, Duke, & Hudson, 2008). Positive attitudes about EBP have also been linked to actual EBP use among nurses (Estabrooks, Floyd, Scott-Findlay, O’Leary, & Gushta, 2003; Melnyk et al., 2004; Thiel & Ghosh, 2008). While nurses’ changing values about research is a positive step, it does not assure EBP competence. For example, Melnyk et al. (2004) reported nurses had positive attitudes toward EBP and believed that practice supported by evidence can improve clinical outcomes. However, their knowledge or competence in EBP was discordant with their belief.

Gale and Schaffer (2009) conducted a descriptive study to determine the organizational readiness for integrating evidence into practice at a Level 1 trauma center in Minnesota. The study was designed to compare nurse managers’ and staff nurses’
perceptions about factors that influenced adoption of EBP changes and barriers that prevented the integration of the practice changes. The top four barriers (organizational and personal) reported by nurses in this study were (a) insufficient time, (b) lack of staff, (c) not having the right equipment or supplies, and (c) inadequate or poor training. The top three perceived facilitators or reasons to adopt EBP changes were (a) having a personal interest in the topic or practice change, (b) personally valuing the evidence, and (c) avoiding risk of negative consequences to the patient.

Finally, a more recent study by Bartelt et al. (2011) conducted at an academic freestanding pediatric hospital in the Midwest examined bedside nurses’ perceptions of knowledge and skills around EBP using a descriptive cross-sectional design. The same instrument used in the Pravikoff et al. (2005) study was used in this study with the exception of some slight modifications made by the authors to improve its relevance for a single pediatric institution. All RNs working primarily at the bedside were invited to participate in this study. In addition, the authors wanted to examine differences in perceptions, skills, and activities between nurses who participated in an EBP educational initiative and those nurses who had not participated. Major findings from this study revealed (a) significant differences between nurses who attended the EBP educational initiative and those who had not attended, (b) a positive trajectory of perceptions, skills, and activities over time, similarly to those reported in the Cadmus et al. (2008) study; and (c) the practice of asking a colleague remained the primary way nurses’ sought new information. Overall, considering the results of this study, it can be inferred that EBP was being adopted in part because the change was compatible with the existing values
and needs of the organization. Furthermore, these findings support the assumption that RNs are recognizing the value of research; and with organizational support, competence and use of EBP can be increased with ongoing education for the bedside nurse.

Among the 11 studies described in this section, the consistent issues reported by nurses as being personal barriers to engaging in EBP were related to their gap in knowledge. Five studies noted lack of understanding on how to use online research databases as a barrier (Bartelt et al., 2011; Beke-Harrigan et al., 2008; Cadmus et al., 2008; Melnyk et al., 2004; Pravikoff et al., 2005). Using an alternative source rather than the scientific research databases for practice decisions was identified as a barrier in four studies (Estabrooks, Chong, et al., 2005; Gerrish et al., 2008; Thiel & Ghosh, 2008; Yadav & Fealy, 2012). Three studies identified difficulty understanding the statistics found in the journals as a barrier (Brown et al., 2009; Gale & Schaffer, 2009; Melnyk et al., 2004). Five studies noted that nurses did not feel confident in their ability to evaluate the quality of the research (Beke-Harrigan et al., 2008; Brown et al., 2009; Cadmus et al., 2008; Gale & Schaffer, 2009; Pravikoff et al., 2005). In addition, these studies provide insight to the nature of the barriers that continue to preclude a considerable proportion of nurses from providing evidence-based care. Furthermore, among the studies that reported solutions to these barriers, educational interventions were primarily involved which supported the intervention approach used in this pilot study. The literature shows that educational interventions can be effective at increasing knowledge and skills associated with EBP (Sherriff, Wallis, & Chaboyer, 2007; Varnell et al., 2008).
Barriers to EBP Competence Among Pediatric Nurses

A number of studies have investigated barriers to EBP (Adams, 2001; Dunn, Crichton, Roe, Seers, & Williams, 1998; Funk, Champagne, Weise, & Tornquist, 1991; Kajermo, Nordstrom, Kruesbrant, & Bjorvell, 1998; McCaughan, Thompson, Cullum, Sheldon, & Thompson, 2002; Nagy, Lumby, McKinley, & Macfarlane, 2001; Nolan et al., 1998; Parahoo, 2001; Retsas, 2000; Sitzia, 2001), facilitators of EBP (Adib-Hajbaghery, 2007; Rycroft-Malone et al., 2004), and readiness to engage in EBP among nurses (Melnyk et al., 2004; Pravikoff et al., 2005; Thiel & Ghosh, 2008; Waters, Crisp, Rychetnik, & Barratt, 2009). More recently the phenomena of EBP competence and EBP use particularly among pediatric nurses have gained attention (Bartelt et al., 2011; Bozzette, 2011; Christian, 2010, 2011, 2012; Darbyshire, 2008; Long, 2011; MacLean, Desy, Juarez, Perhats, & Gacki-Smith, 2006; Niederhauser & Kohr, 2005; Society of Pediatric Nurses [SPN], 2005). For example, the SPN (2005) has endorsed clinical practice based on best evidence from EBP sources, such as clinical relevant research, clinical practice, and patient and family preferences. Furthermore, the SPN (2005) issued a position statement supporting clinically based nurses who use an EBP approach to maximize clinical outcomes for pediatric patients and their families.

In addition, nursing leaders in the area of pediatric nursing have emphasized EBP. For example, Dr. Becky Christian has contributed to the Journal of Pediatric Nursing (JPN) as journal editor for three consecutive years (2010, 2011, and 2012). In 2010, she challenged pediatric nurses to discover the power of research and EBP to improve the quality of pediatric nursing care. In response to this challenge, the 2010 issue of JPN
featured authors that translated research findings into best practices by presenting age-appropriate assessment methods, innovations in pediatric nursing care, and developmentally appropriate strategies for conducting research with children and adolescents. In 2011, she delineated the impact of translational research on creating an excellent evidence-based pediatric nursing practice. Consequently, six research articles were featured in that issue of *JPN* that demonstrated a variety of approaches for translating research evidence to improve pediatric nursing practice (Ahern & Norris, 2011; Eddy, Khastou, Cook, & Amtmann, 2011; Lennartsson, 2011; Noonan, Quigley, & Curley, 2011; Wood & Bolyard, 2011; Zentz, 2011). Finally, in 2012, she commented on the significance of synthesizing an evidence-base for pediatric nursing research and practice. As a result, that issue of *JPN* featured 10 articles from pediatric nursing practice that enhanced the understanding of knowledge development by providing foundational evidence synthesized from the literature through literature reviews, systematic integrative reviews, concept analyses, and evaluations of quality improvement programs (Banta-Wright, Shelton, Lowe, Knafl, & Houck, 2012; Gavriloff, 2012; Habich et al., 2012; Kelly, 2012; Lauver, 2012; Morrell & Tilley, 2012; Parsarón, 2012; Shapiro, 2012; Stayer, 2012; Tanda & Salsberry, 2012).

**Personal and Organizational Factors**

Studies exclusive to pediatric nurses have reported barriers to EBP related to time constraints, accessibility to evidence-based databases, and limited skills in EBP (Bartelt et al., 2011; MacLean et al., 2006; Niederhauser & Kohr, 2005). These barriers are consistent with the barriers reported by nurses in other specialties. In Bartelt
et al.'s (2011) study, the top three personal barriers reported by RNs were: (a) lack of understanding of organization or structure of electronic database, (b) difficulty accessing research, and (c) lack of skill to critique and/or synthesize the literature. The top three organizational barriers reported by RNs were: (a) workload doesn’t allow it, (b) presence of other goals with a higher priority, and (c) training in resource utilization.

MacLean et al. (2006) conducted a descriptive study among nurses working in a pediatric emergency center to identify what nurses reported they needed to increase their involvement in research. The authors identified several barriers that precluded nurses’ research involvement, including (a) limited research knowledge and experience, (b) limited awareness and availability of research resources, (c) lack of time available dedicated to research, and (d) lack of recognition for contributions to research. As a result of these findings and to begin addressing the barriers identified among this sample, a research curriculum was developed to meet the continuing education needs and interests of pediatric emergency care nurses.

Niederhauser and Kohr (2005) conducted a study to (a) identify the facilitators of and barriers to using research among pediatric nurse practitioners (PNPs), (b) identify barriers to conducting research among PNPs, (c) describe research-related activities of PNPs, and (d) identify resources needed to promote research among members of the National Association of Pediatric Nurse Practitioners (NAPNAP). This study was relevant to this pilot study because it revealed that the issues that preclude bedside pediatric nurses from engaging in EBP in the acute care setting were also present, to some extent, among PNPs in the primary care setting. PNPs reported the primary barriers
to using research in their practice were (a) time constraints for reading and implementing research, (b) the amount of research information and the way it is compiled, and (c) knowledge deficits about statistical analysis interpretation. Additionally, the primary barriers to actually conducting research as reported by PNPs were (a) time constraints, (b) lack of grant writing skills, and (c) lack of funding. The primary facilitators of EBP reported by PNPs included (a) having the time to review and implement findings, (b) having authority to change nursing practice based on research findings, and (c) conducting clinically relevant studies. Finally, only 21% of PNPs reported ever being involved in a research project and the most desirable way to learn research skills reported by PNPs were via the Internet and mentorship programs.

It is apparent from these studies (Bartelt et al., 2011; MacLean et al., 2006; Niederhauser & Kohr, 2005), initiatives directed at increasing the utilization of research for pediatric nurses across diverse settings are warranted to elevate the standards of nursing care and optimize patient outcomes. Additionally, these reports suggested pediatric nurses at all levels of education may fail to use EBP consistently primarily due to a gap in knowledge. Future studies need to shift their focus to the exploration and testing of emerging pedagogies for their efficacy in closing this gap in knowledge among pediatric nurses.

Evidence Base Factors

Pediatric nurses, like nurses in other specialties, are continually faced with clinical practice issues, questions, and concerns. To address these matters, nurses are expected to use the EBP approach for making best-practice decisions for their patients.
and families by first searching the evidence base related to the clinical question being asked or clinical problem presented. However, for the pediatric nurse, the evidence base is remarkably sparse when compared to other specialties, creating greater disparities for evidence-based decision making. In the absence of an abundance of specific trial-based data in children, pediatric nurses are frequently relegated to extrapolate from results of clinical trials in adults, which have the potential to lead to inappropriate decisions. As a result, the importance of a clinical evidence base in pediatrics is increasingly being recognized by major research groups, professional bodies, and pediatric experts (American Academy of Pediatrics [AAP], 1995; Botstein, 1995; Christian, 2012; National Institute of Health [NIH], 1998; Simar, 2000; SPN, 2005). Ultimately, this paucity can have a negative impact on the capacity for EBP competence and EBP use among pediatric nurses because a clinical evidence base is critical for knowledge development and improvements in the specialty of pediatrics.

The literature offers multiple reasons for the limited clinical evidence base in children’s health, including the following: (a) ethical tensions, (b) decreased research funding, (c) fewer clinical trials and RCTs conducted on children compared to adult populations, and (d) lack of high-quality designs (Bourgeois et al., 2012; Cohen et al., 2010; Cohen, Uleryk, Jasuja, & Parkin, 2007; Hamm et al., 2010; Martinez-Castaldi, Silverstein, & Bauchner, 2008). Recent reports suggest the latter two particularly may account significantly to the limited evidence base in pediatrics.

Fewer clinical trials. Bourgeois et al. (2012) explored the prevalence of pediatric studies among clinical drug trials to compare trial characteristics and quality indicators
between pediatric and adult drug trials. Conditions that represented a high burden of pediatric disease according to the *WHO's 2004 Global Burden of Disease* study (i.e., asthma, migraine, schizophrenia, bipolar disorder, depression, malaria, diarrheal illness, lower respiratory tract infection, HIV/AIDS) were linked to drug trials registered in ClinicalTrials.gov with start dates between 2006 and 2011. The investigation by these authors revealed for conditions with a high disease burden in children, only a small proportion of clinical drug trials studied pediatric patients. The authors suggested this may be related to lack of trial funding with pediatric trials relying primarily on government and nonprofit organizations as compared to funding from drug companies.

Cohen et al. (2007) conducted an analysis of the literature published in general medical journals from 1985-2004 to assess the quantity, trend over time, characteristics, and quality of RCTs involving children and adults. Findings from this study revealed that (a) the average number of RCTs involving adult subjects published each year over 20 years doubled with virtually no change in RCTs involving pediatric subjects, (b) adult RCTs were more likely to be hospital-based and involved more well-conducted multicenter trials, and (c) quality scores were similar even though adult RCTs were cited more frequently. The authors concluded that there may be significant barriers that preclude the publication of high-quality pediatric RCTs in general medical journals.

In a subsequent study, Cohen et al. (2010) conducted a citation analysis of disease specialty journals during a period of 20 years from 1985-2005 to investigate the secular trends in RCT publications between pediatric and adult age groups. Findings from their analysis revealed adult RCT publications were increasing at a faster rate (at
approximately four times the rate) than pediatric RCTs in almost all specialties, with notable exceptions in immunology and tropical medicine. The authors concluded the gap between pediatric and adult RCTs may have implications for the quality of evidence-based care delivered to children because RCTs are considered the preferred study design for assessing interventions.

To this point, the paucity of evidence base in pediatrics has been demonstrated using reports from the medical literature that examined the quantity and quality of quantitative studies, particularly RCTs. Another explanation for the paucity of evidence base in pediatrics may be found examining the nursing literature. No published reviews of the quantity and quality of quantitative studies by pediatric nurse researchers were found. The amount of nurse-led pediatric RCTs published in the nursing literature is arguably limited when compared to other adult specialties. For instance, a literature search of two peer-reviewed, scholarly journals having a pediatric nursing focus was conducted by this student investigator and a medical librarian. Both journals were analyzed for the quantity of nurse-led RCTs published over a minimum of two decades. The first journal searched was the *JPN* from 1987-2013. Results from this search yielded only 65 RCTs or on average, less than two RCTs published each year. The second journal searched was the *Pediatric Nursing (PN)* journal from 1989-2013 and yielded only 49 RCTs. The publication history based on these two journals suggests the majority of investigations in child health may not center on rigorously designed studies testing the efficacy of treatments or interventions but rather the use of weaker study designs to provide data to improve outcomes for children.
In contrast, the one area in pediatric research with historically high accrual rates for treatment protocols and published benefits from clinical trials is pediatric oncology. In the past decades, extensive research and inclusion of children in treatment protocols has led to an increase in 10-year survival from 10-80% for children with cancer (Caldwell, Murphy, Butow, & Craig, 2004; Pritchard-Jones, Dixon-Woods, Naafs-Wilstra, & Valsecchi, 2008). Thus, the steadily increasing clinical trials conducted within the sub-specialty of pediatric oncology have improved the evidence base of pediatrics. Nonetheless, the evidence base pediatric nurses have to refer to when providing care to children who do not have cancer is still limited when compared to the evidence base available for nurses in adult specialties.

Lack of rigorous designs. Integral aspects of high-quality research include the presence of randomization and a control or placebo group. However, the literature suggests these attributes of a rigorous design raise logistical issues that can often impede the participation of children (Buscariollo et al., 2012; Caldwell, Butow, & Craig, 2003; Caldwell et al., 2004; Tait, Voepel-Lewis, & Malviya, 2003; Welton, Vickers, Cooper, Meade, & Marteau, 1999; Wiley et al., 1999). For example, Buscariollo et al. (2012) conducted a cross-sectional survey of parents of children with Type 1 Diabetes to assess parental attitudes towards clinical trials for Type 1 Diabetes, as well as factors that impact willingness to enroll their children with and without diabetes. Results from this study were consistent with other reports about the influence of random allocation of treatment and the use of placebos on parents' decision to consent their children in clinical trial studies. The authors found only a minority of parents were comfortable with the
possibility of their children being randomized to a placebo arm. Thus, in this study, 
comfort with placebos had a strong positive correlation with and was predictive of 
willingness to enroll both a child with diabetes and without diabetes in clinical trials for 
Type 1 Diabetes.

In addition to randomization and the use of control groups/placebos, the absence 
of rigorous designs in pediatric research can stem from other factors, such as high risk for 
selection bias (Hamm et al., 2010) and tendency of researchers to use less rigorous study 
designs (Martinez-Castaldi et al., 2008). For example, Hamm et al. (2010) conducted a 
search of the Cochrane Central Register of Controlled Trials to provide an overview of a 
representative sample of pediatric RCTs published in 2007 and assessed the validity of 
their results. Three hundred RCTs were randomly selected and examined for 
(a) methodological quality, including risk of selection bias, and its association with effect 
estimates; (b) the rate of trial registration, and investigators’ reasons for registration and 
non-registration; and (c) availability of trial protocols and their consistency with 
publications. Findings from this review revealed a high risk of selection bias in over 50% 
of the pediatric RCTs selected and 75% of the trials were not registered. These findings 
are consistent with subsequent reports that have documented the methodological 
limitations of published RCTs in pediatrics and suggested pediatric studies are less likely 
to be rigorous in terms of their design, conduct, and reporting (DeMauro, Giaccone, 
Kirpalani, & Schmidt, 2011; Nor Aripin, Choonara, & Sammons, 2010; Thomson et al., 
2010). Thus, these findings minimize the internal validity of these studies and increase 
the likelihood of inaccurate estimates of reported treatment benefits and/or harms.
Martinez-Castaldi et al. (2008) conducted a systematic review of all articles published in six journals (i.e., *New England Journal of Medicine*, *Journal of the American Medical Association*, *Annals of Internal Medicine*, *Pediatrics*, *Archives of Internal Medicine*, *Archives of Adolescent and Pediatric Medicine*) during the first 3 months of 2005 and assessed for differences in study design and purpose between pediatric and adult research. A major finding from this review revealed adult studies were significantly more likely than pediatric studies to be randomized, controlled trials, systematic reviews, or studies of therapies.

**Ethical tensions.** Pediatric research has been proven to generate scientifically valuable information that has answered important questions concerning the health and welfare of children. This has been most evident in the area of pediatric oncology. For example, cancer research conducted in children with leukemia has improved survival from being nearly fatal 50 years ago to approximately 80% of children with leukemia now being disease free 5 years after diagnosis (National Cancer Institute, 1999). In recognition of the benefits from pediatric research, research ethics has evolved from a position of excluding children to one of careful analysis and consideration.

A number of reports have discussed the ethical issues unique to children in research and the special considerations that must be made when conducting research with children of differing ages (Allmark & Spedding, 2007; Berg, 2007; Caldwell et al., 2004; Gill, 2004; IOM, 2004; Kipnis, 2003; Koogler, 2012; Roth-Cline, Gerson, Bright, Lee, & Nelson, 2011; Zeigler, 2011). The traditional exclusion of children from research is deeply rooted on the principles expressed in the *Belmont Report*, which stipulate
participants of research should generally be those who are least vulnerable and most able to identify with the benefits of the research (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research [NCPHSBBR], 1979). However, this approach, combined with the practical difficulties in recruiting sufficient numbers of children in research, impedes the development of a pediatric evidence base, which paradoxically hinders the health and welfare of all children. Historically, children have been viewed as the research participants of last resort because they are vulnerable and lack a mature capacity to identify with the goals of research (Kipnis, 2003). In addition, for over three decades, the vulnerabilities and decisional incapacities of children have been expounded on within numerous reports (Food and Drug Administration [FDA], 2007; Council for International Organizations of Medical Sciences [CIOMS], 2002; IOM, 2004; NCPHSBBR, 1979; World Medical Association [WMA], 2008). Corollary to this, the principle of scientific necessity and unique risk associated with children being enrolled in RCTs, in particular, have been the subject of debate by several experts (Carroll & Gutmann, 2011; CIOMS, 2002; de Melo-Martin, Sondhi, & Crystal, 2011; Fisher et al., 2007; Glass & Binik, 2008; Henschel, Rothenberger, & Boos, 2010; IOM, 2004; NCPHSBBR, 1979; Office for Human Research Protections [OHRP], 2005; Kopelman, 2000; Shah, Whittle, Wilfond, Gensler, & Wendler, 2004; Unguru, Coppes, & Kamani, 2008). Thus, topics that remain in considerable disagreement among experts in pediatric research are related to (a) the appropriate balance of risk and potential benefit, (b) ethical imperatives in study recruitment, design, and conduct; and (c) child assent and parental permission (Roth-Cline et al., 2011).
Contrary to most adults, children often lack the legal right, and the intellectual and emotional maturity to consent to research participation on their behalf. These unique characteristics have provided the most compelling argument for excluding children in research. As such, both the legal and developmental aspects of competence and capacity to give informed consent must be considered. In this instance, the IRB, parental consent, and/or patient assent for children ensure their rights are not violated. Additional protections that extend beyond the IRB review and the informed consent process can be viewed as unreasonably paternalistic when similar substituted judgments are considered appropriate and prudent for other vulnerable populations (i.e., adults with advanced dementia, persons incapacitated by critical illness, pregnant women, and persons incarcerated) (Karlawish, 2003; Luce et al., 2004; Truog, 2005). Nonetheless, the wide variation in IRB practices and the informed consent process have been cited by some as reasons for excluding children in RCTs (Caldwell et al., 2002; HarrisInteractive, 2004; Kimberly, Hoehn, Feudtner, Nelson, & Schreiner, 2006; Mammel & Kaplan, 1995; Walterspiel, 1990; Whittle et al., 2004). Ethical tensions between safeguarding the health of an individual children and society’s obligation to facilitate research that will result in improved outcomes for children in the future continue to be cited within the literature (Halpern, Randolph, & Angus, 2009; Meaux & Bell, 2001; Ross & Walsh, 2003). Despite the regulatory and compliance processes that have been established to protect children in studies (i.e., Department of Health Education and Welfare, 1983; IOM, 2004; NCPHSBBR, 1979; OHRP, 2005; Pediatric Research Equity Act of 2007), ethical tensions within pediatric research continue to surface, and may be exacerbated by

**Decreased research funding.** The availability of funding allocated for pediatric research is often cited as being insufficient when compared to adult specialties (Gitterman and Hay, 2008; Hay, 2009; Prows, Hopkin, Barnoy, & Van Riper, 2013; Vastag, 2006). With the exception of pediatric oncology, many other pediatric subspecialties receive limited extramural funding, which decelerates the pace of scientific advancement in this specialty (Rivara & Alexander, 2010). Furthermore, decreased funding translates to less capacity to conduct research, and discourages clinicians and investigators interested in conducting pediatric research from pursuing a career in child relevant research. Gitterman and Hay (2008) conducted a systematic review to examine the historical and recent trends in funding of pediatric research at the National Institutes of Health (NIH). Findings confirmed that although NIH appropriations and pediatric research funding increased in nominal amounts, the proportion of NIH funds devoted to pediatrics has remained flat since 1993. The delivery of high-quality evidence-based care is dependent on the availability of child relevant research and the under-investment by NIH in pediatric research, especially clinical trials, is a good example of how resource allocation towards children’s health is deprived, thereby limiting the evidence base in this specialty.

As noted in the literature, there are a myriad of personal, organizational, and evidence-base factors that can preclude pediatric nurses from using EBP and
demonstrating EBP competence. Furthermore, a substantial number of studies have identified barriers to and described attitudes of nurses toward the implementation of EBP in nursing. However, to date, implementation studies that objectively measure EBP competence and EBP use among pediatric bedside nurses have not been conducted. In consideration of these factors, this pilot study was the next logical step towards developing and testing interventions designed to secure a pediatric nursing workforce that can demonstrate an EBP approach to care.

Emphasis on BSN-Prepared Nurses and Expected Level of EBP Competence

The IOM report suggested the highly complex healthcare environment of the 21st century requires nurses to have stronger knowledge and skill sets that begin at the baccalaureate level (IOM, 2010). As such, they recommended an 80% BSN prepared nursing workforce by 2020 (IOM, 2010). The IOM report also asserted, unlike associate degree curricula, the content provided in BSN curricula prepares entry-level nurses to, not only navigate in the current healthcare environment, but also adapt to the anticipated changes with healthcare reform (IOM, 2010).

In addition to recommendations set by the IOM, there are growing numbers of research reports that support how a higher percentage of BSN-prepared nurses can equal better patient outcomes (Aiken, Clarke, Cheung, Sloane, & Silber, 2003; Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005; Goode & Blegen, 2009; Tourangeau et al., 2007). For instance, Aiken et al. (2003) conducted a landmark study that found
a 10% increase in the proportion of nurses with a BSN degree was associated with a 5% decrease in both the likelihood of surgical patients dying within 30 days of admission and the rate of failure to rescue. Blegen and Goode (2009) conducted a longitudinal study of 21 U.S. hospitals and found that patients cared for by BSN-prepared nurses experienced a (a) significant reduction in length of inpatient stay, (b) decrease in hospital-acquired pressure ulcers, and (c) reduction in cardiac mortality. Estabrooks et al. (2005) conducted a cross-sectional analysis study to assess the relative effects and importance of nurse education and skill mix, continuity of care, and quality of work environment in predicting 30-day mortality after adjusting for institutional factors and individual patients' characteristics. This study replicated Aiken et al.'s study in 2003 and results were identical, as they found that institutional and hospital nursing characteristics (i.e., educational preparation) were significant considerations in efforts to reduce the risk of 30-day mortality of patients. Finally, Tourangeau et al. (2007) used a retrospective design to examine the nursing-related determinants of risk-adjusted 30-day mortality for acute medical patients in hospitals in Ontario, Canada. The study occurred in two phases. In the first phase, they surveyed nurses working in medical and combined medical-surgical units in Ontario. In the second phase one year later, they linked nurse survey data with secondary sources of patient and hospital data to test a number of hypotheses. Findings from this study revealed, among several determinants studied, hospitals that had a higher proportion of BSN-prepared nurses were associated with lower 30-day hospital mortality rates (Tourangeau et al., 2007).
Accordingly, a number of influential organizations have called for either a higher percentage of BSN-prepared nurses or making the BSN degree the entry level into nursing practice (AACN, 2000; American Organization of Nurse Executives [AONE], 2008; National Advisory Council on Nurse Education and Practice [NACNEP], 2010; Reams & Stricklin, 2006). Respective to the focus of this pilot study, the AACN (2008) identified the scholarship of EBP as one of nine Essentials expected of BSN-prepared nurses. Thus, BSN-prepared nurses are expected to translate current evidence into their practice and the ability to implement EBP is viewed as one of the essential skills needed to practice within complex healthcare systems. According to the AACN (2008), BSN-prepared nurses who demonstrate a scholarship of EBP are expected to identify practice issues, appraise and integrate evidence, and evaluate outcomes. Furthermore, as clinicians at the point of care, BSN-prepared nurses are at a vantage point to monitor patient outcomes and identify practice issues. The bedside nurse, in particular, has first-hand experience with current practice issues/problems in direct patient care as well as how practice can be safe, appropriate, and cost effective. However, the AACN is not alone in making an association between EBP and BSN-prepared nurses. Other highly renowned organizations, such as the IOM (2010) and ANA (2009) have reported essential links between EBP and BSN-prepared nurses.

The emphasis on producing an educated nursing workforce that begins at the BSN level as well as the inclusion of EBP as an essential skill for entry level nurses were instrumental to the investigator’s selection of a BSN-prepared sample for this pilot study. At the least, the evidence presented in this section suggests within the acute care setting,
BSN-prepared nurses are expected to provide evidence-based care and lead nurses with lesser education (i.e. ADNs) in implementing EBP within their practice. Past research provides indirect insight on why the link between BSN-prepared nurses and evidence-based care exists by providing evidence on the link between staffing/expertise and improved outcomes (Elixhauser, Steiner, & Fraser, 2003). However, no studies to date have examined the underlying explanation for any observed link between BSN-prepared nurses and evidence-based care. Further, current research continues to emphasize the link between nursing degrees and mortality rate (Aiken et al., 2011; Kutney-Lee, Sloane, & Aiken, 2013). Consequently, studies that have explored the link between BSN-prepared nurses and evidence-based care do so using a descriptive design approach (Lehman, 2007). In particular, it was anticipated that findings from this intervention pilot study would contribute to an improved understanding of the link between BSN-prepared nurses and evidence-based care, from which strategies for measuring EBP competence among pediatric nurses with respect to level of education would be derived.

Institutional Approaches to Improving EBP Competence and EBP Use in Nurses

Current evaluation tools used to assess EBP competencies in nurses are subjective and in the form of self-reports (Cullen & Titler, 2004; Dearholt et al., 2008; Hart et al., 2008; Pierson & Schuelke, 2009; Rutledge & Skelton, 2011; Sciarra, 2011; Sherriff et al., 2007). Cullen and Titler (2004) used an evaluation questionnaire and nurses’ responses from focus group sessions to assess an EBP internship program implemented at the University of Iowa Hospitals and Clinics in the U.S. The internship was designed to assist staff nurses in implementing and evaluating a clinically relevant EBP practice
change. During the internship, staff nurse-interns worked with their peers to promote adoption of EBP change by clinicians in their clinical area. In addition, the internship program included coursework, team meetings, and facilitated project work time to improve EBP competence among the staff nurse-interns. The staff nurse-interns in this study reported an understanding of the EBP process, appreciation for the opportunity for professional growth, and their objectives being met.

Dearholt et al. (2008) used workshop and speaker evaluations to rate how helpful a two-day EBP workshop was among nursing leaders within an organization. The goal of the workshop was to develop a group of mentors that would lead EBP projects within their departments and help provide mentorship to nurses at the bedside. Although Dearholt et al. (2008) reported that nurses who participated in the workshop had the opportunity to demonstrate specific knowledge and skills related to EBP during the workshop (i.e., ability to locate selected EBP Websites and perform an online literature search), the primary evaluation tool used to assess EBP competence was in the form of a self-reported questionnaire administered to nurses at the end of each workshop day. Additionally, Dearholt et al. (2008) reported the 2-day workshop was successful in providing training to key administrative nurses who could then incorporate EBP into their culture and use an EBP approach in making decisions about practice.

Hart et al. (2008) used a pre-intervention and post-intervention survey (i.e., Evidence-Based Nursing Questionnaire) developed by Nagy, Lumby, McKinley, and Macfarlane (2001) to measure nurses' perceptions of knowledge, attitude, and skill level related to EBP and research utilization. A computer-based educational program was
implemented over a period of 7 months to educate and engage nurses in EBP and research utilization. Findings from study revealed statistically significant improvements in perceptions of knowledge, attitude, and skill level after the nurses participated in the computer-based educational intervention.

Pierson and Schuelke (2009) used a combination of objective and subjective methods to evaluate EBP competence after nurses participated in an independent EBP study pilot project. The authors evaluated the effectiveness of the independent study packets on EBP using Kirkpatrick's (1998) four levels of evaluation model. Level 1 used nurses' reactions to the intervention from evaluations included in the independent study packets. Level 2 used a post-learning activity to assess application of EBP principles in the clinical setting. Sample items from the post-learning activity included describing a clinical situation or nursing intervention nurses would like to explore, conducting a literature search for that question using the elements of PICO, and attaching the search results to the post-test. Level 3 used nurses' performance on their initial attempt to advance up the clinical ladder. Thus, all nurses who completed the independent study packet were successful on their first attempt to meet the EBP criteria of the clinical ladder for advancement at this hospital. Level 4 used a survey to assess beliefs about EBP. Pierson and Schuelke (2009) noted the preliminary data from their pilot study suggest nursing leaders and educators require consistent reiteration of learning content and skill acquisition, and development of EBP skills to ensure enculturation and sustainability of EBP competence and use.
Rutledge and Skelton (2011) used a survey developed by Gerrish et al. (2007) (i.e., Development of EBP Survey) at three different points in time to measure the effectiveness of a clinical experts EBP program among nurses. The EBP program consisted of four 6-hour days of classroom/computer laboratory work during the summer with follow-up activities throughout the year. The aim of the clinical experts EBP program was to enhance nurses’ knowledge, attitudes, and competence related to EBP as well as decrease barriers and enhance facilitators to EBP. Findings from the surveys revealed (a) increased comfort level for using EBP strategies, (b) a slight decrease perception in each challenge reported by nurses over time (i.e., finding and using evidence; inadequate time; not enough research findings; difficulty accessing literature; not knowing where to look; difficulty understanding findings), and (c) increased perceptions of competence immediately after the four class days, which decreased by the end of the year.

Sciarra (2011) used a survey developed by Upton and Upton (2006) (i.e., Clinical Effectiveness and EBP Questionnaire) prior to and after five 2-hour educational sessions to evaluate if ICU nurses’ rating of their EBP application, attitudes, and skill level would be significantly different. Findings from this study revealed the mean posttest scores on EBP application, EBP attitudes, and EBP skill level were significantly higher than the pretest scores.

Similar to Hart et al. (2008), Sherriff et al. (2007) used the Evidence-Based Nursing Questionnaire to survey a sample of nurses who participated in an EBP educational program. The educational program was comprised of eight 4-hour
workshops held approximately 1 month apart and an accompanying workbook. The questionnaire was administered immediately prior to the workshop, 1 week after the workshop, and 3 months after the workshop. Findings from this study were generally consistent with the previous literature presented. Thus, nurses reported (a) reductions in the number of obstacles to EBP, (b) increased perception of organizational support, and (c) increased confidence in their ability to locate and evaluate research, as a consequence of the educational intervention.

While the studies presented in this section offer insight on nurses’ attitudes and beliefs about EBP competence, the validity and accuracy of these reports must be considered when interpreting the results simply because the method of collecting these results were based on self-reports. The advantage of the self-report method is its ability to yield information about what people think, feel, or believe which is impossible to gather by any other means (Polit & Beck, 2012). However, a major disadvantage of this method concerns the validity and accuracy of self-reports, as investigators can never be completely certain that respondents feel or act the way they say they do. Data collected using the self-report methods are highly subject to researchers’ or participants’ bias, social-desirability bias, demand characteristics (i.e., fatigue, memory burden, confusion), and response sets (i.e., straight line, extremes, right down the middle), which all affect the validity and accuracy of findings (Polit & Beck, 2012). Furthermore, the majority of evaluation tools used in these studies to measure EBP competence were not by objective means but a subjective form of assessment, which adds to threats in construct validity (Polit & Beck, 2012).
Nursing literature, in particular, has demonstrated the use of internships (Cullen & Titler, 2004), workshops (Dearholt et al., 2008; Sherriff et al., 2007), fellowships and scholar programs (Hockenberry et al., 2009), computer and Web-based EBP programs (Hart et al., 2008), independent study packets (Pierson & Schuelke, 2009), mini-educational sessions (Sciarra, 2011), and EBP mentors and facilitators (Rutledge & Skelton, 2011; Wallen et al., 2010) as operational strategies to help engage clinical nursing professionals in EBP. Collectively, these studies revealed two main limitations: (a) the amount of EBP education was unclear as it varied from 2 days to 1 year, and (b) the educational approaches selected for implementation in these studies were institutionally driven. These inconsistencies around EBP education for bedside nurses trigger a need for research that addresses these factors. This pilot study provided preliminary data on the usefulness of an educational approach that was free from institutional constraints for improving EBP competence among pediatric bedside nurses.

Empirical Instruments that Measure EBP Competence

The term competence has been defined as a concept (Crowley, n.d.; Merriam Webster Online, 2013; Schon, 1983), a process (ANA, 2004; Benner, 1982; Epstein & Hundert, 2002; Miller, 1990; Nagelsmith, 1995), and viewed as context-dependent (Meretoja, Leino-Kilpi, & Kaira, 2004; Klass, 2000; Sternberg, 1990). The Merriam Webster Dictionary Online defines competence as the quality or ability to perform a task or function; to be proper or rightly pertinent; to have requisite or adequate ability; or to be legally qualified or adequate (Merriam Webster Dictionary Online, 2013). Regardless of the variability of this term, it certainly concedes to the knowledge and aptitude of
something. The most reliable and valid approach to assess and evaluate an individual's knowledge and aptitude is to administer a tool that measures the degree of knowledge and aptitude. In this regard, empirical studies on EBP competence are non-existent in nursing. The primary approaches used to study EBP competence in nursing have been descriptive and/or cross-sectional methodologies (Bartelt et al., 2011; Boström, Ehrenberg, Gustavsson, & Wallin, 2009; Brown et al., 2009; Hauck, Winsett, & Kuric, 2013; McSherry et al., 2006; Melnyk et al., 2004; Niederhauser & Kohr, 2005; Prior, Wilkinson, & Neville, 2010; Smirnoff et al., 2007). Furthermore, the assessment tools used in these studies to measure EBP competence have been self-reports and/or learner satisfaction questionnaires. Finally, the majority EBP studies found in the nursing literature assessed the perception of nurses' knowledge, attitudes, and skills, which are subjective methods. Thus, the assessment tools that objectively measure and evaluate EBP competence in nursing are lacking. The assessment tools in existence that measure EBP competence have been primarily conducted with medical students and physicians (Fritsche, Greenhalgh, Falck-Ytter, Neumayer, & Kunz, 2002; Hatala & Guyatt, 2002; Ramos, Schafer, & Tracz, 2003). The current literature is limited in valid and reliable measurements of EBP competence, particularly within the profession of nursing. The following three tools in this next section are presented for their applicability primarily within the medical profession.

**Fresno Test**

The *Fresno* test was developed by Ramos et al. (2003) to measure EBP competence in medical professionals. The *Fresno* test consists of two clinical scenarios
and multiple open-ended questions. The *Fresno* test requires participants to (a) formulate a PICO question, (b) identify electronic databases and other sources for searching for evidence (c) identify appropriate research designs for answering the question, (d) identify issues important to determining the relevance and validity of an article, and (e) explain the magnitude and importance of research findings. The authors concluded that the *Fresno* test was a reliable and valid test for detecting the effect of instruction in evidence-based medicine. Since its initial appearance in the literature in 2003, the *Fresno* test has been modified to assess EBP competence in other health disciplines (i.e., physical and occupational therapist) and translated into Spanish (Argimon-Pallàs, Flores-Mateo, Jiménez-Villa, & Pujol-Ribera, 2010).

**Berlin Questionnaire**

The Berlin questionnaire was originally developed by Fritzsche et al. (2002) to measure EBP competence in medical professionals. The *Berlin questionnaire* consists of 15 multiple choice questions built around clinical scenarios that primarily test the participants' epidemiological skills and knowledge. The *Berlin questionnaire* requires participants to demonstrate (a) knowledge about interpreting evidence, (b) skills in relating a clinical problem to a clinical question, (c) understanding of the best design to answer a question, and (d) use of quantitative information from research to solve specific patient problems.

**Objective Structured Clinical Exam**

The Objective Structured Clinical Exam (OSCE) has been used to assess clinical skills and considered a reliable method to assess the clinical competence in disciplines of
nursing, medicine, and allied health (Anderson & Stickley, 2002; Fliegel, Frohna, & Mangrulkar, 2002; Harden & Gleeson, 1979; Khattab & Rawlings, 2008; Newble, 2004; Silva, Lunardi, Mendes, Souza, & Carvalho, 2011; Wallace, Rao, & Haslam, 2002). The OSCE is not actually a tool but a framework for assessing clinical competence. It has been particularly useful in assessing the clinical competence of health professionals because it objectively measures technical skills, attitudes, and decision-making strategies (Silva et al., 2011). The OSCE simulates real-life situations that the participants may encounter in the clinical environment and is considered to be a more effective way to assess critical thinking and communication skills. Recently, the OSCE framework has been used to assess EBP competence in medical professionals (Frohna, Gruppen, Fliegel, & Mangrulkar, 2006; Tudiver, Rose, Banks, & Pfortmiller, 2009). However, neither of these studies assessed all steps of the EBP process nor was there any mention of a validated tool for assessing EBP competence using the OSCE.

To date, the Berlin questionnaire and Fresno test are the only tools validated to assess EBP competence (Ilic, 2009). However, EBP competence requires a different level of knowledge and skills at each step of the EBP process. In this regard, the Berlin questionnaire fails to measure the full spectrum of EBP competence because it only assesses the third step of the EBP process (i.e., critical appraisal of the evidence for its validity, relevance, and applicability). It does not assess the other key steps needed to demonstrate complete EBP competence (Fritsche et al., 2002; Ilic, 2009). Alternatively, the Fresno test assesses all five steps of the EBP process (Ramos et al., 2003; Shaneyfelt et al., 2006).
EBP Models that Influence EBP Competence and EBP Use

Several models have been developed to enhance the acceptance and implementation of EBP specifically in the nursing profession (i.e., the Advancing Research & Clinical Practice through Close Collaboration [ARCC] model, the Iowa model, the Academic Center for EBP [ACE] Star model, Rosswurm & Larabee’s model, the Stetler model, and the Clinical Scholar model). These models have been useful in guiding general implementation strategies to promote EBP competence and EBP use among individuals as well as within organizations.

The ARCC Model

The ARCC model was originally conceptualized in 1999 by Dr. Bernadette Melnyk as part of a research strategic planning initiative involving faculty from the University of Rochester School of Nursing and School of Medicine in an effort to integrate research and clinical practice, as well as to advance EBP within an academic medical center and progressive health care community (Melnyk & Fineout-Overholt, 2002). The purpose of the ARCC model was to provide healthcare institutions and clinical settings with an organized conceptual framework that can guide system-wide implementation and sustainability of EBP to achieve quality outcomes (Ciliska et al., 2005).

The key mechanism in the ARCC model is the use of the EBP mentor. Within the ARCC model, the EBP mentor is characterized as an advanced practice nurse who (a) assists nurses and other clinicians in improving their EBP knowledge and skills as well as implementing EBP projects to improve patient care and outcomes, and (b) implements
strategies to overcome barriers in the healthcare environment in building a culture of EBP (Melnyk & Fineout-Overholt, 2010). EBP mentors work together with clinicians to develop strategies to alleviate barriers commonly encountered in daily practice (i.e., inadequate EBP knowledge and skills, lack of administrative support, absence of an EBP mentor, failure to believe EBP improves patient care and outcomes, and uncertainty that nurse-initiated change will be sustainable) (Fineout-Overholt & Melnyk, 2005; Funk, Tornquist, & Champagne, 1995; Hutchinson & Johnston, 2006). As barriers lessen, nurses are more likely to implement EBP to improve patient outcomes. Mentorship with direct care nurses on clinical units by the EBP mentor is important in strengthening their beliefs about the value of evidence-based care and their ability to implement it, which leads to the sustainable organizational change of an EBP culture (Melnyk & Fineout-Overholt, 2002).

The ARCC model has been implemented at Pace University, the State University of New York (SUNY) Upstate Medical Center, and the University of Rochester (Fineout-Overholt & Melnyk, 2005). These organizations have fostered empirical testing of the ARCC model and demonstrated its effectiveness in enhancing the acceptability and implementation of EBP (Melnyk et al., 2004; Melnyk & Fineout-Overholt, 2002). In addition, several studies have been conducted to determine the effects of the ARCC model on building and sustaining an EBP culture within organizations (Fineout-Overholt et al., 2005; Levin et al., 2011; Melnyk, Fineout-Overholt, Giggelman, & Cruz, 2010; Melnyk, Fineout-Overholt, & Mays, 2008; Wallen et al., 2010). These studies, to some
capacity, have substantiated the ARCC model as a suitable framework for enhancing the acceptability and implementation of EBP within the nursing profession.

The Iowa Model

The Iowa model was originally developed in 1994 at the University of Iowa Hospitals and Clinics (Titler et al., 1994). This model provides a framework for nurses to make decisions about day to day practices that affect patient care outcomes. The Iowa model begins by encouraging staff nurses to identify clinical practice questions that are either triggered through identification of a problem or through new knowledge. Once clinical questions are identified, this leads nurses to search the literature for research evidence that will answer their questions. If the research evidence is not sufficient, lower levels of evidence or conducting more research is recommended. If the research evidence was sufficient or high-quality studies were found, a practice change is initiated. Within the Iowa model, clinical practice questions that align with the priorities of the organization are best positioned for allocation of supporting resources. If the identified problem is a priority for the organization, a team is established to develop, implement, and evaluate the practice change. Thus, the team pilots the practice change to determine its feasibility and effectiveness. If the pilot results in positive outcomes, a plan for adoption to practice is facilitated through leadership support, education, and continuous monitoring of outcomes. In summary, the Iowa model illustrates a framework for the inclusion of multiple stakeholders (i.e., bedside nurses, managers, advance practice nurses, and interdisciplinary colleagues) at various levels of an organization (i.e., from higher level management to bedside nurses) to collaborate in support of EBP.
The ACE Star Model of Knowledge Transformation

The ACE Star model was originally developed in 2004 by Dr. Kathleen Stevens and represents a conceptual model that identifies key stages to transform knowledge (i.e., research) into practice (Stevens, 2004). The model is configured as a simple 5-point star and illustrates the following five major stages of knowledge transformation:

1. Discovery- this stage is characterized by the generation of knowledge which is discovered through traditional research methodologies and scientific inquiry. This is the stage of knowledge transformation that builds the body of evidence for clinical actions.

2. Evidence summary- this stage is characterized by the synthesizing of research knowledge into a single, meaningful statement regarding the state of the science (i.e., evidence synthesis, systematic reviews).

3. Translation- this stage is characterized by the transformation of evidence summaries which occurs in two steps: translation of evidence into practice recommendations (i.e., clinical practice guidelines) and integration into practice (i.e., care standards, clinical pathways, protocols, and algorithms). The aim of transformation is to provide useful tools to support care.

4. Integration- this stage is characterized by the implementation of innovations, as well as changes in practice that are adopted and integrated into care. This stage addresses the factors that affect individual and organizational rate of adoption of an innovation and factors that affect integration of the change into sustainable systems.
5. Evaluation- this stage is characterized by the evaluation of outcomes. This stage evaluates the impact of EBP on patient outcomes, provider and patient satisfaction, efficacy, efficiency, and economic analysis.

Consequently, the ACE Star model places the previous scientific works of nursing within the context of EBP and serves as a way to organize and apply EBP (Stevens, 2004).

Furthermore, the ACE Star Model posits as new knowledge is transformed through the five stages, the final outcome is evidence-based quality improvement of health care (Stevens, 2004).

*Rosswurm and Larrabee’s Model*

The Rosswurm and Larrabee model was developed in 1999 by Drs. Mary Ann Rosswurm and June Larrabee. The model is based on theoretical and research literature related to EBP, research utilization, standardized language, and change theory (Rosswurm & Larrabee, 1994). Within this model, nurses are guided through the entire process of developing and integrating an EBP change. Thus, the model supports EBP changes derived from a mix of quantitative and qualitative data, clinical expertise, and contextual evidence. The steps in the Rosswurm and Larrabee (1999) model include:

1. Assessing the need for change in practice.
2. Linking problem interventions and outcomes.
4. Designing a practice change.
5. Implementing and evaluating the change in practice.
6. Integrating and maintaining the change in practice.
This model has been useful in guiding nurses and other healthcare professionals to engage in EBP by providing a systematic process that facilitates the change to EBP.

*The Stetler Model*

The Stetler model was first developed in 1976 by Drs. Cheryl Stetler and Gwen Marram. It was later refined in 1994 with conceptual underpinnings and a set of assumptions (Stetler, 1994). The model was refined again in 2001 on the basis of a related utilization-focused integrative review methodology, targeted evidence concepts, and continuing experience through use of the model with clinical nurse specialists (Stetler, 2001). The revised Stetler model (2001) is referred to as a practitioner-oriented model in which the practitioner makes a series of decisions to apply research to practice setting. Thus, the Stetler model (2001) can be characterized by the following five stages of judgmental activities that determine the appropriateness, desirability, feasibility, and manner in which research will be used:

1. **Preparation**- involves a need being identified.
2. **Validation**- involves searching the literature related to the clinical problem.
3. **Comparative evaluation/decision making**- involves comparing and contrasting findings from the literature review.
4. **Translation/application**- involves implementing the practice change.
5. **Evaluation**- involves formative and summative assessments of the practice change in meeting goals.
The Clinical Scholar Model

The Clinical Scholar model was developed by Dr. Alyce Schultz in 2005. This model of EBP is based on the characteristics of clinical scholars expressed in the Sigma Theta Tau International (STTI) *Clinical Scholarship Resource Paper* published in 1999. In particular, the Clinical Scholar model develops a team of bedside nurses to become clinical scholars, committed to patient care, knowledge development, research translation, and evidence implementation (Schultz, 2005). This model has four central goals: (a) to challenge current practices within the discipline of nursing, (b) for clinical nurses to be able to speak and understand the language of research, and incorporate research-related discussions in daily dialogue; (c) to encourage the critical appraisal, critique, and synthesis of current evidence, and (d) for clinical scholars to serve as mentors to other staff nurses involved in journeys to scholarship by creating mentoring partnerships between experienced and novice scholars (Schultz, 2005).

Essential components of the model require the use of observation and scientifically based methods to identify and solve clinical problems. Therefore, clinical scholars must be able to analyze both internal and external evidence that may support or refute a current practice. In addition, clinical scholars must be able to synthesize the evidence by evaluating its level, quality, quantity, consistency, and strength. Lastly, clinical scholars must be able to apply findings and disseminate findings in the form of poster and/or oral presentations, and publications (Schultz, 2005; STTI, 1999).

In summary, multiple models to improve EBP at organizational and individual levels have been proposed. Nursing is central to these models, either as advanced
practice EBP mentors or clinical scholars at the bedside. This pilot study was most consistent with the aim of the Clinical Scholar model developed by Schultz (2005) because it represented the investigation of various procedures to secure an EBP competent pediatric workforce.

The Growth of Web-Based Educational Delivery Methods for Training Nurses in EBP

The IOM (2001) has charged health professions to further develop specifics of EBP competencies for their respective professions. Based on the literature, it is unclear about how best to integrate EBP into education and practice, and which learning strategies will best achieve this integration (Green, 2000; Hatala & Guyatt, 2002; Leufer & Cleary-Holdforth, 2009; Varnell et al., 2008).

Considering there is no consensus on how to best engage clinical nurses in EBP, the Web-based delivery method was explored in this pilot study as a viable option for several reasons. Web-based educational delivery methods provide nurses with access to continuing education more efficiently than traditional educational delivery methods (Atack & Rankin, 2002; Belcher & Vonderhaar, 2005), which is needed for nurses to maintain competency in a rapidly changing and dynamic healthcare system. In particular, the nursing practice environment is fairly unique in that it is characterized by a continuous influx of new knowledge and technologies, fast-paced work, ongoing demands, and stressful situations. Continuing education must, therefore, be highly flexible and responsive to the personal and professional needs of the nurse learner.

Furthermore, as the largest healthcare workforce, nurses apply their knowledge, skills, and experience to care for the diverse and changing needs of patients.
Technology-supported or Web-based educational delivery methods have been suggested as an appropriate way of meeting the learning needs of busy working nurses (Belda, Gajic, Rabatin, & Harrison, 2004; Carter, Rukholm, & Kelloway, 2009; Hart et al., 2008; Patel, 2007; Rankin, Then, & Atack, 2013; Schneiderman & Corbridge, 2009). Belda et al. (2004) conducted a study to evaluate practice variability among critical care team members with regard to their practices in managing acute respiratory distress syndrome (ARDS) and to assess the feasibility and effectiveness of an online education tool in improving clinicians’ understanding of current evidence about ARDS management. Physicians (n=16), residents (n=28), respiratory therapists (n=23), and critical care nurses (n=50) participated in this study. Findings from this study revealed that patients were less likely to receive potentially injurious ARDS management, and the Web-based teaching tool was useful in educating intensive-care clinicians and promoting EBP.

Carter et al. (2009) implemented a Web-based learning site, Webcasting, and two-way interactive videoconferencing to deliver a mini-course focused on best practice stroke care to a sample of nurses (n=96) working on a stroke unit in northeastern and northwestern Ontario. Nurses who participated in this program reported (a) increased perceptions of competence for caring for stroke patients, (b) increased confidence in using technology for educational purposes, and (c) satisfaction with the overall program.

In a study conducted by Hart et al. (2008), a computer-based educational program was implemented to examine its effectiveness on nurses’ perceptions of knowledge, attitude, and skill level related to EBP and research utilization. The computer-based EBP program was provided to a sample of nurses working in an integrated health care system
located in a southeastern state in the U.S. It was found to be an effective approach in educating and engaging nurses in EBP initiatives and EBP use.

Patel (2007) conducted a longitudinal study to evaluate the effectiveness of a postgraduate critical care course delivered via the Internet. The study examined the critical care nursing course for enhancing knowledge attainment as well as for nurses’ satisfaction with the Web-based learning. Thus, knowledge was assessed pre- and post-intervention, and found to be significantly increased. In addition, nurses reported the course work was intellectually stimulating and believed they were able to integrate their learning from the course work into their clinical practice.

Rankin et al. (2013) used a RCT design to determine the impact of a 6-week Web-based workshop on the accuracy of emergency room (ER) nurses’ triage skills (n=132) who worked among six hospitals across Canada. The sample was recruited from nurses who were enrolled in a triage and acuity scale class for ER nurses. All nurses received the exact same content and learning activities. However, nurses in the intervention group (n=65) received a mandatory online tutorial, online discussion, and workplace project while the nurses in the control group (n=67) did not. Findings from this study revealed that nurses in the intervention group were significantly more accurate with their triage skills. In addition, nurses from the intervention group reported the online methods used during the workshop increased their preparation for online learning and were successful in transferring their triage learning to practice.

Schneiderman and Corbridge (2009) conducted a study with bedside nurses from two community hospitals in northern Illinois (n=58) to determine the effectiveness of a
computer-based learning module specific to arterial blood gas (ABG) interpretation. Findings from this study supported that computer-based, online learning was effective in significantly increasing nurses’ knowledge on ABG interpretation.

Finally, a systematic search of the literature from 1996 through 2008 identified over one thousand empirical studies of online learning. The resulting meta-analysis found that students in online learning conditions, on average, performed modestly better than those receiving face-to-face instruction (U.S. Department of Education, 2010). This was an important finding and although the five studies presented in this section indicate that Web-based delivery methods are effective for educating bedside nurses, more research is needed to explore its feasibility and practicality among bedside nurses. Hence, an overarching goal in this student investigator’s dissertation was to examine the feasibility and effectiveness of a Web-based educational delivery method on nurses’ knowledge acquisition of EBP.

In addition to the emerging evidence that suggests Web-based delivery methods improve knowledge acquisition among bedside nurses, there is a growing body of evidence that supports Web-based educational delivery methods as an ideal mode of learning for working nurses because it provides an element of satisfaction (Carter et al., 2009; Lindner, 1998; Sery-Ble, Taffe, Clarke, & Dorman, 2001), convenience and flexibility (Bullen, 1998; Burge, 1994; Connors, Smith, DeCock, & Langer, 1996; Cragg, 1994; Kenny, 2002), and autonomy (Jeffries, 2005a). Some of these studies have also reported factors that may preclude bedside nurses from online learning (i.e., limited access to Internet, time constraints, workload, and lack of technical support). However,
as the Web-based learning environment becomes more prevalent in the education of bedside nurses in the 21st century, the preclusions cited in the literature are expected to decrease as educators consider ways to establish individual computer competence and user-friendly learning environments on the Internet for nurses (Howatson-Jones, 2004; Jeffries, 2005b; National League for Nursing [NLN], 2008; Reeves & Reeves, 2008).

Summary

A review of the literature pertinent to developing EBP competence as well as promoting EBP use among nurses was presented. In particular, substantive evidence demonstrating how (a) nurses’ current knowledge and skill sets in EBP, (b) notable barriers to EBP competence, (c) institutional approaches to improving EBP, (d) models of EBP, and (e) the emergence of Web-based learning environments, can influence the development of EBP competence and EBP use among BSN-prepared pediatric nurses was presented in this chapter.
CHAPTER 3
METHODOLOGY

Currently, the literature is sparse with studies that examine EBP competence in pediatric nurses and how to promote EBP use within this nursing specialty. As the information technology era has evolved, the accessibility and use of Web-based educational platforms for training healthcare professionals, including nurses, have increased exponentially. The overall purpose of this study was to assess and refine a Web-based EBP educational intervention focused on improving EBP competence in BSN-prepared pediatric bedside nurses, while examining the feasibility, acceptability, and usability of implementing such an intervention via the Internet. This chapter describes the methodology that was used to achieve this study's purpose including study design, setting and sample, instrumentation, data collection procedures, and methods for data analysis. Protection of human subjects is also addressed.

Research Design

This pilot study used a two group randomized controlled experimental embedded mixed methods design as delineated by Creswell and Plano Clark (2011). The secondary qualitative strand was used to explore feasibility, acceptability, and usability factors of implementing a Web-based EBP educational intervention with respect to intervention content and delivery method, measures, and data collection procedures. As noted by
Creswell and Plano Clark (2011), the inclusion of the qualitative strand to a primarily quantitative study can be a means to overcome some of the perceived challenges associated with a pilot study as well as enhance the interpretation of findings from the quantitative component of the study. Thus, the integration of a qualitative strand into the overall design of this pilot study enhanced the understanding of the (a) fidelity of the intervention, (b) adherence by participants, and (c) strength of the methods and data collection based on the experience of the participants. As such, quantitative data were collected using Web-based data collection techniques at baseline and following completion of the intervention period. In addition, qualitative data around the feasibility, acceptability, and usability of the intervention content and delivery method, as well as around the tools used for data collection were obtained. *Figure 2* illustrates the implementation of a Web-based EBP educational intervention using the concurrent embedded model, and demonstrates the various components of this design and their interrelationships.
**Procedure:**
Demographic data form and *EBPB* scale (pre-intervention)
*EBPB* scale and adapted *Fresno* test (post-intervention)
Feasibility outcome evaluation

**Product:**
Independent samples t-test analysis,
Mann-Whitney U analysis,
Chi-square analysis, Analysis of Covariance

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**QUAN**
Pre-intervention data collection

**INTERVENTION**

**QUAN**
Post-intervention data collection

**Procedure:**
Acceptability
and Usability
Survey

**Product:**
Descriptive Coding

**qual**

**review of processes**
during outcome study

Use of a mixed methods analysis to link qual data with QUAN results

Integration of findings from QUAN outcome evaluation with qual findings to determine feasibility, acceptability, and usability of the intervention

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**Figure 2.** Implementation of a Web-based EBP Educational Intervention: A Concurrent Embedded Model.

Note: EBPB = Evidence Based Practice Belief. QUAN = quantitative. qual = qualitative. Figure adapted from "Meeting the Challenge of Doing an RCT Evaluation of Youth Mentoring in Ireland: A Journey in Mixed Methods," by B. Brady and C. O'Regan, 2009, *Journal of Mixed Methods Research, 3*, p. 277.
Setting and Sample

The setting for this study was an acute care free standing pediatric hospital located in a large city in the Southeastern United States. This particular hospital has three main campuses and 20 neighborhood sites, including five Urgent Care Centers. There is an estimate of over 3000 nurses employed at this hospital. Nurses were recruited from two of the three main campuses of this hospital using a combination of Web-based and face-to-face recruitment strategies. Nurses who worked on the excluded campus were not eligible to participate in this study because an earlier version of the EBP module had been piloted on this campus.

Eligible participants for this study included (a) BSN-prepared pediatric nurses who self-reported (b) having access to a computer that met the basic requirements for retrieving the modules, (c) having basic computer literacy skills, (d) having access to the Internet, (e) not working on the excluded campus of this pediatric hospital, (f) not participating in any formal EBP training program during the study timeline, and (g) not having participated in the earlier version of the Web-based module piloted at this hospital. A convenience sample of participants was randomized to one of two groups, a Web-based EBP Intervention group or Attention Control group.

Description of the Intervention

EBP Intervention Group Module

The purpose of the Web-based EBP educational intervention was to provide a basic understanding of the EBP process and skill building applications to demonstrate EBP competence, particularly for pediatric nurses. Nurses in the intervention group
received EBP education via a Web-based EBP module while nurses in the control group received an attention control module. Table 1 provides a comparative view of the modules used with the EBP intervention group and the attention control group, and the content within the modules.

Table 1

**Overview of Modules Used With the EBP Intervention Group and the Attention Control Group**

<table>
<thead>
<tr>
<th>Content</th>
<th>Intervention Group</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Content</strong></td>
<td><em>A Web-based Educational EBP Module for Pediatric Bedside Nurses</em></td>
<td><em>Munchausen's Syndrome by Proxy: What every pediatric nurse should know</em></td>
</tr>
<tr>
<td><strong>Unit A:</strong> Ask and formulate the clinical question; PICO format; matching question type with research design</td>
<td>-Munchausen's Syndrome vs. MSBP</td>
<td>-The clinical profile of the perpetrator, victim, and family of MSBP</td>
</tr>
<tr>
<td><strong>Unit B:</strong> Acquire and search for the best evidence; Qual vs. Quan; levels and sources of evidence; search strategies</td>
<td>-Common agents and/or methods of abuse in MSBP</td>
<td>-Strategic protocols as well as multidisciplinary approaches necessary to decrease the M&amp;M rates of MSBP</td>
</tr>
<tr>
<td><strong>Unit C:</strong> Appraise and critically consider the evidence; understanding validity, reliability, and applicability of evidence</td>
<td>-Case study to further analyze the presentation, detection, and treatment of MSBP</td>
<td>-The social worker's role with suspected victims of MSBP</td>
</tr>
<tr>
<td><strong>Unit D:</strong> Apply and Assess statistical items commonly reported in research articles; exploring various literature reports for clinical relevance</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Length</strong></td>
<td>Each unit 20-30 minutes totaling two hours</td>
<td>Two hours</td>
</tr>
<tr>
<td><strong>Format</strong></td>
<td>PowerPoint Slides</td>
<td>PowerPoint Slides</td>
</tr>
</tbody>
</table>

*Note. PICO= Patient-Intervention-Comparison-Outcome. Qual= Qualitative. Quan= Quantitative. MSBP= Munchausen's Syndrome by Proxy. M&M= morbidity and mortality.*

The Web-based EBP educational intervention was a 2-hour module comprised of four units that were delivered via the Internet, in which participants were encouraged to review within 4 weeks. Both, the delivery design and outcome variables measured from
the Web-based EBP educational intervention, were based on certain principles from Benner's (1984) novice to expert theory. Benner's theory delineates how levels of competence reflect movement from reliance on past abstract principles to the use of past concrete experiences, and results in change in perception of a situation as a complete whole in which certain parts are relevant. Likewise, the EBP educational module used in this study comprised of four units that built on the previous with the expectation that participants would extrapolate what was relevant as they progressed through the module. Furthermore, as participants extrapolated components of the EBP module that were relevant, abstract principles became refined, and the opportunity to use skills learned through the experience was expanded to gain EBP competence. The target audience for this educational intervention was pediatric nurses and therefore, when applicable, examples specifically pertinent to the scope of pediatric nursing were presented throughout the module.

The Web-based EBP educational intervention was designed by the investigator and informed by examples in her practice as a pediatric nurse in an acute care setting. Additionally, information was extrapolated from noted experts in EBP to further develop its content and delivery (i.e., Bernadette Melnyk, Ellen Fineout-Overholt, Nancy Burns, Susan Grove, Kathleen Stevens, Denise Polit, and Cheryl Tatano Beck). The basis for the investigator's decision on what EBP competencies that were expected of BSN-prepared bedside nurses was extrapolated from the Essential Competencies for Evidence-Based Practice in Nursing (Stevens, 2009). These competencies were highly influenced by the IOM's recommendations and represent a national consensus on essential EBP
competencies by education level (Stevens, 2009). Thus, the application of competencies for nurses educationally prepared and working at the baccalaureate level was used in the development of the Web-based EBP educational intervention.

Prior to implementing the Web-based EBP module in this pilot study, a two-phased content review process was utilized to obtain face and content validity of the content and format of the Web-based EBP educational intervention. A draft of the Web-based EBP educational module accompanied by a content review form was sent via email to content reviewers. The review panel consisted of one PhD-prepared director of Nursing Research and EBP, and four BSN-prepared pediatric nurses who have a working knowledge of EBP and engage their peers in the EBP process. The content review form asked reviewers the following:

1. Did you find the format (PowerPoint) optimal for learning?
2. Did you find the content easy to read and follow?
3. Was the amount of time it took to complete the module acceptable?
4. Did you perceive it would be useful in promoting EBP for BSN-prepared pediatric nurses?
5. Is there any content in the module that you think should be deleted?
6. Is there any content that is not in the module that you think should be added?

Reviewers were also asked to provide additional feedback on any questions they answered “no” to and why this aspect of the EBP module was weak or could be improved. The feedback from reviewers indicated (a) the audio narration increased understandability but may be more of a distraction for nurses new to EBP, (b) modules
were too lengthy, (c) more difficult content was found in the last two modules and may not hold the commitment or interest of the average nurse, (d) adding more charts/visuals for difficult concepts, and (e) adding quick links to the modules would help improve understandability. These comments were incorporated into the final version of the EBP module implemented in this study.

The EBP module was also reviewed by a PhD-prepared faculty at the investigator's University who is an expert in presentation design. Feedback was provided on the best technologies for maximizing the delivery of content as well as strategies for minimizing cognitive dissonance. The feedback from this reviewer facilitated optimum slide design, content chunking, and slide organization which was also incorporated into the final version of the EBP module used in this study.

Attention Control Group Module

The attention control module was comprised of three PowerPoint presentations on content unrelated to EBP but relevant to the scope of pediatric nursing. The purpose of the attention control module was to provide a similar amount of time spent in Web-based educational activities in the control group as those in the intervention group, without the specific content on EBP. The content in the module was developed by the investigator and other pediatric nurses for Nursing Grand Round learning events at their institution (i.e., Munchausen’s Syndrome by Proxy). This particular module was one of several developed by the investigator and other pediatric nurses at their institution. The module was approximately two hours in length, requiring a similar time commitment from the attention control group as was required from participants in the intervention group.
The feasibility, acceptability, and usability of this pilot study with respect to the intervention content and delivery method were of critical importance given the fact that the intervention was implemented completely via the Internet. Conducting this pilot study via the Internet had the potential for gaining greater access to the target population. However, attention to how the (a) sample was recruited, (b) intervention was delivered, and (c) data were collected was carefully considered to ensure high quality data and validity of findings.

Ahern (2005) noted several advantages for study participants involved in research conducted via the Internet. These include (a) increased anonymity, (b) ability to provide information at their own pace, (c) increased sense of control, (d) increased willingness to participate because of it being a novel approach to research, and (e) convenience and ease of use (Ahern, 2005). Some limitations associated with research conducted via the Internet include (a) lack of control over testing, (b) subject recruitment bias, (c) possible equipment problems and/or network incompatibility, (d) questionable decreased response rates, (e) questionable authenticity of participants’ data, and (f) concerns about privacy and confidentiality (Ahern, 2005).

Based on the advantages and disadvantages cited by Ahern (2005), considerations were applied to this study to maximize the feasibility, acceptability, and usability of the Web-based EBP educational intervention. For instance, the informed consent was provided to participants prior to any data collection and delineated how their privacy and confidentiality rights would be protected, as well as how their information would be used. In addition, anonymity of participants was maximized to the extent feasible throughout
the study. Participants were also able to review the modules at their own pace. The application of the online learning environment, *CourseSites by Blackboard*, used in this study represented an innovative approach to delivery of content and increased the integrity of the study protocol by packaging it in one central location. As an added convenience and to increase the ease of use, a troubleshooting tip sheet for navigating the online learning environment, clearly written instructions for facilitating progression through the study, and the investigator's contact information was made available to participants. Finally, participants had an opportunity to provide their feedback on intervention content and delivery method, as well as data collection procedures within the qualitative component of this study.

*CourseSites by Blackboard* is a free online learning environment that houses uploaded Web-based components of courses, promotes communication and collaboration, and provides one convenient location online for participants to access materials. The participants' view of the *CourseSites by Blackboard* site once logged in included an announcement page that was specifically tailored to the group in which they were allocated (see Appendix A). The EBP intervention and attention control modules were uploaded unto *CourseSites* as two separate courses (i.e., *Course A* for the EBP intervention module and *Course B* for the attention control module). This setup promoted a standardized protocol for participants in the intervention group and attention control group to access the EBP intervention and attention control modules, respectively. In addition, this setup helped prevent contamination of the intervention and minimize threats to internal validity (Polit & Beck, 2012).
Instrumentation

Demographic Data Form

The demographic data form captured data about the participants and the environment in which they worked (see Appendix B). The demographic information collected included: gender, race/ethnicity, age, school enrollment status, years in nursing, years as a pediatric nurse, year in which they obtained their BSN degree, amount of EBP training received during nursing school, years of employment at current organization, perception of EBP resources available at organization, and previous experience with EBP. There was also an area on this form where participants were asked to provide their email addresses, phone numbers, and unit/campus where they currently worked. The email addresses were used for participants to initially access the study and the phone numbers were used to collect qualitative data from participants concerning the acceptability and usability aspects of the study.

EBP Beliefs (EBPB) Scale

The EBPB scale was used in this study pre- and post-intervention to measure participants' beliefs about the value of EBP and their ability to implement it (see Appendix C). The EBPB scale was developed by Melnyk and Fineout-Overholt in 2002 and is a 16-item Likert scale, with responses that range from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate stronger beliefs about the value of EBP and the ability to implement it. Scoring for the EBPB scale consists of summing responses to the 16 items for a total score that can range between 16 and 80.
The *EBPB scale* has established face, content, and construct validity, with internal consistency reliabilities consistently greater than 0.85 (Melnyk et al., 2008). Accordingly, initial reliability and validity evidence on the *EBPB scale* were as follows: (a) face and content validity were established from early drafts of the scale by a convenience sample of practicing staff nurses; the readability of the scale using Flesch-Kincaid reading level was 8.0; (b) Cronbach’s alpha was 0.90 and Spearman-Brown \( r \) was 0.87, (c) all 16 items had factor loadings >0.35 which indicated that a single construct was being measured, (d) criterion validity was established based on known group comparisons (i.e., exposure to EBP, education level, and nursing role); participants who had prior exposure to EBP had beliefs about EBP that were similar to those who had no prior exposure; however, correlations between prior exposure to EBP, and beliefs in EBP and implementation of EBP were statistically significantly (for exposure \( r=0.51 \) and for little or no exposure \( r=0.35 \) at \( p=0.05 \)), which indicated when participants had prior exposure to EBP through formal training, their beliefs in EBP were more strongly related to the frequency in which they implemented EBP; education level: strength of beliefs in EBP significantly increased with level of education, \( F(4, 344) =7.03, p<0.001 \): participants with associate degrees scored lowest (M=49.70, SD=19.95), while those with doctoral degrees scored highest (M=64.06, SD=9.14); nursing roles: the strength of beliefs in EBP significantly increased from staff nurse to educator/faculty, \( F(3, 233) =9.34, p<0.001 \): staff nurses scored lowest (M=48.72, SD=21.63) and educator/faculty scored highest (M=61.50, SD=8.51) (Melnyk et al., 2008). In this study, internal
consistency reliability was good with a Cronbach’s alpha of 0.75 pre-intervention and 0.73 post-intervention.

Adapted Fresno Test for Pediatric Nurses

An investigator-adapted version of the Fresno test was used in this study to measure EBP competence post-intervention (see Appendix D). To date, the original version of this tool is the only validated and reliable instrument found that measures all five stages of EBP (Ramos et al., 2003; Shaneyfelt et al., 2006). Permission was obtained from the developers of the original Fresno test to adapt the questionnaire (see Appendix E). Reliability and validity evidence published from the original Fresno test were as follows: (a) Inter-rater correlations ranged from 0.76 to 0.98, (b) Cronbach’s alpha was 0.88, (c) Item difficulties ranged from moderate to difficult, and were able to discriminate between experts and novice candidates, as experts consistently scored higher than novices which established high construct validity; (d) on the total test, the novice mean was 95.6 and the expert mean was 147.5 (p<0.001), and (e) on individual items, a higher proportion of experts than novices earned passing scores on 15 of the 17 items (Ramos et al, 2003).

The original Fresno test consists of two clinical scenarios, seven short answer questions, two questions that require a series of mathematical calculations, and three fill-in-the-blank questions. The first clinical scenario presents a breastfeeding mother seeking advice about oral contraception and the second scenario presents a child with enuresis. The seven short answer questions that follow the two clinical scenarios requires participants to (a) formulate a focused clinical question, (b) identify the most appropriate
research design for answering the question, (c) demonstrate knowledge of electronic
database searching, (d) identify issues important for determining the relevance and
validity of a given research article, and (e) discuss the magnitude and importance of
research findings. Lastly, a series of five questions that require calculations and filling in
the blank are asked. Scoring the Fresno test involves comparing participants’ responses
against examples provided on a grading rubric. Grading categories include: “excellent,”
“strong,” “limited and/or minimal,” and “not evident,” each with a score between zero
and 24. The maximum possible test score is 212. This instrument and its scoring rubric
are discipline-specific as its psychometric properties have been reported only with use in
family practice residents and faculty members (Ramos et al., 2003).

The original Fresno test requires modification when used in disciplines other than
family medicine because it is discipline-specific. Thus, there have been several revisions
and adaptations of this tool since its development in 2003 (i.e., Lai & Teng, 2009;
McCluskey & Bishop, 2009; Tilson, 2010).

McCluskey and Bishop (2009) developed and pilot tested two versions of the
Fresno test on a group of occupational therapists (n=114), and reported the psychometric
results from their study. Results from their study were as follows: (a) inter-rater
reliability was excellent for versions 1 and 2 of the adapted Fresno test scores (Version 1:
ICC=0.96, 95% CI, 0.83-0.99; Version 2: ICC=0.91, 95% CI, 0.69-0.98), (b) Cronbach’s
alpha was reported as moderate at 0.74, (c) overall mean change on their version of the
adapted Fresno test was 20.6 points (95% CI, 15.6-25.5), 26.8 points (95% CI, 21.6-1.9)
for low scorers, and -1.8 points (95% CI, -6.4 to 10.1) for high scorers. The authors
reported their versions of the *Fresno* test had acceptable psychometric properties, measured change in knowledge and skills of occupational therapists following EBP training, and suggested that their versions of the *Fresno* test would be most useful in evaluating change in novice learners (McCluskey & Bishop, 2009).

Tilson (2010) conducted a study in which the original *Fresno* test was modified to include content specific to the practice of physical therapists. The aim of the study was to validate the modified *Fresno* test in assessing physical therapists’ EBP knowledge and skills. An expert panel reviewed the test for content validity and a cross-sectional cohort representing three training levels (EBP-novice students \( n=31 \), EBP-trained students \( n=50 \), and EBP-expert faculty \( n=27 \)) completed the modified *Fresno* test. Results on the validity and reliability evidence from this study were as follows: (a) inter-rater reliability was excellent (ICC=0.91, 95% CI, 0.87-0.94) (b) intra-rater reliability was excellent for between two raters (rater 1-ICC=0.95 [0.90-0.98] and rater 2-ICC=0.96 [0.90-0.98]), (c) Cronbach’s alpha was acceptable at 0.78, and (d) there was a statistically significant \( p<0.0001 \) difference in total score corresponding to training level (EBP-novice students, 92.8; EBP-trained students, 118.5; EBP-expert faculty, 149.0). Based on this evidence, Tilson (2010) concluded the modified *Fresno* test was a valid and reliable assessment of physical therapists’ EBP knowledge and skills.

The investigator-adapted version of the *Fresno* test, called the adapted *Fresno* test for Pediatric Nurses, includes three case scenarios relevant to the scope of pediatric nursing. The case scenarios are followed by 11 open-ended questions, with the exception of question #8. Question #8 presents a generic scenario in which participants must
answer five sub-items constructed as a mix of open- and closed-ended questions.

Questions #1 through #7 must be answered based on the initial three case scenarios presented. The first case scenario presents a problem with adolescent Cystic Fibrosis (CF) patients and their lack of adherence to current diet and respiratory therapy regimens. The second case scenario presents an infant with bronchiolitis and the use of respiratory nebulizer treatments versus suctioning without nebulizer treatments. Finally, the third case scenario presents a toddler with Type 1 Diabetes with an extreme case of needle anxiety and the proposal of an Insufion port for administration of insulin. The possible range of scores for this adapted version of the Fresno test are the same as the original Fresno test, zero to 212 with higher scores indicating greater EBP competence. Construct validity evidence for this adapted version of the Fresno test was obtained via expert review.

To facilitate the establishment of acceptable intra-rater reliability, in addition to the modifications made to the original Fresno test, its associated grading rubric was revised to include examples specific to the three clinical scenarios, and relevant to the scope of pediatric nursing. For question #1, examples were provided of ideal responses to each focused clinical question, with the use of PICO (population, intervention, comparison, and outcome) format. For question #2, examples of databases and information sources provided by Ramos et al. (2003) were expanded to include pediatric nursing-specific sources. For example, evidence-based databases such as PEMSoft (an online clinical library and multimedia decision support system that addresses acute and chronic illness and injury conditions in children from newborn to young adult), and other
information sources such as *Journal of Pediatrics* and *Journal of Pediatric Nursing* were added. For question #3, examples were written of preferred search terms, medical subject headings (MeSH), and limits to use for each clinical scenario. For questions #4 - #7, minimal changes were made. Questions #8, 9, and 10 of the original Fresno test involved calculations beyond the scope of practice for BSN-prepared pediatric nurses, and therefore were omitted. In the adapted version of the Fresno test for pediatric nurses, questions #8 and #9 provided examples of ideal responses related to statistical significance, clinical significance, types of analyses, types of research designs, and levels of measurement. Questions #11 and #12 in the original Fresno test were transposed to questions #10 and #11 in the adapted version for pediatric nurses, respectively. The original Fresno test suggests participants need at least 30-minutes to complete. The adapted Fresno test for pediatric nurses was designed for completion by participants between 30-minutes to 1 hour.

In this study, scoring of the adapted Fresno test for Pediatric Nurses was done in a blinded fashion. As participants completed the adapted Fresno test, the investigator’s dissertation chair would de-identify the completed tests and send them electronically in groups of five or greater to the investigator for grading. The investigator graded the completed adapted Fresno tests blinded to participants’ identification numbers and group assignment. Unblinding of the data occurred after all participants completed testing and all tests were scored. Intra-rater agreement was also assessed in a blinded fashion. The dissertation chair randomly selected two participants from each group to have their adapted Fresno tests re-scored. The results of the initial scoring/re-scoring were as
follows: 86/87, 61/61, 51/52, 68/66, which supported strong intra-rater agreement.

Finally, estimates of the time it took to complete the adapted Fresno test were assessed by setting up a statistics tracking system online, which was a Web-statistics service enabled by CourseSites by Blackboard.

Data Completion and Intervention Monitoring Form

This data collection tool is an investigator-developed instrument that was used throughout the study to collect specific information on participants' progression through the study online (see Appendix F). It was used to monitor and enter the following collection of data: (a) participants' access and completion of demographic data form, (b) participants' access and completion of EBP scale pre-intervention, (c) initial access of non-EBP and EBP-related module by each participant, (d) participants' access and completion of EBP scale post-intervention, (e) participants' access of the "ready to test" survey (see Appendix G) for taking the adapted Fresno test for Pediatric Nurses, and (f) participants' access of the "ready to interview" survey (see Appendix H) for taking the acceptability and usability survey via phone interview post-intervention with the student investigator.

Acceptability and Usability Survey

The acceptability and usability survey is an investigator developed tool that was used at the end of the study by the researcher to determine participants' perspectives and experience with the entire study (see Appendix I). This information was collected via telephone interview by the researcher after participants completed the adapted Fresno test for pediatric nurses. A combination of open-ended questions and Likert-scale items were
used to assess participants’ (a) ease of accessibility, use, clarity, understandability, and helpfulness of the Web-based educational modules; (b) perception of content that should be deleted or added to the Web-based educational modules, and (c) overall rating of their experience with the Web-based modules.

Follow-up Survey

The follow-up survey is an investigator-developed tool that was completed only with participants who withdrew from the study (see Appendix J). This survey included a checklist of reasons for withdrawing from the study and an open-ended question inviting participants to comment on their experience. Participants had the option to complete this survey via email or phone interview.

Procedures

Administrative Approval

In the earliest planning stages of the study, a meeting was held with the Director of Nursing Research at the hospital to assist with (a) the best strategy for recruiting a criteria-specific sample and (b) the IRB process at this hospital if necessary. Information obtained from this meeting informed the procedures proposed for the study. Following the meeting with the Director of Nursing Research, a meeting with the Director of Nursing from the largest campus within this study was held to request permission and assistance in gaining access to the pediatric nurses via email and/or face-to-face. During this meeting, a description and purpose of the study was explained as well as the proposed strategy for recruitment of nurses. Once Institutional Review Board (IRB) approval was obtained from the Mercer University IRB (see Appendix K), contact was
made with four unit nurse managers from the largest campus included in this study to obtain approval to begin recruitment on their units.

Recruitment

The email invitation was sent directly to the four nurse managers with instructions to forward the email to their nurses (see Appendix L). In particular, the email invitation provided nurses with (a) the details of the study and what constituted their informed consent, (b) inclusion/exclusion criteria, (c) an explanation of procedures necessary to receive their $75 monetary incentive, (d) investigator and IRB contact information for questions, (e) a link to complete the demographic survey, and (f) instructions to expect a follow-up email from the student investigator with information to access study. The 2 weeks preceding the email invitation, the investigator announced the study at prescheduled staff meetings and various “huddle” sessions held during nurses’ work shifts. In addition, study announcement fliers (see Appendix M) that contained a description of the study and the investigator’s contact information were posted in areas designated by the nurse managers.

However, shortly after the data collection phase began and having found that the rate at which nurses were enrolling in the study was low, a modification to the Mercer IRB application was submitted by the investigator to change the recruitment process. As a result of the IRB approved modification, there were two primary changes in the recruitment process: (a) the study’s inclusion/exclusion criteria were expanded to reach BSN-prepared pediatric nurses who worked throughout the entire hospital system, with the exclusion of one campus that had been exposed to the earlier version of the EBP
modules; and (b) the method of advertisement for the study was enhanced by the use of the hospital system’s Intranet for recruiting nurses that met the study inclusion/exclusion criteria (see Appendix N). The incorporation of the hospital’s Intranet site was ideal because it was currently the platform used by this hospital system to provide communications on upcoming events, current news, and updates that impacted their employees. Additionally, the hospital’s Intranet site was only visible to employees within this hospital system and not accessible on the World Wide Web or to the public.

**Randomization**

Random assignment of eligible participants to the EBP intervention group or the attention control group occurred after participants consented to the study and completed the demographic survey. Random assignment for smaller samples can be challenging. Consequently, a randomization procedure to assure near equal number of participants in both groups was used. For this study, randomization of participants occurred at the unit level and not the individual level to reduce the threat of contamination. Initially, the study was open to only four units at the study site. Once the study became available to the entire hospital system, group allocation continued to occur at the unit level. As such, randomization of units was predetermined prior to enrolling participants from outside the original four units targeted for the study using an electronic randomization process. Units were randomly assigned such that participants from patient care area (PCA) 2, PCA3, and non-ICUs were assigned to the intervention group and participants from PCA1, PCA4, and ICUs were assigned to the attention control group.
Data Collection

Participants’ email addresses were available to the investigator once participants consented to the study permitting the investigator to send the follow-up email (see Appendix O) to participants on how to access the EBP module or attention control module through the online learning environment, CourseSites by Blackboard. This follow-up email also contained troubleshooting tips for navigating CourseSites by Blackboard. Each participant was able to access CourseSites by Blackboard through their unique user id (email address) and password. Linking participants with data would be important for the validity and accuracy of findings. Therefore, participants were given a participant id and instructed to use this id throughout the study. This setup met the needs of this study’s longitudinal design and allowed for repeated sampling (i.e., pre/post-intervention). In addition to the follow-up email, participants were sent a registration email (see Appendix P) directly from CourseSites by Blackboard which was initiated by the investigator as participants enrolled in the study.

The data collection phase was anticipated to take between 4 weeks and 8 weeks depending on when participants actually accessed CourseSites by Blackboard but ended up taking 10 weeks to complete. CourseSites by Blackboard was the online learning management system used in this study to house the (a) EBP and attention control modules, (b) active link to the EBPB scale pre-and post-intervention, (c) active link that notified the investigator when participants are ready to take the adapted Fresno test for Pediatric Nurses, and (d) active link that notified the investigator to call participants and collect their responses to the Acceptability and Usability survey via phone interview.
Quantitative data were collected online and entered into an excel spreadsheet, and then uploaded into Statistical Packages for the Social Sciences (SPSS) software for analysis, with the exception of the adapted Fresno test for Pediatric Nurses scores which were manually entered into the SPSS database.

Data Management

During the data collection phase of the study, participants' progress was monitored daily by the investigator and inputted onto the data completion and intervention monitoring form. Participants received an email from the investigator when there was inactivity, defined as no login for a one-week period or if there had not been any progress to the next phase of the study. Qualitative data were collected from participants using the Acceptability and Usability survey, and entered into an excel spreadsheet. The data were then exported from excel into a word document, and a hard copy printed to facilitate data analysis.

SurveyMonkey is a provider of Web-based tools that enables users to create surveys used for data collection and analysis (SurveyMonkey, 2013). The student investigator used SurveyMonkey to administer the (a) informed consent, (b) demographic survey, (c) EBPB scale pre-and post-intervention, (d) “ready to test” survey, and (e) “ready to interview” survey.

Overview of Data Analysis

All quantitative data obtained from the study were entered into an SPSS database. The data were cleaned and managed, and the extent of missing data was ascertained. A two-tailed alpha of $p < .05$ was used as the criterion for statistical significance. In
addition to statistical significance, effect sizes were calculated, reported, and interpreted as the criterion for clinical significance in this study using Cohen’s (1988) guidelines and more recent publications (Fritz, Morris, & Richler, 2012; Kelley & Preacher, 2012; Sun, Pan, & Wang, 2010). Sample nominal data were displayed as frequencies and percentages. Interval/ratio data were described with measures of central tendency and normality was assessed. The qualitative data were exported from an Excel spreadsheet into a Word document, and a hard copy printed to facilitate data analysis. Prior to conducting analyses to address the research questions, the intervention and attention control groups were compared on demographic variables and baseline measures of the 

EBPB scale, using Chi-square, Mann-Whitney U tests and independent samples t-tests, respectively. Variables that were found to show significant differences between the groups were controlled in the analysis as appropriate.

Data Analysis Plan per Research Questions

Research question #1 (RQ1): Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP educational intervention demonstrate greater EBP competence compared to nurses receiving the attention control content? For RQ1, an independent samples t-test was conducted to examine differences in EBP competence between the intervention group and the attention control group. In addition, effect sizes for the difference between means (i.e., Hedges' g) were also calculated, and interpreted by referencing previous effect sizes within and between similar studies (Durlak, 2009; Henson, 2006).
Research question #2 (RQ2): Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP educational intervention report stronger beliefs about the value of EBP and their ability to implement it compared with nurses receiving the attention control content? For RQ2, pre-intervention measures of EBP beliefs were examined for differences between the intervention group and attention control group. Because significant differences were demonstrated between the groups pre-intervention, an ANCOVA analysis was conducted to statistically control for the baseline difference in EBPB scores. Similar to RQ1, the effect size for the difference between means using Hedges' $g$ guidelines was also calculated, and interpreted by referencing previous effect sizes within and between similar studies.

Research question #3 (RQ3): What are the feasibility, acceptability, and usability factors of implementing a Web-based EBP educational intervention with respect to intervention content and delivery method, measures, and data collection procedures? For RQ3, feasibility was measured by analyzing (a) participants' feedback and study protocol related to the Web-based intervention via CourseSites by Blackboard and associated data collection procedures, (b) the number of participants who successfully completed the study, and (c) the number of participants who withdrew from the study after consenting and their reasons for withdrawing. Acceptability was assessed by qualitative analyses of participants' responses to a brief, post-intervention interview about their experiences with completing the study in its entirety. To evaluate usability, CourseSites by Blackboard usage statistics of each participant and group were examined. CourseSites by Blackboard website usage statistics included counts on the number of times participants accessed
content by date, hour of the day, and day of the week. Additionally, usability was assessed via qualitative analyses of participants' responses regarding the ease of navigation and use and the time required to complete the data collection procedures via post-intervention interview.

Justification for Sample Size

There have been no previous intervention studies examining EBP competence with an adapted Fresno scale in nurses. Arain, Campbell, Cooper, and Lancaster (2010) argued that for a pilot study, statistical significance and power are not as great a priority. In such cases, it is more important for the sample size to be sufficient for the researcher to clearly understand issues around subject recruitment, study procedures, and attrition. Consequently, a minimum sample size of 15 participants in each group was targeted. The study analysis permitted estimates of the difference between two means (i.e., Cohen's $d$; Hedges' $g$). In addition, Hertzog (2008) noted in pilot studies that inherently test a number of procedures, a sample size of 15 in each group would permit estimating a medium to large effect with reasonable confidence.

Protection of Human Subjects

Approval for the conduct of research involving human subjects was made through the Georgia Baptist College of Nursing of Mercer University's IRB. Once IRB approval was obtained, the process of recruiting the sample commenced. The consent for this study was accessible to nurses online via the invitation email. This email explained the purpose of the study, the inclusion/exclusion criteria, and included active links to the Web-based informed consent and demographic survey. Interested nurses were informed
that by clicking the informed consent link, it constituted consent for participation and use of their data for the research study. A follow-up email was sent to participants that met the study criteria approximately 24-48 hours explaining how their email login and participant ID code would be linked to all data collection tools within the study. This email also delineated how and when to use the email login to access the (a) EBPB scale pre- and post-intervention, (b) EBP intervention or attention control modules, (c) “ready to test” survey, (d) adapted Fresno test for Pediatric Nurses, and (e) “ready to interview” survey. Participants were asked to provide a phone number so that the investigator could (a) complete the qualitative portion of the study with participants using questions from the Acceptability and Usability survey, (b) provide specific details on how to receive the $75 monetary incentive, and (c) personally thank participants for their time.

Confidentiality of information provided by participants in the study was maintained and no identifying information will be presented in publications or presentations. All data presented in this report has been de-identified and anonymity has been preserved. In addition, the investigator will keep separately in a locked file cabinet any of the participants’ identifying information from the data collection methods for a period of 5 years.

Summary

This chapter presented the methodology that was used in the study including the design, setting, sample, and randomization procedures. Instrumentation, data collection procedures, statistical analyses, justification of the sample size, and human subject protection considerations were also described.
CHAPTER 4

RESULTS

This chapter presents the data from this study examining a Web-based EBP educational intervention in improving EBP competence in BSN-prepared pediatric nurses. Data are presented comparing the two groups on EBP competence and EBP beliefs. Feasibility, acceptability, and usability factors with respect to intervention content, delivery method, measures, and data collection procedures are also examined.

Progression of Participants through Pilot Study

Guided by the Consolidated Standards of Reporting Trials (CONSORT) endorsed by Schulz, Altman, and Moher (2010) for the CONSORT Group, and the sequence of steps in a conventional randomization design illustrated by Polit and Beck (2012), the following diagram depicts how participants progressed through this pilot study (see Figure 3). A total of 63 nurses expressed interest in the study and 5 were excluded. Of the 58 participants who were randomized, a greater percentage of the Web-based EBP Intervention group (36.4%) did not log into the CourseSites by Blackboard site compared to the Attention Control group (16%). Similar numbers of participants in each group failed to complete their assigned modules or failed to take the adapted Fresno test. The final analytic sample included 14 participants from the Web-based EBP Intervention group and 15 participants in the Attention Control group who completed the study.
Description of Analytic Sample

A comparison of the intervention and attention control groups on demographic variables is presented in Table 2. The sample consisted of 29 BSN-prepared nurses from various departments throughout the study site. The majority of nurses in this study worked on medical surgical units. There were 14 nurses in the intervention group and 15 nurses in the attention control group. The mean age for nurses in the intervention and attention control groups were similar at 36.9 (SD = 11.5) and 36.3 (SD = 11.9), respectively. The age range was from 22-57 years for the intervention group and 23-58 years for the attention control group. In addition, the means were found to be similar between both groups with respect to (a) years as a nurse, (b) years since BSN obtained, (c) years as a pediatric nurse, and (d) years employed at study site. Ninety three percent of the sample was female and almost 97% reported their ethnicity to be White. Finally, the majority of nurses reported they were not currently enrolled in school.
Table 2

*Comparison of Intervention and Attention Control Groups on Demographic Variables (N=29)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Intervention Group (n=14)</th>
<th>Attention Control Group (n=15)</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td>36.9 (11.5)</td>
<td>36.3 (11.9)</td>
<td>.83a</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Female</td>
<td>12 (85.7)</td>
<td>15 (100)</td>
<td>†</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>2 (14.2)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Race/Ethnicity</td>
<td>African-American/Black</td>
<td>1 (7.1)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Caucasian/White</td>
<td>13 (92.9)</td>
<td>15 (100)</td>
<td></td>
</tr>
<tr>
<td>Enrollment Status</td>
<td>Currently in School</td>
<td>1 (7.1)</td>
<td>2 (13.3)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Not Currently in School</td>
<td>13 (92.9)</td>
<td>13 (86.7)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>M (SD)</td>
<td>M (SD)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Years as Nurse</td>
<td>8.0 (9.8)</td>
<td>8.9 (8.7)</td>
<td>.61a</td>
<td></td>
</tr>
<tr>
<td>Years since BSN degree</td>
<td>6.8 (9.5)</td>
<td>7.7 (8.5)</td>
<td>.57a</td>
<td></td>
</tr>
</tbody>
</table>
Table 2 (continued)

<table>
<thead>
<tr>
<th></th>
<th>M (SD)</th>
<th>M (SD)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Years as Pediatric Nurse</td>
<td>6.3 (6.3)</td>
<td>7.7 (8.3)</td>
<td>.61a</td>
</tr>
<tr>
<td>Years Employed at Study Site</td>
<td>6.6 (6.6)</td>
<td>6.4 (7.9)</td>
<td>.90a</td>
</tr>
</tbody>
</table>

Note. * = Mann-Whitney U Test conducted. † = Unable to calculate X² due to cell frequency requirements not being met.

Table 3 shows the comparison of the intervention and attention control groups on perceptions of available EBP resources pre-intervention. For this study, participants' perception on the availability of EBP resources at the study site also represented, to some degree, their perception of social norms of EBP because their perception of these EBP resources may have reflected their beliefs on whether the study site provides a supportive environment for them to implement EBP in their clinical setting. Despite working in the same setting, their perceptions on the provision of (a) medical librarian services, (b) a shared decision making environment, and (c) EBP mentors differed substantially between both groups. In these areas, the attention control group was found to have stronger perceptions regarding the availability of each EBP resource when compared to the intervention group.
Table 3

Comparison of Intervention and Attention Control Groups on Perceptions of Available EBP Resources Pre-Intervention (N=29)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Intervention Group (n=14)</th>
<th>Attention Control Group (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBP Resource</td>
<td></td>
<td>n (%)</td>
<td>n (%)</td>
</tr>
<tr>
<td>Electronic Databases</td>
<td></td>
<td>12 (85.7)</td>
<td>12 (80)</td>
</tr>
<tr>
<td>Medical Librarian</td>
<td></td>
<td>11 (78.5)</td>
<td>14 (93.3)</td>
</tr>
<tr>
<td>Journal Clubs</td>
<td></td>
<td>12 (85.7)</td>
<td>13 (86.6)</td>
</tr>
<tr>
<td>Shared Decision Making</td>
<td></td>
<td>9 (64.2)</td>
<td>13 (86.6)</td>
</tr>
<tr>
<td>Formal EBP Training</td>
<td></td>
<td>6 (42.8)</td>
<td>8 (53.3)</td>
</tr>
<tr>
<td>EBP Mentors</td>
<td></td>
<td>3 (21.4)</td>
<td>9 (60)</td>
</tr>
</tbody>
</table>

Note. EBP= Evidence based practice.

Table 4 presents a comparison of participants’ reported EBP experience during and since graduating from nursing school between the two groups. More than two-thirds of the sample reported a moderate to complete emphasis of EBP in their nursing curriculum during nursing school. With respect to participants’ EBP experience since graduating from nursing school, both groups reported limited formal EBP training. However, almost 30% of the intervention group reported having formal EBP training, whereas only 13.3% of the attention control group reported having formal EBP training.
since graduating from nursing school. The formal EBP training was described as research and EBP classes that were provided by the study site.

Table 4

*Comparison of Intervention and Attention Control Groups on EBP Experience During and Since Nursing School (N=29)*

<table>
<thead>
<tr>
<th>Variable</th>
<th>Category</th>
<th>Intervention Group (n=14)</th>
<th>Attention Control Group (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nursing School Experience</td>
<td>No emphasis in the curriculum</td>
<td>2 (14.3)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td></td>
<td>Barely emphasized in the curriculum</td>
<td>0</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td></td>
<td>Sporadic emphasis in the curriculum</td>
<td>2 (14.3)</td>
<td>1 (6.7)</td>
</tr>
<tr>
<td></td>
<td>Moderately emphasized in the curriculum</td>
<td>3 (21.4)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td></td>
<td>Greatly emphasized in the curriculum</td>
<td>4 (28.6)</td>
<td>4 (26.7)</td>
</tr>
</tbody>
</table>
Table 4 (continued)

<table>
<thead>
<tr>
<th>After Nursing School Experience</th>
<th>n (%)</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completely emphasized in the curriculum</td>
<td>3 (21.4)</td>
<td>4 (26.7)</td>
</tr>
<tr>
<td>Formal EBP Training</td>
<td>4 (28.6)</td>
<td>2 (13.3)</td>
</tr>
<tr>
<td>Informal EBP Training</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>No EBP Training</td>
<td>10 (71.4)</td>
<td>13 (86.7)</td>
</tr>
</tbody>
</table>

Data Analysis by Research Questions

Prior to addressing RQ1 and RQ2, participants' adapted Fresno test scores and EBPB pre-intervention and post-intervention scores were assessed for normality. The distribution of scores was normal. Based on these data, parametric statistics were used to address the quantitative questions.

Research Question 1 (RQ1): Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP Educational Intervention demonstrate greater EBP Competence compared to nurses receiving the attention control content? To address RQ1, an independent samples t-test was conducted and the results are presented in Tables 5. Nurses who received the Web-based EBP Educational intervention demonstrated higher
EBP competence (M 94.1, SD 32.4) compared to nurses who received the attention control group content (M 80.3, SD 24.3). However, this difference was not statistically significant. The observed effect size bordered on a medium effect with Hedges’ $g$ of 0.47 (95% CI [-0.25, 1.22]) (Fritz et al., 2012; Kelley & Preacher, 2012).

Table 5

*Independent Samples t-test Comparison of Adapted Fresno Test Scores by Intervention Group (N=29)*

<table>
<thead>
<tr>
<th>Group</th>
<th>Intervention (n=14)</th>
<th>Attention Control (n=15)</th>
<th>$t$ value</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean (SD)</td>
<td>94.1 (32.4)</td>
<td>80.3 (24.3)</td>
<td>1.31</td>
<td>.20</td>
</tr>
<tr>
<td>95% CI of the difference between means (+/-)</td>
<td></td>
<td>(-7.89, 35.50)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hedges’ $g$</td>
<td></td>
<td></td>
<td>.47</td>
<td></td>
</tr>
<tr>
<td>95% CI (+/-)</td>
<td></td>
<td>(-0.25, 1.22)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Note.* SD=standard deviation. CI=confidence interval. Effect size: small ($g=.2$), medium ($g=.5$), large ($g=.8$).

*Research Question 2 (RQ2):* Do BSN-prepared pediatric bedside nurses receiving the Web-based EBP educational intervention report stronger beliefs about the value of EBP and their ability to implement it compared with nurses receiving the attention control content? To address RQ2, a one way ANCOVA was conducted, controlling for pre-intervention EBP beliefs scores. Preliminary data analysis indicated that pre-intervention EBP beliefs’ mean scores should be a covariate in the model, as a significant
difference in pre-intervention EBP beliefs’ mean scores was observed between the intervention (M 52.8, SD 4.5) and attention control group (M 57.4, SD 5.7) ($t = -2.41$, DF= 27). No violations of the assumptions of ANCOVA were noted. Table 6 illustrates the ANCOVA comparison of pre-intervention and post-intervention EBPB scores by group. The results supported that nurses who received the Web-based EBP educational intervention reported statistically significantly stronger beliefs about the value of EBP and their ability to implement it compared to nurses who received the attention control content, controlling for pre-intervention EBPB scores.

The effect size of Hedges’ $g$ on the post-intervention EBPB scores was 0.49 (95% CI [-0.24, 1.24]) (Fritz et al., 2012; Kelley & Preacher, 2012). This degree of difference between the intervention and attention control group with respect to EBP beliefs post-intervention was a borderline medium effect, in which the intervention group on average reported stronger EBP beliefs than the attention control group. Of note, EBP beliefs increased over time in the intervention group and decreased over time in the attention control group.
Table 6

**Comparison of Post-Intervention EBP Belief Scores by Intervention Group Controlling for Pre-Intervention Belief Scores (N=29)**

<table>
<thead>
<tr>
<th></th>
<th>Pre-Intervention EBPB Scores M (SD)</th>
<th>Post-Intervention EBPB Scores M (SD)</th>
<th>Adjusted Mean Scores Post-intervention M (SD)</th>
<th>$F$ value</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention Group (n=14)</td>
<td>52.8 (4.5)</td>
<td>58.7 (5.7)</td>
<td>60.1 (5.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attention Control Group (n=15)</td>
<td>57.4 (5.7)</td>
<td>55.9 (5.5)</td>
<td>54.6 (5.1)</td>
<td>6.44</td>
<td>.005**</td>
</tr>
</tbody>
</table>

Hedges' $g$ .49

95% CI (+/-) (-0.24, 1.24)

*Note. EBPB=Evidence Based Practice Belief. Adjusted means controlling for pre-intervention EBPB Scores. df= degrees of freedom. CI=Confidence Interval. **$p < .01$. Effect size: small ($g=.2$), medium ($g=.5$), large ($g=.8$).*

Research Question 3 (RQ3): What are the feasibility, acceptability, and usability factors of implementing a Web-based EBP educational intervention with respect to intervention content and delivery method, measures, and data collection procedures?

To address RQ3, the feasibility, acceptability, and usability factors of this study were explored using a combination of quantitative and qualitative analysis. In particular, the qualitative methods were used to support the design of the intervention and to help understand issues of feasibility, acceptability, and usability in this study.
This pilot study was conducted over a period of 69 days from October 10th through December 18th, 2013. Recruitment occurred for the first 43 days with the remainder devoted to participant follow-up. The first participant logged into CourseSites by Blackboard occurred on October 17th. Data collection for both groups ceased on December 18th with the investigator conducting the last interview with a participant from the intervention group.

**Feasibility Factors**

Feasibility factors addressed three main issues: 1) adequate numbers of participants could be recruited, 2) participants could be retained, and 3) the study could be implemented using the Web-based format for delivery and for data collection. During the course of the study, 58 nurses were enrolled and were randomized to the intervention or attention control group. However, only 29 nurses (50%) completed the study in its entirety. Of the 29 nurses, one nurse declined to participate in the interview portion of the study. An extensive study log was maintained by the investigator to capture the enrollment, retention, and attrition rates of participants every two weeks over the course of the study.

With respect to enrollment, the highest enrollment rate occurred from October 23rd through November 6th, at which point 31 nurses completed the informed consent and demographic survey. Prior to October 24th, only 15 nurses had enrolled in the study over a period of 2 weeks. On October 24th, the study began to advertise on the study site’s Intranet reaching a larger pool of nurses. By October 27th, a period of 3 days, an additional 16 nurses enrolled in the study.
With respect to retention and attrition, of the total number of nurses who had enrolled in the study (N=58), nearly 28% (n=16) never logged into the CourseSites by Blackboard website. Twelve of the 16 were in the intervention group and it is unclear why a greater percentage of these participants had not accessed the website. Of the 42 nurses who began to review their assigned modules, 19% (n=8) did not complete the modules and an additional 12% (n=5) completed the modules but did not take the adapted Fresno test for Pediatric Nurses. A follow-up survey was sent electronically to 29 nurses to assess their reasons for not completing the study and 62% (n=18) responded. The most frequently reported reasons for not completing the study were time constraints with work schedule (n= 11), followed by life events/stressors (n=4) (i.e., vacations, family emergency, and surgery), then technical issues (n=3) (i.e., unable to log into website, unable to download Respondus).

An important feasibility issue arose around the adapted Fresno test for Pediatric Nurses. As part of the study protocol, participants had to download a special browser called Respondus Lockdown Browser, which is a custom browser that locks down the testing environment within CourseSites by Blackboard. Thus, when participants used this browser they were unable to print, copy, go to another URL, or access other applications. Some participants who did not complete the study reported they were unable to download the Respondus browser. For those who downloaded the Respondus browser and started the test, they were locked into it until they were ready to submit it for grading. Consistent with other studies, participants were given a time restriction of up to 60 minutes to complete the adapted Fresno. With this feature, the test would save and
submit automatically when the time expired. This presented problems for some participants because they reported they did not have enough time to complete the test in its entirety. No problems were reported about the use of the Web-based delivery to complete the demographic forms or *EBPB scale*.

**Acceptability Factors**

During the interview portion of this study, participants were asked about their perception on the acceptability and usability of the modules they reviewed. Participants from both groups reported they agreed or strongly agreed the module was useful in promoting EBP in BSN-prepared pediatric nurses (64.3%) and they would recommend the module to nurses who wanted to learn about EBP (64.2%). Participants differed by group when asked if they believed they had the knowledge and skills sets in EBP to implement it in their practice and to provide explanations on how they would use what they reviewed in the module to improve their practice. Participants from the attention control group frequently reported feeling confused between what they reviewed in the module and EBP implementation. Participants from the intervention group frequently reported the module they reviewed as a *primer* to EBP implementation.

Participants were also asked if there was any content in the module they thought should be deleted or added and if they had any additional comments that could improve delivery of content. An analysis of the narrative comments was conducted for both the Intervention and Attention Control groups. For those participants who reviewed the EBP module, they expressed they would have wanted to be able to interact with someone about the content and to ask questions. For example, participant *EBP-02* noted, “I would
like more examples for more of the technical information and someone to go to for help with explaining difficult content.” Participant EBP-14 noted, “Not a lot of interaction. The interaction would have been more helpful.” For participants who reviewed the attention control content on MSBP, they expressed the modules kept them engaged and were relevant to their practice. For example, participant MSBP-01 noted, “I found it very interesting from a nursing standpoint on what to look for with Munchausen’s.” Participant MSBP-18 noted the following, “thought it was really interesting and relevant to the families we have on our floor.” However, interestingly enough, participants from this group also expressed an interest in having the EBP module accessible in the future for reference. The following quotes exemplify this sentiment: Participant MSBP-01 stated, “I am actually interesting at looking at the EBP module when the study is done” and participant MSBP-25 stated, “I would have really enjoyed reviewing the module and could you make it available...or have it available for me after the study because the test seemed really interesting.”

With respect to the acceptability and usability of the Web-based modules, participants in the EBP intervention and attention control group expressed positive feedback about the content. In particular, participants from the intervention group found the content as being helpful, a foundation, a refresher, and having a lot of good information. For example, participant EBP-31 stated, “I feel the module was helpful with telling me how and where to start.” Participant EBP-20 said, “I don’t feel there was enough information to be an expert to implement EBP but I do feel it was a good foundation and for furthering my knowledge about EBP.” Participant EBP-30 said, “It
was informative, sort of a very brief review of the research course I took in nursing school.” Participant EBP-02 said, “I am a recent graduate and your module just reinforced what I have learned and it has made me more confident.” Participants from the attention control group found the content to be relevant, user-friendly, and with good examples. For instance, participant MSBP-13 noted, “I found the reading and experience of going through it and the case study very interesting to me.” Participant MSBP-06 noted, “I enjoyed reading the module online and the modules do benefit pediatric nursing.” Participant MSBP-25 stated, “It was easy to understand and covered all the points with my experience with MSBP.” Finally, participant MSBP-03 said, “I enjoyed reading the module; I felt like it described some of the patients I see.”

Usability Factors for the CourseSites Website

Along with usability of the Web-based content, there were also usability issues around the use of the CourseSites website for data collection and to access the modules. The total number of hours spent in the CourseSites website by group was evaluated. Table 7 presents results from this analysis with respect to the usability of the CourseSites website for the delivery of the content used in this pilot study. Participants in the intervention group spent more time compared to the participants in the attention control group. Correspondingly, the average time spent in the website per user in hours was greater in the intervention group at 3.1 when compared to the attention control group. These results are what were expected because the modules for the intervention group were expected to be more content-intensive when compared to the modules for the attention control group. With respect to the total number of logins, measured by the
number of “hits” or times content was accessed by the user, as a group, the attention control group had more hits than the intervention group. The average login per user for the intervention group was greater than that of the attention control group. The mean time from first login to last (days using the website) was similar between groups.

Table 7

*CourseSites by Blackboard Web Statistics for Intervention and Attention Control Groups (N=29)*

<table>
<thead>
<tr>
<th>Web Statistic</th>
<th>Intervention Group (n=14)</th>
<th>Attention Control Group (n=15)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total time in course</td>
<td>42.65</td>
<td>34.63</td>
</tr>
<tr>
<td>Average time in course per user</td>
<td>3.05</td>
<td>2.16</td>
</tr>
<tr>
<td>Total Logins</td>
<td>162</td>
<td>171</td>
</tr>
<tr>
<td>Average login per user</td>
<td>11.57</td>
<td>11.4</td>
</tr>
<tr>
<td>Total time in course from first to last login</td>
<td>57</td>
<td>55</td>
</tr>
<tr>
<td>Mean time from first to last login</td>
<td>4.21</td>
<td>4.26</td>
</tr>
</tbody>
</table>

Summary

This chapter presented the results of this two group randomized controlled experimental embedded mixed methods design study. A flow diagram was presented to
show the progression of participants through the study. The two groups were compared on demographic characteristics and data to address the research questions were presented.
CHAPTER 5

DISCUSSIONS, CONCLUSIONS, AND RECOMMENDATIONS

This chapter presents a discussion and interpretation of findings of the study including explanations about the feasibility, acceptability, and usability of the intervention and the way it was delivered. This is followed by a discussion of implications of the findings and recommendations for nursing education, nursing practice, and future research. The chapter ends with a discussion of study limitations and conclusions.

Discussion of Findings

This was a pilot study testing the use of a Web-based EBP educational intervention for improving EBP beliefs and competence in BSN-prepared pediatric bedside nurses. Findings showed nurses in the study were primarily Caucasian females in their mid-30s who had limited amount of training in EBP after graduating nursing school. These demographics are somewhat similar to the U.S. population of nurses reported in the 2010 National Sample Survey of Registered Nurses (NSSRN). According to the NSSRN (2010), 83.2% of nurses in the U.S. are White and 90.4% are female. This is comparable to the percentage in this pilot study (i.e., 93% female and almost 97% White/Caucasian). According to the NSSRN (2010), the average age of RNs in the U.S. was reported to be 45.5 which is older than the mean age of 36.6 reported for nurses in
this study. However, the mean age of RNs reported in this study does align with a study conducted by Melnyk, Fineout-Overholt, Gallagher-Ford, and Kaplan in 2012 who found that older nurses had less interest and desire to learn new EBP knowledge and skills when compared to younger nurses. In Melnyk et al.'s (2012) study, from a sample of 1015 nurses surveyed, their ages ranged from 21 to 79 years with a mean of 51.2 years. Results from their descriptive study found negative correlations between the number of years in clinical practice and the perceived importance of gaining more knowledge and skills in EBP as well as an interest in receiving more EBP education and skills building (Melnyk et al., 2012). Overall, the mean age of nurses in the current study reflected a younger group of nurses who were interested in learning about EBP.

Although more than two-thirds of the participants reported a moderate to complete emphasis on EBP in their nursing curriculum, only about 20% had some form of EBP training after graduating from nursing school. These results are consistent with publications that report a lack of continued EBP education and skills building for bedside nurses (Hart et al., 2008; Koehn & Lehman, 2008; Larrabee, Sions, Fanning, Withrow & Ferretti, 2007; Munroe et al., 2008; Thiel & Ghosh, 2008). Education plays a crucial role in improving EBP competence among bedside nurses. The emphasis on patient safety and quality care in the current healthcare climate has pushed the expectation for increased EBP competence and EBP use among bedside nurses. Consequently, many healthcare institutions are still lagging in their inherent duty to provide EBP education and skills building for practicing nurses.
A recent survey confirmed that practicing nurses in the U.S. are still (a) struggling with using EBP and (b) practicing in environments that are non-conducive to EBP despite longstanding recommendations for EBP use in nursing education and nursing practice (Melnyk et al., 2012). A critical finding from Melnyk et al.’s (2012) report that was amazingly different from Pravikoff and colleagues’ report in 2005 was nurses’ shift in their perceived value of EBP. In Pravikoff et al.’s (2005) study, findings suggested that nurses were not ready to implement or embrace EBP and a lack of value for EBP was most often reported by nurses in their study as a barrier to EBP. Melnyk et al. (2012) noted nurses that were surveyed reported that they wanted to gain more knowledge and skills in order to deliver evidence-based care in their institutions. In the current study, this shift in value for EBP was confirmed during the interview portion as some nurses from the attention control group expressed their discouragement about not being allocated to the group that reviewed the EBP module. Additionally, some nurses within both groups expressed they would like to have access to the modules after the study had completed for their reference. Taken in context, these findings support the need for EBP educational interventions such as the one examined in this study for improving EBP competence in nurses by providing continued education and skills building in EBP.

**EBP Competence**

No statistically significant difference was demonstrated between nurses who reviewed the Web-based EBP educational module and nurses who reviewed the attention control module in this study. However, the effect size supported that the Web-based EBP educational intervention group had greater EBP competence scores with a small to
borderline medium effect. To date, there have been no published studies evaluating EBP competence in BSN-prepared pediatric nurses. Studies that have examined EBP competence were conducted in the medical and allied health professions (i.e., occupational therapists, physical therapists, speech pathologists, social workers, and psychologists). Excluding the original study testing the psychometric properties of the Fresno test of competence in evidence-based medicine for which an effect size could not be calculated (Ramos et al. 2003), these studies used the original Fresno test or a revised version of the Fresno test but failed to consistently report effect sizes (Dinkevich, Markinson, Ahsan, & Lawrence, 2006; Lai & Teng, 2009, 2011; McCluskey & Lovarini, 2005; Novak & McIntyre, 2010; Tilson, 2010). Studies that have reported effect sizes and have used the Fresno test or a revised version of the original Fresno as the instrument for measuring changes in knowledge and skills reported effect sizes that ranged from -0.4 to 1.78 (Argimon-Pallas et al., 2010, 2011; Dizon, Grimmer-Somers, & Kumar, 2011; McCluskey & Bishop, 2009). However, the two published studies by Dizon et al. (2011) and McCluskey and Bishop (2009) are not strictly comparable because the authors adapted the Fresno test and the scoring system to match their objectives and their teaching modules. As such, these differences in Fresno adaptations need to be taken into consideration when interpreting effect sizes within and between the studies mentioned in this discussion. Furthermore, all the reported effect sizes were interpreted from EBP competence studies in disciplines other than nursing, that used alternative approaches to EBP training (i.e., workshops, lectures), over variable periods of time (i.e., 1 day, 2 days, 4 days). Nonetheless, the small to baseline medium effect
size reported in this study is the first reported for an intervention study focused on EBP competence in pediatric nursing.

An important development that occurred upon completion of the current study concerning the establishment of EBP competencies for practicing nurses, in general, deserves some commentary at this point. A recent Delphi study generated a clear set of EBP competencies for practicing nurses that can be used to facilitate nurses’ use of research evidence for an EBP approach to care (Melnyk, Gallagher-Ford, Long, & Fineout-Overholt, 2014). Melnyk et al.’s (2014) study proposed 13 EBP competencies from questioning practice for the purpose of improving care to participating in strategies that sustain a culture of EBP. The EBP competencies proposed by Melnyk and colleagues (2014) were found to align with some of the EBP principles and guidelines used to develop the Web-based EBP intervention used in this study. As mentioned in Chapter 3, the work of Stevens (2009) significantly influenced the design of the intervention used in this study for the provision of essential EBP competencies for BSN-prepared nurses. It is clear and reassuring that the evidence base on EBP competence in the profession of nursing is evolving (AACN, 1995, 1996; ANA, 1994; IOM, 2003; Melnyk et al., 2014; Quality and Safety Education for Nurses [QSEN], 2014; Stevens, 2009). However, a chasm exists with respect to intervention studies that measure EBP competence in nurses and its impact on clinical decision-making or EBP implementation rates. Additionally, although reports show the importance of an EBP culture for the sustainment of EBP use by nurses (Melnyk & Fineout-Overholt, 2010; Newhouse, Dearholt, Poe, Pugh, & White, 2007; Melnyk et al., 2010; Titler et al., 1994; Wallen et
al., 2010), the development of objective methods for assessing EBP competence within nursing, such as the adapted Fresno test used in this pilot study, is equally important to evaluate its impact on the quality of care and patient outcomes.

**EBP Beliefs**

EBP beliefs were found to be statistically significantly different between the Web-based EBP educational intervention group and nurses in the attention control group controlling for the pre-intervention EBPB scores. The data demonstrated nurses in the intervention group, who began this study with weaker EBP beliefs compared to the attention control group, experienced a substantial positive change in their beliefs about EBP when compared to the attention control group. These results are consistent with other studies that used the EBPB scale pre- and post-intervention and found EBP beliefs can increase with educational interventions (Levin et al., 2011; Melnyk, Bullock et al., 2010; Varnell et al., 2008). Additionally, studies that used the EBPB scale reported similar effect sizes as reported in this pilot study (Melnyk, Bullock et al., 2010; Wallen et al., 2010). For instance, Melnyk, Bullock et al.'s (2010) study showed NICU nurses who participated in an 8-hour workshop on EBP and the Creating Opportunities for Personal Empowerment (COPE) program (n=48) had significantly higher EBP beliefs than nurses in the comparison group (n=33) post-intervention, which resulted in a medium to large positive effect (d = .57) for the delivering the COPE program. Wallen et al. (2010) found nurses who participated in an EBP mentorship program had a larger increase in EBPB scores compared to those nurses who had not participated, and reported a medium effect size (d = .52) post-intervention.
Finally, there is one other finding related to EBP beliefs in this study that deserves an in-depth commentary. Nurses in the attention control group, who began this study with stronger EBP beliefs than the intervention group, experienced a substantial decrease in their EBP beliefs post-intervention. This finding was similar to a pilot study conducted in 2011 by Levin and colleagues, to evaluate the preliminary effects of implementing an EBP model on several variables (i.e., ARCC model). Their study used a repeated-measures design and assessed EBP beliefs at 4 time points. The authors reported EBPB scores for the attention control group increased slightly from times 1 to 2 but then decreased steadily at times 3 and 4. At time 4, the attention control group’s score on the EBPB scale was reported lower than it was at baseline. The authors provided no explanation about this decline in their article. However, for this study, the fact that the attention control group demonstrated a noticeable decline in their beliefs about EBP suggests other factors may have influenced their perceptions toward EBP. For instance, the adapted Fresno test deals with practical application of EBP principles. It is possible that in completing the adapted Fresno test they recognized their limited understanding of EBP and consequently, this had a detrimental effect on their EBP beliefs. Qualitative data in this study support this explanation as nurses, particularly in the attention control group, expressed frustration about (a) the test not having anything to do with the module they reviewed and (b) not being prepared to take the adapted Fresno test.
Feasibility, Acceptability, and Usability

With respect to the feasibility, acceptability, and usability factors in this study, findings from this pilot study showed the Web-based EBP educational intervention was feasible. However, acceptability and usability factors show the content and delivery of the intervention must be addressed to enhance future studies. Some nurses in this study reported the content was too much to absorb and others reported a more interactive module would have facilitated their understanding of the content. Others reported the need for more emphasis on the complex content, such as study designs and statistical analyses. Finally, nurses from the intervention and attention control groups provided unfavorable feedback about the testing environment employed in this study for completion of the adapted Fresno (i.e., Respondus Download Browser and 1 hour time limitation). From a methodological perspective, the application of the special browser and time restriction was to increase study rigor by reducing threats to internal validity, and to ensure that each participant was provided the same testing conditions. However, qualitative survey data indicated nurses felt they did not have sufficient time to complete the test and a small number of nurses experienced some difficulty with downloading the browser. The investigator identified several participants that left adapted Fresno items blank, especially the last set of question items, which were consistent with qualitative data that nurses may have needed more than 1 hour to complete the test.

Information in the current literature provides suggestions on pedagogical approaches for teaching EBP to bedside nurses (i.e., independent study packets, internships, workshops, computer-based programs, nursing grand rounds). However, the
most effective method to learn the EBP process and demonstrate EBP competence is debatable. The majority of the nurses in this study identified the Web-based approach to learning about EBP as an effective method. These findings support the use of Web-based technology for the education of busy working nurses (Atack & Rankin, 2002; Belcher & Vonderhaar, 2005; Belda et al., 2004; Carter et al., 2009; Hart et al., 2008; Patel, 2007; Rankin et al., 2013; Schneiderman & Corbridge, 2009; U.S. Department of Education, 2010). Additionally, suggestions to integrate an interactive mode and point person to go to for questions were made for enhancing the Web-based approach used in this study. These findings corroborate the work of other EBP experts who have emphasized the use of EBP mentors and/or clinical scholars for the sustainability of EBP particularly in the healthcare organizational setting (Melnyk, 2007; Melnyk & Fineout-Overholt, 2010; Schultz, 2005). For example, Melnyk (2007) asserted the availability of EBP mentors within a healthcare system is a key factor in sustaining EBP. By definition, EBP mentors are nurses specifically trained to (a) assist nurses in improving their EBP knowledge and skills as well as implementing EBP projects to improve patient care and outcomes, and (b) implement strategies to overcome barriers in the healthcare environment in building a culture of EBP (Melnyk & Fineout-Overholt, 2010). Similarly, Schultz (2005) characterized clinical scholars as bedside nurses who serve as mentors to other staff nurses involved in journeys to scholarship and are committed to patient care, knowledge development, research translation, and evidence implementation.
Recommendations for Nursing Education and Practice

The results of this study found that BSN-prepared pediatric bedside nurses have limited competence in EBP. Overall, the $EBPB$ scores of nurses in this sample at baseline were reflective of strong beliefs in the value of EBP implementation. However, their EBP competencies scores were relatively low compared to other studies that have used the *Fresno* test. According to the AACN (2008), schools of nursing are responsible for preparing and providing society with knowledgeable and competent nurses who are ready to engage in EBP. Similarly, healthcare organizations that employ nurses are equally responsible for ensuring provisions are made for continued education and competence of a nursing workforce that engages in EBP to maximize patient outcomes (IOM, 2001; 2003; 2008; Joint Commission, 2007). Therefore, refinements of EBP knowledge and skills in undergraduate nursing education as well as continuing education for bedside nurses are necessary to assist in the acceleration of nurses using research knowledge to take an evidence-based approach to care.

Recommendations for Future Research

Refinements to the Adapted Fresno Test

The adapted *Fresno* test for Pediatric Nurses used in this study needs to be tested psychometrically. Further research focused on obtaining additional reliability and validity data on this instrument will support the objective assessment of EBP competence in the area of pediatric nursing. Additionally, removing the time limitation on the adapted *Fresno* test is recommended. This will provide a more accurate reflection of the time it actually takes to complete such an assessment as well as more reliable data for
measuring EBP competence. Finally, longitudinal studies are needed to understand the adapted Fresno test’s responsiveness to change over time as well as its predictive validity (i.e., whether EBP competence scores allow predictions of EBP implementation rates). McCluskey and Bishop (2009) considered a 10% change from baseline on the mean total score of their adapted version of the Fresno tool to be educationally important. Thus, future studies that use the adapted Fresno test for Pediatric Nurses should consider a similar criterion when measuring its potential for responding to change in EBP skills over time. Studies with these foci could also examine further the relationship of EBP competence and EBP implementation rates, and explicate how the relationship competence and implementation is influenced by secular trends.

Refinements to Testing of the Intervention

The findings in this pilot study provided preliminary evidence on the acceptability and usability of the EBP Web-based educational intervention. Based on the participants’ feedback, the integration of “ask me” tab and a more interactive component should be applied in future versions of the EBP module used in this study. Also, since half of the sample in this study never accessed the CourseSites by Blackboard website, consideration for using a Web-based portal for housing the EBP module that has fewer layers for accessing content is recommended. Lastly, it is recommended that this study be replicated in an adequately powered main study using a national sample of pediatric nurses to fully test the intervention. Effect sizes observed in the current study will be used to inform the power analysis in the main study. Overall, this will increase the representativeness and generalizability of findings, and is highly recommended for
examining the effectiveness of Web-based EBP educational approaches among BSN-pediatric bedside nurses in an attempt to validate an evidence-based EBP teaching methodology.

**Limitations**

There were several limitations to this study. The first was in the attrition rate. Fifty percent of the sample did not complete the study and attrition may have affected the precision of the estimates of effect sizes and confidence intervals. Considering the largest attrition occurred early in the study with nurses who never accessed the CourseSites by Blackboard website, this made it difficult to assess the feasibility of the content and consequently, the ability to capture the effects of the intervention used in this pilot study.

The second limitation involved the method of data collection pre-intervention and post-intervention with the EBPB scale, as well as the post-intervention phone interviews with the investigator. This approach may have caused a Hawthorne effect for both groups. The very act of asking questions about EBP may have resulted in a positive change in EBP beliefs. The investigator is employed at the institution where the study was implemented and it is possible that some of the participants in the study were reluctant to provide negative comments during the phone interview about the acceptability and usability of the Web-based intervention. For instance, there were inconsistencies when participants were asked (a) whether the module would be useful in promoting EBP in BSN-prepared pediatric nurses and (b) did they believe they had the knowledge and skill sets to implement EBP in their practice. Several nurses, particularly
from the attention control group, demonstrated inconsistent responses between these question items on the survey and at the end of the interview they expressed favorable responses for EBP when in fact they did not believe the modules they reviewed promoted EBP.

A final limitation of this study was related to the adapted Fresno test for Pediatric Nurses being developed specifically for use in this study with limited reliability and validity data. The original Fresno test has been adapted and revised several times to objectively measure EBP competence in disciplines other nursing. To date, researchers who have published reports about modifications made to the original Fresno test have established high reliability and validity coefficients. A comprehensive search of the literature confirmed adapting the original Fresno test was essential to measure the outcome variable of EBP competence in a pediatric nursing sample. Ultimately, using an instrument with limited established validity and reliability data adds to the threat of statistical conclusion validity in this study, and thus induces an element of error to the analysis. This should be considered in the interpretation of the results. Overall, the instrument yielded a distribution of scores that was normally distributed and the grading rubric yielded adequate intra-rater agreement suggesting that the tool has the potential for demonstrating strong psychometric properties.

Conclusions

The IOM has set a goal that 90% of clinical decisions be supported by accurate, timely and up-to-date clinical information, and reflect the best available evidence by the year 2020 (IOM, 2008). In order to meet this goal, healthcare professionals must be
competent in using research to take an evidence-based approach to care. Nurses who demonstrate EBP competence possess the knowledge, skills, and attitudes in EBP to maximize their patients’ outcomes and improve the quality of care they provide. Nursing is the nation’s largest healthcare profession (Health Resources and Service Administration [HRSA], 2010) and portrayed by the IOM as a critical component in transforming the current healthcare system (IOM, 2011). Although a key driver and longstanding proponent of EBP, the IOM is one of several influential organizations that have emphasized the importance of having a nursing workforce competent in EBP for the delivery of high quality and safe healthcare. Amid these assertions, the barriers and facilitators of EBP adoption among nurses, in particular, continue to be cited by noted EBP experts, and with respect to barriers of EBP adoption, pediatric nurses are at a greater disadvantage.

This pilot study was a novel and useful attempt to assess and refine a Web-based EBP educational approach for improving EBP competence in BSN-prepared pediatric bedside nurses. The preliminary data from this study demonstrated the Web-based approach for EBP education (a) was feasible for practicing nurses, (b) demonstrated a non-significant but borderline medium effect in improving EBP competence, and (c) demonstrated a statistically significant and borderline medium effect in improving nurses’ beliefs about EBP. Refinements of EBP knowledge and skills for BSN-prepared pediatric nurses are still needed to facilitate the acceleration of EBP competence in order to maximize patient outcomes and improve the quality of care. Ultimately, improving
EBP competence in this population will increase the capacity of pediatric nurses in achieving the IOM’s 2020 goal of basing 90% of clinical decisions on best evidence.
REFERENCES


Lehman, K. D. (2007, April). Nurses’ perceptions of evidence-based practice. Paper presented at the 3rd Annual Symposium on Graduate Research and Scholarly Projects (GRASP) at Wichita State University, KS.


Sauls, D. J. (2007). Nurses’ attitudes toward provision of care and related health outcomes. *Nursing Research, 56*, 117-123. doi: 10.1097/01.NNR.0000263972.54619.4a


Shilling, V., & Young, B. (2009). How do parents experience being asked to enter a child in a randomized controlled trial? *BMC Medical Ethics, 10*, 1. doi: 10.1186/147206939-10-1


APPENDICES
Appendix A

CourseSites by Blackboard Announcement Page for Group A and B

Announcements

Welcome to Study Group A!
Posted on Tuesday, October 1, 2013 4:25 PM EDT

Thank you for agreeing to participate in this study!

This study requires you complete the following steps in the exact order specified below:

1. Complete the Evidence Based Practice Beliefs (EBPB) scale (located in the resources & links tab to your left)
2. Review the 2-hour Web-based module (located in the session materials tab to your left)
3. Click on the Ready to Test link and complete information (located in the resources & links tab to your left) - a password will be sent to you via email to access the test.
4. Take the Adapted Fresno Test for Pediatric Nurses (located in the session materials tab to your left)
5. Complete the EBPB scale a second time
6. Click on the Ready to Interview link and complete information (located in the resources & links tab to your left)

Reminder: please include your participant code whenever indicated.

If you have any questions or concerns, please do not hesitate to contact me at Natasha.Lewin-Fortes@live.mercer.edu or call 978-997-1672.

Announcements

Welcome to Study Group B!
Posted on Tuesday, October 1, 2013 4:25 PM EDT

Thank you for agreeing to participate in this study!

This study requires you complete the following steps in the exact order specified below:

1. Complete the Evidence Based Practice Beliefs (EBPB) scale (located in the resources & links tab to your left)
2. Review the 2-hour Web-based module (located in the session materials tab to your left)
3. Click on the Ready to Test link and complete information (located in the resources & links tab to your left) - a password will be sent to you via email to access the test.
4. Take the Adapted Fresno Test for Pediatric Nurses (located in the session materials tab to your left)
5. Complete the EBPB scale a second time
6. Click on the Ready to Interview link and complete information (located in the resources & links tab to your left)

Reminder: please include your participant code whenever indicated.

If you have any questions or concerns, please do not hesitate to contact me at Natasha.Lewin-Fortes@live.mercer.edu or call 978-997-1672.
### Appendix B

#### Demographic Questionnaire

<table>
<thead>
<tr>
<th><strong>UNIT WORKED:</strong></th>
<th><strong>Email Address:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<tr>
<td><strong>Phone Number:</strong></td>
<td></td>
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<tr>
<td></td>
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</tr>
</tbody>
</table>

**1. What is your Gender:**
- Female
- Male

**7. How long have you been a pediatric nurse? (In years):**

**8. How long have you been employed at CHOA? (In years):**

**2. What is your Race/Ethnicity:**
- African American/Black
- Asian/Pacific Islander
- Hispanic/Latino
- Multiracial
- Native American/American Indian
- White
- Other (please specify) ____________
- Prefer not to respond

**9. Please indicate on the following scale, how much evidence-based practice (EBP) education and skill building did you receive in nursing school while obtaining your BSN degree?**

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Nothing about EBP</td>
</tr>
<tr>
<td>1</td>
<td>EBP was emphasized through the curriculum</td>
</tr>
<tr>
<td>2</td>
<td>EBP was taught in one course</td>
</tr>
<tr>
<td>3</td>
<td>EBP was taught in two or more courses</td>
</tr>
<tr>
<td>4</td>
<td>EBP was emphasized throughout the curriculum</td>
</tr>
<tr>
<td>5</td>
<td>EBP was emphasized throughout the curriculum and demonstrated in practice</td>
</tr>
</tbody>
</table>

**3. How old are you?**

**4. Please indicate if you are currently enrolled in nursing school and what your enrollment status is:**
- Not Currently enrolled in school
- Currently enrolled in school
  - MSN
  - DNP
  - PhD

**10. Briefly describe what was taught about EBP in your BSN curriculum:**

**11. Please indicate whether these EBP resources are accessible to you at work:**
- Electronic databases (i.e., CINAHL, OVID, PubMed)
  - Yes
  - No
  - Not Sure
- Medical Librarian
  - Yes
  - No
  - Not Sure
- Journal Clubs
  - Yes
  - No
  - Not Sure
- Shared Decision Making
  - Yes
  - No
  - Not Sure
- Formal EBP training
  - Yes
  - No
  - Not Sure
- EBP Mentors
  - Yes
  - No
  - Not Sure

**5. How long have you been a nurse? (In years):**

**6. What year did you receive your BSN degree?**

**12. Please indicate whether you have had previous experience with EBP since graduating from your BSN program:**
- Formal EBP training (Describe):
  - Yes
  - No
  - Not Sure

---

**Note:** The table layout and formatting have been simplified for readability. The original document contains more detailed responses and options not fully transcribed here.
Appendix C

Evidence-Based Practice Beliefs Scale

This scale is copyrighted and consequently cannot be included in the Appendices.
Appendix D

Adapted Fresno Test for Pediatric Nurses

Adapted Fresno Test for Pediatric Nurses

Participant Code: __________

Instructions:

EBP involves knowledge and skills related to identifying, applying, and evaluating evidence to inform practice. This test is designed to assess your competence in EBP.

There are 11 questions. Questions 1 through 7 require you to refer to scenarios 1, 2, and/or 3.

Please complete the entire test in one sitting and allow yourself up to 60 minutes to complete the test.

Scenario #1: You’ve been working with adolescent Cystic Fibrosis (CF) patients for a number of years and you note a large proportion of these patients have become non-adherent with their diet and respiratory treatments when hospitalized. As a result, they are hospitalized more frequently, are much sicker when they return, and stay hospitalized for longer periods. Currently, pet therapy and music therapy are used to promote adherence in this population of patients. You are thinking of conducting a search of the literature as well as other sources of evidence to develop a plan for improving non-adherence in this population.

Scenario #2: Ben is a 4-month-old previously healthy infant presents to the emergency department (ED) with upper respiratory infection (URI) symptoms, poor oral intake, increase cough, and nasal congestion. Results from a viral panel are positive for respiratory syncytial virus (RSV). Upon assessment, he is irritable, crying but consolable, pulse ox 90% on room air with scattered crackles on auscultation. He has copious nasal secretions accompanied with a wet cough. The new ED attending orders maintenance IVFs, oxygen (O2) to keep saturations >93%, and suction. However, Ben continues to have significant difficulty in breathing, O2 requirement to keep saturations >90%, poor feeding, and unable to handle secretions with bulb suctioning, and requires deep suctioning. Mom is concerned that we have not administered respiratory treatments to Ben via nebulizer and indicates her 6y/o with asthma has received nebulizer treatments in previous ED visits and it helped tremendously. You are also curious to know why initial respiratory treatments have not been ordered for this infant.
Scenario#3: Asia is a 4 year-old female admitted with Diabetic Ketoacidosis not requiring a PICU admission. Her hemoglobin A1-C indicates her glycemic levels have been suboptimal. She was recently diagnosed with Type 1 Diabetes 6 months ago. Since her diagnosis, she has had four admissions, one of which was a PICU admission. She requires 4 multiple dose injections per day and has not tolerated them well at home per parents. On this admission, at least two staff members have had to assist parents in restraining Asia to administer the insulin injections. Child life specialists have been working with Asia but it appears she has an extreme case of needle anxiety. It also takes Asia at least 1-2 hours to recover emotionally from each injection. Parents are tearful and have expressed to you frustration with giving the injections and fear they are not managing her illness well. You consider recommending the use of an Insufion port (indwelling subcutaneous vinyl catheter through which a single medication can be administered to avoid multiple needle sticks) for insulin administrations but a coworker tells you at this hospital, the Insufion ports have only been used for anticoagulant therapy and never been used for glycemic control in patients with diabetes.

Question#1: Formulate a PICO question for each of these scenarios that will help you organize a search of the clinical literature. (36 points)

Question#2: Where might you go to find answers to questions like these? List as many possible sources of information as you can. Describe the most important advantages and disadvantages for each type of information source you listed. (24 points)

Question#3: If you were to search PubMed, CINAHL or any other database for one of these questions, describe what your search strategy would be. Be as specific as you can about which topics and search categories (fields) you would search. Explain your rationale for taking this approach. Describe how you might limit your search if necessary and explain your reasoning. (24 points)

Question#4: Choose to focus on one of the clinical scenarios (CF and non-adherence, RSV and respiratory treatments, or Type 1 Diabetes and Insufion ports). What type of study (study design) would best be able to address this PICO question and why? (24 points)

Question#5: When you find a report of original research on these questions, what characteristics of the study will you consider in determining if it is relevant? Include examples. (Question#6 and #7 will ask you how to determine if the study is valid and how important the findings are). For this question, focus on how to determine if it is really relevant to your practice. (24 points)

Question#6: When you find a report of original research on these questions, what characteristics of the study will you consider in determining if its findings are valid? Include examples. (You’ve already addressed relevance in question#6 and question#7 will ask you how to determine the importance of the findings). For this question, focus on the validity of the study. (24 points)
Question #7: When you find a report of original research on these questions, what characteristics of the study will you consider to determine their magnitude and significance (clinical and statistical)? You've already addressed relevance and validity. For this question, focus on how to determine the meaning of an effect reported in the study. (24 points)

Question #8: A 2-year study was conducted to quantify the use and characterization of circumstances in which sweet-ease was ordered for minor procedures on a 24-bed medical-surgical unit in a tertiary-care children's hospital. Data collected were as follows: (a) age group in months on admission (>1-<2; >3-<6; >7-<12), (b) gender, (c) illness/admission diagnosis, (d) procedure type, (e) family presence, and (f) sweet-ease order. A retrospective evaluation was performed using the medical charts of 200 pediatric patients admitted to the unit who ranged from 1 month to 12 months of age between January 2011 and December 2012. The approach to analyzing the data was a time-to-event analysis, for which the event was the date of procedure. Results from the study found associations between sweet-ease orders and procedure type ($p<0.001$), family presence ($p=0.02$), age group ($p=1.09$), gender ($p=.791$), and illness/admission diagnosis ($p=0.509$).

(4 points each)

Based on these results presented, are any of the findings statistically significant and provide a rationale for your answer?

Based on the data collected, what type of analysis was conducted? (i.e., t-test, chi-square, Spearman's Rho, or ANOVA)

Based on the scenario presented, what type of research design is described?

Based on the variables presented, are they measured on a continuous or categorical scale?

Based on the scenario presented, was parametric or non-parametric analysis conducted and provide a rationale for your answer?

Question #9: A recent randomized controlled trial (RCT) tested the effectiveness of scented pacifiers in reducing minutes-per-day of crying or non-consoling in a group of infants with Hypoxic Ischemic Encephalopathy (HIE). The results of this study indicated the scented pacifiers were found to be statistically non-significant in reducing minutes-per-day of crying or non-consoling. However, the authors of the study reported infant-parental bonding was found to be clinically significant. Based on this example, provide an explanation of what it means for findings in a study to be statistically non-significant yet clinically significant. (You may provide another example to explain the difference between statistical significance and clinical significance). (4 points)

Question #10: Which study design is best for a study about diagnosis? (4 points)

Question #11: Which study design is best for a study about prognosis? (4 points)
Appendix E

Email Permission to Adapt Original Fresno Test

From: Susan Tracz [susant@csufresno.edu]
Sent: Friday, September 21, 2012 8:53 PM
To: [redacted]
Cc: [redacted]
Subject: Re: inquiry about Dr. Ramos and the Fresno Test

Dear Laura,

Thank you for your interest in the Fresno Test of Evidence-Based Medicine. You can have permission to use this instrument. Sorry I didn't get to you earlier, but I was out of the country for a good part of the summer.

Best of luck to you and your student on your research!!!

Susan M. Tracz, Ph.D.
Coordinator of Research, DPELFS
Graduate Programs Coordinator
Kremen School of Education and Human Development
California State University Fresno
5005 N. Maple Ave./MS 303
Fresno, CA 93740-8025
(559) 278-0347
(559) 278-0379 FAX
Appendix F

Data Completion and Intervention Monitoring Form

<table>
<thead>
<tr>
<th>PARTICIPANT CODE</th>
<th>DEMO</th>
<th>Pre-LRPR</th>
<th>LRPR Modules</th>
<th>Non-LRPR Modules</th>
<th>Post-LRPR</th>
<th>USNIR</th>
<th>Acceptability</th>
<th>Feasibility Score</th>
</tr>
</thead>
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</tbody>
</table>
Appendix G

Ready to Test Survey

Participant Code:

Please indicate the best time you would be able to take the Adapted Fresno Test for Pediatric Nurses below:

Within the next 24 hours:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Within the next 2-4 days:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Within the next week:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Other:

Based on your preference, the test will be available for taking within the CourseSites learning environment when you click the session materials tab. Please call 678-997-1672 if the test is not available to you within the timeframe specified.

Thank you!
Appendix H

Ready to Interview Survey

Participant Code:

Please indicate below the best time you would be able to schedule an interview with the Principal Investigator, Natasha Laibhen-Parkes:

Within the next 24 hours:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Within the next 2-4 days:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Within the next week:

- (8am-12noon):
- (12noon-4pm):
- (4pm-8pm):

Other:

Based on your preference, Natasha Laibhen-Parkes will call you on the number you provided earlier in the study. Please call 678-997-1672 if you do not receive a call or would like to change your interview time.

Thank you!
Appendix I

Acceptability and Usability Survey

PARTICIPANT CODE:_________

There are two parts to this survey. In part A, please rank the following statements according to what you agree with. There are no right or wrong answers. Please specify the number corresponding to how you feel about a statement. In part B, please provide your feedback to the questions.

### A:

<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>If it were made available for me to review the module in paper format rather than reviewing it over the Internet, it would have improved my understanding of the content.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The Web-based module was optimal for learning.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The online learning environment, CourseSites by Blackboard, was easily accessible.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The online learning environment, CourseSites by Blackboard, was easy to navigate.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The instructions provided by the researcher were helpful.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The troubleshooting tips provided by the researcher were sufficient.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The amount of time suggested to complete the module was acceptable.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>The module is useful in promoting EBP in BSN-prepared pediatric nurses.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
<tr>
<td>I would recommend this module to nurses who want to learn about EBP.</td>
<td>1 2 3 4 5</td>
<td></td>
</tr>
</tbody>
</table>
1. How long did it take to complete the module?

2. Is there any content in the module you think should be deleted or added? And Why?

3. How many times did you have to access the module?

4. Is there any part of the module you wanted to or had to go back and review? And, if so, which part?

5. After reviewing the module in this study, do you believe you have the knowledge and skill sets in EBP to implement it in your practice? If so, how will you use what you’ve reviewed in the module to improve your practice?

6. If you had the opportunity, would you participate in similar Web-based studies?

7. Overall, on a scale from 1 to 10 (1=worst experience; 10=best experience), how would you rate your experience with the Web-based module? And Why?

Additional comments:
Appendix J

Follow-up Survey

Can you provide me with some feedback as to why you were not able to complete the study?

Checklist of reasons:
Too many questionnaires/surveys
Study too complex
Time commitment too much
Current work schedule did not permit
Network/technical problems
No longer interested
Other (add comment)

Can you comment on your experience with the study?

What are your suggestions on what could have been done so that you could have completed the study?
Appendix K

IRB Approval Letter

18-Sep-2013

Ms. Natasha Laibhen-Parkes
Georgia Baptist College of Nursing
Georgia Baptist College of Nursing
3001 Mercer University Dr.
Macon, GA 30341

IRB: Web-based Evidence Based Practice Educational Intervention to Improve EBP Competence Among BSN-Prepared Pediatric Bedside Nurses: A Mixed Methods Pilot Study (H1309222)

Dear Ms. Laibhen-Parkes:

Your application entitled: Web-based Evidence Based Practice Educational Intervention to Improve EBP Competence Among BSN-Prepared Pediatric Bedside Nurses: A Mixed Methods Pilot Study (H1309222) was reviewed by the Institutional Review Board for Human Subjects Research in accordance with Federal Regulations 21 CFR 56.110(b) and 45 CFR 46.110(b) (for expedited review) and was approved under Category 6, 7 per 63 FR 60364.

Your application was approved for one year of study on 18-Sep-2013. The protocol expires 18-Sep-2014. If the study continues beyond one year, it must be re-evaluated by the IRB Committee.

Item(s) Approved:

New Application

Please complete the survey for the IRB and the Office of Research Compliance. To access the survey, click on the following link: http://www.surveymonkey.com/s/K7XRBR

It has been a pleasure to work with you and much success with your project!! If you need any further assistance, please feel free to contact our office.

Mercer University IRB & Office of Research Compliance
Phone (478) 301-4101
Fax (478) 301-2329
ORC.Research@Mercer.Ed

Respectfully,

[Signature]

Ava Chambers Richardson, M.Ed., CIH, CIP
Associate Director of Human Research Protection Programs (HRPP)
Member
Institutional Review Board
Appendix L

Email Invitation for EBP Study

INVITATION TO PARTICIPATE IN A WEB-BASED EBP STUDY and BE COMPENSATED $75 FOR YOUR PRECIOUS TIME!!!

Dear Pediatric Nurse, please read below if you are:

- BSN-prepared
- have access to a computer that meets the basic requirements for retrieving modules online
- have basic computer literacy skills
- have access to the Internet
- work primarily at the Scottish Rite campus during the months of September-December 2013
- not participating in any formal EBP training program during the months of September-December 2013
- have not participated in earlier versions of the EBP Web-based modules trialed on the Egleston campus.

Step#1: You must read the attached Informed Consent AND click on the Informed Consent Survey link below if you would like to participate in this study.
Step#2: You must click on the Demographic Survey link and complete to participate in this study.

INFORMED CONSENT LINK
https://www.surveymonkey.com/s/9TV8NCF

DEMOGRAPHIC SURVEY LINK
https://www.surveymonkey.com/s/SS9R9ZK

Thank you,
Natasha Laibhen-Parkes
Student Investigator/Principal Investigator and Researcher
Appendix M
Study Announcement Flier

EVIDENCE-BASED PRACTICE STUDY ANNOUNCEMENT WITH PEDIATRIC BEDSIDE NURSES!!!
You will learn a lot and receive $75.00 upon completing the study.

Natasha Laibhen-Parkes, a PhD student in Nursing Education at Georgia Baptist College of Nursing (GBCN) of Mercer University, is recruiting nurses for a research study about how nurses can become more competent in EBP. Nurses must meet the following criteria to participate:

- BSN-prepared bedside nurses
- Have access to a computer that meets the basic requirements for retrieving modules
- Have basic computer literacy skills
- Have access to the Internet
- Work primarily at the Scottish Rite campus during the months of September-December 2013
- Not participating in any formal EBP training program during the months of September-December 2013
- Have not participated in earlier versions of the EBP Web-based modules trialed on the Egleston campus

Nurses in this study will be required to:

1. review a 2-hour Web-based educational module
2. take an evidence-based practice competence test online, and
3. complete two 5-10 minute surveys pre- and/or post-intervention online and one survey via phone interview.

If interested, please contact Natasha Laibhen-Parkes at Natasha.laibhen-parkes@live.mercer.edu or respond to the email invitation about this study. This study has been approved by GBCN of Mercer University in Atlanta, GA.
Appendix N

Careforce Study Announcement

Scottish Rite Nurses Needed for Web-based Evidence-based Practice Study

A new study will test the feasibility of a web-based evidence-based practice (EBP) educational intervention on improving EBP competence among BSN-prepared pediatric nurses.

Natasha Latihen-Parkes, General Pediatric Nurse Leader at Egleston and the principle investigator in the study, is looking for Scottish Rite nurses to participate. Nurses will be asked to:

• Review a two-hour, web-based educational module
• Take an EBP competence test online
• Complete two, 5-10-minute, online surveys before and/or after the intervention, as well as participate in one phone survey

Nurses who wish to participate will need to be BSN-prepared and have access to a computer with an Internet connection and the ability to retrieve online modules. Participants should work primarily at Scottish Rite during the months of September through December, and should not be participating in any formal EBP training program during those months. Nurses who have participated in earlier trial versions of the EBP web-based modules at Egleston are not eligible for the study.

Nurses who participate in this study will receive $75 for their time.

Contact Natasha Latihen-Parkes by Friday, Nov. 15, if you’re interested in the study.
Appendix O

Follow-Up Email Invitation

Dear participant,

Thank you for consenting to participate in the study entitled, *Web-based EBP Educational Intervention to Improve EBP Competence Among BSN-Prepared Pediatric Bedside Nurses: A Mixed Methods Pilot Study*. This email contains the following:

- Information on how to access *CourseSites by Blackboard*, the online learning environment that will be used throughout this study.
- Troubleshooting tips for accessing and navigating *CourseSites by Blackboard*.
- Information about your unique user ID (email address) and password setup.
- Information about your participant code that should be used throughout the study.
- Step-by-step guide for progressing through the study
- Information on how to claim your $75.00 monetary incentive at the end of the study.

**How to access CourseSites by Blackboard:**

This study requires you access *CourseSites by Blackboard* to view your assigned module and receive instructions for accessing the adapted Fresno test for Pediatric Nurses, EBPB scale, and Acceptability and Usability survey. To access *CourseSites by Blackboard*, you must be registered. An email invitation will be sent to you from “no-reply@coursesites.com” with the subject line “EBP STUDY: REGISTERING FOR COURSESITES BY BLACKBOARD!!” Please respond to this email and follow the directions.

**Troubleshooting tips for accessing and navigating CourseSites by Blackboard:**

*CourseSites by Blackboard* is a free hosted online course creation and facilitation service that allows educators to add Web-based components to their courses. For study purposes and only within *CourseSites*, the principal investigator will be referred to as your “educator” or “school” and your user status will be as “student.” In order to use *CourseSites by Blackboard*, you must have access to the World Wide Web and your computer must meet the basic requirements for retrieving content uploaded on *CourseSites*. 
In addition, because this is a free Web-site, it includes certain communications from Blackboard and other external parties, including service announcements, administrative meetings, product updates and blogs. These communications are NOT part of this study.

As such, when you login to CourseSites, you should click on the EBP Study link located under the “My Classes” heading on the top right. This will take you to the EBP Study’s announcement page. To the left of the announcement page, you must click on session materials tab to locate the Web-based module. All other materials related to this study will be located in the resources and links tab, with the exception of the adapted Fresno test for Pediatric Nurses which will also be located in the session materials tab. The resources and links tab is located directly under the session materials tab. When you click on the resources and links tab, some of the material that you click on to complete this study will open a new window to SurveyMonkey. Please complete the material as directed and remember to include your participant code where indicated on all forms.

If you have trouble logging in or accessing any materials, you can click on the help links AND contact the principal investigator, Natasha Laibhen-Parkes at Natasha.Laibhen-Parkes@live.mercer.edu or 678-997-1672.

Information about your unique user ID (email address) and password setup:
Your unique user ID is your email address linked to this email invitation and you will be prompted to setup your password when you register to CourseSites by Blackboard. Please do not forward this email as your unique user ID is linked to this email and may be inactivated when forwarding.

Information about your participant code:
Your participant code is: The participant code is unique to you and should be included on all forms throughout the study. The principal investigator will use this code to link all data collected specific to you.

Step-by-step guide for progressing through the study:
1. Register for CourseSites by Blackboard as instructed above.
2. Complete the EBPB scale located in the resources and links tab. This survey should be completed before reviewing the Web-based study module!
3. Review assigned Web-based study module located in the session materials tab of CourseSites. This is a 2-hour module that can be completed in multiple sittings. You should try to complete the module within 4 weeks. Once you access this module, the principal investigator will send email reminders out weekly to complete.
4. **After** reviewing the Web-based study module, click on the **ready to test link** located in the **resources and links tab** of **CourseSites**. This will notify the principal investigator that you are ready to take the EBP competence test. This link will be activated within 24 hours at which time you will be permitted to take the **adapted Fresno test for Pediatric Nurses**. This test will be located in the **session materials tab** of **CourseSites**. This test must be completed in one sitting and may take up to 1-hour to complete.

5. Complete the **EBPB scale** located in the **resources and links tab** of **CourseSites**. This survey takes approximately 10-minutes to complete. This is the same survey you completed at the beginning of the study.

6. Click on the **ready to interview link** located in the **resources and links tab** of **CourseSites**. This will notify the principal investigator that you are ready for your phone interview. During phone interview, the principal investigator will take approximately 10-minutes to ask you questions about the **acceptability and usability** of the study.

**Information on claiming your $75.00 monetary incentive:**

You will have two options for claiming up to $75 for your participation time.

**Option #1:** If you elect to complete only the first part of the study (i.e., demographic questionnaire, pre-and post-intervention **EBPB scale**, Web-based module, and adapted **Fresno test for pediatric nurses**), you will receive $20 for your time.

**Option #2:** In addition to the first part of the study, if you elect to complete the second part of the study (i.e., **Acceptability and Usability** survey via a phone interview with the researcher), you will receive the remaining $55 for your time.

During your phone interview with the researcher, specific information will be provided on how to collect your monetary incentive.

If you have any questions or concerns, please contact the principal investigator/researcher, Natasha Laibhen-Parkes at Natasha.laibhen-parkes@live.mercer.edu or 678-997-1672.
Appendix P

CourseSites by Blackboard Registration Email for Group A and B

Email Invitation

Hello,

I would like to invite you to participate as a Student in my course EBP Study Group A which I'll be teaching using CourseSites by Blackboard. I've provided a brief description below for more information.

Course Description:
As a participant in this group, you will be reviewing an EBP module (divided into four units) in a PowerPoint presentation format.

To confirm your participation, please register using the following link. Once you create an account, you will be enrolled automatically and can begin.

* Click to confirm and register

If you have any questions about the course, please contact me via email at natasha.lalbhen-parkes@live.mercer.edu. Please visit the CourseSites Help page to contact support with any technical issues.

For all future visits to the course, after registration, please use the link below.

* Click to visit course home page and login

I look forward to seeing you online soon!

Sincerely,

Nataasha Lalbhen-Parkes

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Email Invitation

Hello,

I would like to invite you to participate as a Student in my course EBP Study Group B which I'll be teaching using CourseSites by Blackboard. I've provided a brief description below for more information.

Course Description:
As a participant in this group, you will be reviewing a set of three (3) PowerPoint Modules on "Munchausen's Syndrome by Proxy: What every pediatric nurse should know."

To confirm your participation, please register using the following link. Once you create an account, you will be enrolled automatically and can begin.

* Click to confirm and register

If you have any questions about the course, please contact me via email at natasha.lalbhen-parkes@live.mercer.edu. Please visit the CourseSites Help page to contact support with any technical questions.

For all future visits to the course, after registration, please use the link below.

* Click to visit course home page and login

I look forward to seeing you online soon!

Sincerely,

Nataasha Lalbhen-Parkes