EDUCATIONAL INTERVENTION EFFECTS ON NURSES' PERCEIVED ABILITY TO IMPLEMENT EVIDENCE-BASED PRACTICE

by

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ABSTRACT

The purpose of this study was to examine the effects of an educational intervention on nurses' knowledge of, beliefs about, and attitudes toward EBP, and their perceived ability to implement EBP. Also, the study was focused on examining the correlation between nurses' knowledge of, beliefs about, and attitudes toward EBP and nurses' perceived ability to implement EBP. A pretest/posttest quasi-experimental randomized design was used. Nineteen nurses employed in a county hospital in California participated in the study. Data were collected via a web-based survey. The knowledge and attitude subscales of the Evidence Based Practice Questionnaire, the Evidence Based Practice Beliefs Scale, and the Evidence Based Practice Implementation Scale were used to measure nurses' knowledge of EBP, attitudes toward EBP, beliefs about EBP, and their perceived ability to implement EBP respectively. Data analysis included descriptive statistics, Wilcoxon's signed rank test, and Pearson's correlation coefficient test. Within subject data analysis indicated that the EBP educational intervention significantly improved nurses' beliefs about EBP, knowledge of EBP, and their perceived ability to implement EBP ($p < .05$). Pearson's r test analysis indicated that there is no relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP ($p > .05$). The study results could encourage nurse leaders to promote teaching EBP in clinical settings and remove barriers to the application of evidence into nursing practice. The study served as a foundation for future studies on an educational intervention to help nurses adopt EBP.

DEDICATION

I dedicate this work to the registered nurses participating in this study. Thank you for your time and honest responses involved in this dissertation study, which was developed to facilitate nurse leaders and researchers to promote evidence-based practice in nursing. The implications of the study to leaderships, health policy, and nursing provides insightful information to enculture evidence-based nursing practice in various aspects of healthcare organizations.

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Chapter 1

Introduction

Evidence-based practice (EBP) improves the overall quality of patient care by making health care more dependable, safe, accessible, and patient-centered. However, the gap in the time between when evidence is obtained from research studies and when the evidence gets implemented into practice often takes decades (Melnyk & Fineout-Overholt, 2015). Regulatory agencies such as the Joint Commission have begun focusing on narrowing the gap between evidence and practice to improve health care quality and safety (Titler, 2008). Transforming evidence into action requires knowledge, action, and the will to accelerate the process of applying research into practice. Melnyk, Fineout-Overholt, Stillwell, and Williamson (2010) defined EBP as a problem-solving approach to the delivery of optimal care to the patients. Evidence-based practice integrates the best research evidence available in the research literature and individual preferences and values with health care professionals' expertise. Nursing staff plays an integral role in achieving these goals. Nurses require strategies that galvanize, educate, and support them in understanding the process of EBP. Then, nurses will be able to identify clinical questions, explore and implement the evidence-based interventions to develop effective action and improve clinical outcomes. Nurses in a broad range of settings are expected increasingly to use EBP to develop plans care and effective nursing interventions to promote positive patient outcomes (Institute of Medicine [IOM], 2003, 2011).

In this dissertation study, a pretest/posttest randomized design was used to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement

EBP. Additionally, the correlation between nurses' knowledge of, beliefs about, and attitudes toward EBP and nurses' perception of their ability to implement EBP after implementation of the intervention was examined. The study was conducted in a county hospital in the San Francisco Bay Area in California. Data collection instruments included the Evidence Based Practice Questionnaire (EBPQ) (see Appendix A), the Evidence Based Practice Beliefs (EBPB) Scale (see Appendix B), and the Evidence Based Practice Implementation (EBPI) Scale (see Appendix C). Purposive sampling was used in recruiting nurses employed in the county hospital to participate in the study. Participation in the study was voluntary, and the participants were assigned to the experimental group or control group randomly.

Chapter 1 begins with the introduction, background, purposes, problem statement, and significance of the study. The discussion of these subjects leads to the logical development of the research questions from the history, goals, and the importance of the study. The research questions guide the design of the study and the methodology to address the identified research problems. The research questions lead to the development of hypotheses that predict the nature and direction of relationship between variables. Following a discussion of the theoretical framework for the study and the definitions of key terms, the chapter ends with a review of the assumptions, scope, limitation, and delimitations of the study.

Background

The Institute of Medicine (IOM, 2003, 2011) published a series of reports about quality improvement initiatives to meet the call for effective, safe, and efficient health care since 1999. These reports have promoted the movement for EBP consistently for

over a decade (IOM, 2003, 2011; Stevens, 2013). Evidence-based practice is a crucial approach to providing the best quality care to a patient, ensuring patient safety, and developing evidence-based policy making. Hewison (2008) suggested that health care policies should keep pace with the increasing rate of adoption of evidence-based medicine and evidence-based nursing care in shaping health care in the future. Evidence-based practice requires health professionals, regulators, and payers to work together and break down silos across different disciplines and systems (Talsma, Grady, Feetham, Heinrich, & Steinwachs, 2008). Evidence-based practice improves the quality of care, patient outcomes, nurse satisfaction, and patient satisfaction while reducing costs (Melnyk, Fineout-Overholt, Stillwell, & Williamson, 2010).

Robust evidence alone is insufficient for creating changes in practice. Meijers et al. (2006) suggested that providing education and time for nurses to engage in applied research activities can influence their attitudes toward EBP, and competency building in EBP implementation. However, nurses face numerous barriers to EBP. These barriers include lack of EBP knowledge and skills, negative beliefs about EBP, negative attitudes toward EBP, and perceived inability to implement EBP (Melnyk & Fineout-Overholt, 2015). Such obstacles must be overcome to promote EBP and sustain changes in health care practice.

Structured EBP educational interventions may improve nurses' knowledge and skills of EBP, their attitudes toward EBP, and their perceived ability to implement EBP (Hart et al., 2008; Mollon et al., 2012). Nurses must possess knowledge and skills of EBP to change their beliefs, attitude, and perceived ability to implement EBP. Hart et al. (2008) examined the effects of a computer-based education program on nurses'

knowledge about EBP, attitude toward EBP, and their perceived skill level of research utilization. There were significant improvements in self-reported perceptions of knowledge, attitudes, and skill level after the nurse participants finished the computer-based educational intervention. Opposite results were found in the other two studies. The results of the studies showed that the online EBP educational intervention did not improve nurses' practice, attitudes, knowledge, or skills regarding EBP (Mollon et al., 2012; Underhill, Roper, Siefest, Bouscher, & Berry, 2015). These three studies by Hart et al. (2008), Mollon et al. (2012), and Underhill et al. (2015) offered contradictory evidence about the efficacy of online educational interventions on nurses' perceived competency to implement EBP.

Evidence-based practice education programs may enhance research uptake in clinical practice and affect nurses' beliefs about and attitudes toward EBP (Melnyk, Fineout-Overholt, Giggleman, & Cruz, 2010; Scott & Pollock, 2008). Education is vital to the success of EBP implementation especially in acute care settings (Cummings, Estabrooks, Midodzi, Wallin, & Hayduk, 2007; Melnyk, Fineout-Overholt, & Mays, 2008). In a systematic review, Estabrooks, Floyd, Scott-Findlay, O'Leary, and Gushta (2003) indicated that nurses' beliefs and attitudes toward EBP were correlated with the use of evidence in practice. Likewise, Wallin, Bostrom, Wikblad, and Ewald (2003) demonstrated that nurses who received EBP training and continued working with quality improvement projects were more persistent in promoting evidence-based nursing.

An EBP educational program is one of the major facilitators to adopting EBP (Fineout-Overholt, Melnyk, & Schultz, 2005; Keele, 2011). An educational intervention is considered to be a facilitating method to provide nurses with knowledge about EBP

and skills to implement EBP. A tailored educational program can provide nurses with knowledge and skills of appraising evidence critically, as well as strategies to implement and evaluate evidence. Improving nurses' beliefs and attitudes toward EBP will enhance their perceived ability to implement EBP (Melnyk et al., 2004, Melnyk, Fineout-Overholt, Stillwell, et al., 2010). However, while educational training on EBP is an essential component in facilitating EBP, only a small number of studies to date have demonstrated that such an intervention has significant impacts on evidence-based nursing practice.

External driver and fragmented changes. State legislatures have demanded practice changes in health care delivery systems in the public sectors in response to the call for safety and superb quality in health care (Aarons, Hurburt, & Horwitz, 2011). The Centers for Medicare and Medicaid Services imposed the Delivery System Reform Incentive Payments (DSRIP) reimbursement system in California and other states (California Department of Health Care Services, 2015). The DSRIP was approved for five years ending in fiscal year 2015 (California Department of Health Care Services, 2015). The federal reimbursement system and health care transformation project was replaced with the Public Hospital Redesign and Incentives in Medi-Care (PRIME) in year 2016 (California Department of Health Care Services, 2017). The new reimbursement system became an important external driver for public hospitals implementing innovative practices using evidence-based and quality improvement methods. However, the EBP landscape is fragmented and changing rapidly (Shonkoff & Phillips, 2000). Implementation of EBP is a challenging and complex process (Aarons et al., 2011; Cummings et al., 2007). Many efforts to implement EBP programs that are designed to

improve the quality of health care services have struggled to reach critical milestones because of a variety of challenges embedded in the implementation process. Aarons et al. (2011) and Doran et al. (2012) recognized that the organizational context and staffing characteristics play significant roles in explaining variations in EBP implementation success.

The Promoting Action on Research Implementation in Health Services model (PARiHS) is used widely as a practical conceptual framework for steering the implementation of EBP (Perry et al., 2011; Rycroft-Malone & Bucknall, 2010). The PARiHS model provides a comprehensive view of the three core elements for successful implementation of research into practice. Evidence, context, and facilitation are the tenets of the PARiHS model that intricately affect the successful translation of knowledge into practice (Hopp, 2010; Stetler et al., 2011). Health care leaders may be able to establish a feasible strategic plan for change if they have a proper understanding of the relationship between these three essential elements of the PARiHS model (Bergstrom, Peterson, Namusoko, Waiswa, & Wallin, 2012).

Lack of knowledge and skills are the most often cited barriers impeding nurses to adopt EBP. Aarons et al. (2011) identified that nurses' knowledge of EBP, beliefs about, and attitudes toward EBP significantly affect the successful implementation of EBP in the public service sectors. Nurses' negative attitudes toward EBP and lack of knowledge of and skills to use EBP have been shown to be correlated significantly (Rycroft-Malone, 2004; Rycroft-Malone & Bucknall, 2010). The use of multiple strategies, including an educational intervention with administrative support, is considered to be a successful intervention (Balakas & Fineout-Overholt, 2015). In this study, an educational

intervention was designed to provide the knowledge and skills that nurses need to improve their perceived ability to implement EBP.

Inner organizational context and nurses' engagement. California's public hospital system consists of 21 government hospitals that provide health care services to 2.5 million patients every year and hospital care to approximately 3.5 million uninsured patients (Cohen, 2011). The state government has provided monetary incentives to the 21 public hospitals to reform their health care delivery systems and improve the quality of care. These financial incentives included an amount of $3.3 billion in matching federal funding within five years (California Department of Health Care Services, 2015). By March 2011, each of the public hospitals submitted 17 improvement projects to the Delivery System Reform Incentive Program (DSRIP). Following the completion of the DSRIP in year 2015, the Centers for Medicare and Medicaid Services introduced the PRIME funding program in year 2016 to continue the health care transformation in public hospitals (California Department of Health Care Services, 2017). Many of the projects are linked to EBP to improve the quality of patient care and efficiency of the health care delivery system.

The implementation of EBP is not a straightforward process. Applying evidence into practice needs strategies that address leadership, the readiness of the organizational culture, available resources, education, and facilitation. Meijer et al. (2006) identified six significant contextual factors that mediate between the health care organization and EBP implementation in nursing. These six contextual factors include the role of a nurse, access to resources, organizational culture and climate, multi-faceted support, time for staff to become involved in research activities, and provision of education to staff. The

PARiHS model includes these contextual factors in its core element of context that shape the cultures of private and public health care organizations.

Problem Statement

Nurses constitute the largest group of healthcare providers and play a key role in the delivery of high-quality care (Khammarnia, Mahsa, Amani, Rezaeian, & Setoodehzadeh, 2015; Stevens, 2013). Evidence-based practice provides nurses a problem-solving method to deliver effective, safe, and efficient health care and improves patient outcomes (IOM, 2011; Stevens, 2013). However, the application of empirical findings into practice by health care professionals, including nurses, has been inconsistent and slow, which may impede the quality of care inadvertently (Keele, 2011; Kim et al., 2013).

Common barriers to EBP for nurses are the lack of knowledge about EBP, lack of mentors and time, negative attitudes toward research, inadequate resources, and competing priorities (Fineout-Overholt et al., 2005; Majid et al., 2011). However, an effective EBP educational intervention has not been identified in the clinical settings (Black, Balnezves, & Garossio, 2015; Majid et al., 2011; Melnyk, Fineout-Overholt, Giggleman, & Cruz, 2010; Stokke, Olsen, Espehaug, & Nortwedt, 2014; Underhill et al., 2015). The lack of effective EBP educational interventions may delay the promotion of EBP in nursing. Nurses have limited knowledge and skills in EBP, which hinders their ability to implement EBP (Khammarnia, 2015; Majid et al., 2011). Nurses must have the adequate education and expertise to examine the efficacy of their practice.

Nurses who believe in the advantages of EBP are more likely to implement EBP than their colleagues who have negative thoughts about EBP (Melnyk et al., 2004;

Thorsteinsson, 2013). The nurses will develop positive beliefs and attitudes toward EBP after they learn about it and participate in EBP workshops (Stokke et al., 2014). The findings from a cross-sectional study conducted by Stokke et al. (2014) indicated that there was a positive association between nurses' beliefs about EBP and implementation of EBP. Having beliefs about the value of EBP is insufficient to apply evidence to practice. Effective EBP educational training and strategies are needed to improve nurses' knowledge and skills of EBP (Melnyk & Fineout-Overholt, 2008, 2015).

This study is designed to address these problems by examining the effects of an educational intervention on nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and nurses' perceived ability to implement EBP. Additionally, this study will address the query about the correlations between nurses' knowledge of, beliefs about, and attitudes toward EBP and their perception of their ability to implement EBP after implementation of the intervention. A quasi-experimental research method was used in the study, and the study was conducted in a county hospital in the San Francisco Bay Area, California. A pretest/posttest randomized design was used with two post-intervention measures for both the experimental group and the control group.

Purpose of the Study

The purpose of the study was to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, their beliefs about, and attitudes toward EBP, and their perceived ability to implement EBP. In addition, the study was focused on examining the correlations between nurses' knowledge of, beliefs about, and attitudes toward EBP and their perception of their ability to implement EBP after implementation of the intervention. Using the framework of the PARiHS model, the quasi-experimental

study was conducted at a county hospital in the San Francisco Bay Area. A pretest/posttest randomized design was used in the study. The knowledge subscale of the Evidence Based Practice Questionnaire (EBPQ) was used to measure nurses' knowledge of EBP. The attitude subscale of the EBPQ was used to measure nurses' attitudes toward EBP. The Evidence Based Practice Beliefs (EBPB) Scale and the Evidence Based Practice Implementation (EBPI) Scale were used to measure nurses' beliefs about EBP and their perceived ability to implement EBP respectively. Practicing nurses employed in a county hospital in the Bay Area, California were recruited for the study. Data were analyzed using descriptive statistics, Wilcoxon signed rank test and multiple correlation tests. Descriptive statistical tests were used to describe the demographic characteristics of the participants. The Wilcoxon signed rank test was used to determine if differences existed between the experimental group and the control group in nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. Multiple correlation tests were used to test the strength of correlations existed between nurses' knowledge of, beliefs about and attitudes toward, and their perceived ability to implement EBP after implementation of the intervention.

Significance of the Study

In a systematic review of the literature, Estabrooks et al. (2003) identified six factors that significantly impacted the implementation of EBP among nurses. The six factors include beliefs about and attitudes toward EBP, participation in EBP related activities, information seeking, professional attributes, education, and socio-economic factors. Providing EBP education was one of the common facilitating factors related to EBP implementation. Estabrooks et al. (2003) demonstrated that an educational program

had a positive association with nurses' attitudes and their perceptions of knowledge and skills in research utilization. A pretest/posttest design was used in this study, which meant that it did not produce the highest level of evidence as a randomized controlled trial would (Estabrooks et al., 2003). By design, a randomized controlled trial of an educational intervention can produce the strongest evidence to test for significant impacts on the improvement in nurses' skills and knowledge needed to implement EBP (Munroe et al., 2008; Sherriff et al., 2007).

Among other contextual and facilitating factors, education and training may enhance the implementation of EBP, and improve the involvement of staff nurses in decision-making about the changes in patient care plans (Pagoto et al., 2007; Reavy & Tavernier, 2008). Using an EBP conceptual framework may facilitate the implementation of evidence into practice (Rycroft-Malone & Bucknall, 2010). Evidence suggests that EBP can lead to improved quality of care, better clinical outcomes, increased nurse satisfaction, and reduced costs (Melnyk, Fineout-Overholt, Stillwell, et al., 2010). Although there is an increase in the EBP implementation studies, few studies have been conducted to examine the effects of an educational intervention on nurses' knowledge of and attitudes toward EBP (Black et al., 2015; Underhill et al., 2015). Several studies identified multiple barriers for nurses to EBP implementation, such as lack of mentors, negative attitudes toward EBP, insufficient resources, lack of time, and conflicting priorities at the point of care (Fineout-Overholt et al., 2005; Melnyk. Fineout-Overholt, Giggleman, et al., 2010). The social and political climates, as well as changes in the federal reimbursement funding program, compel public hospitals to strive for

performance improvement, quality care, and patient safety through the adoption of EBP (Cronenwett et al., 2009; Stevens, 2013).

Education enables nurses with knowledge and skills to implement EBP competently for two main reasons. Improving nurses' beliefs and attitudes toward EBP enhances nurses' perceived ability to implement EBP at the bedside. But more importantly, an EBP educational intervention may improve nurses' beliefs and attitudes toward EBP (Melnyk et al., 2004; Melnyk & Fineout-Overholt, 2008, 2015; Stokke et al., 2014). The findings of this dissertation study may contribute to improving patient care outcomes and advancing the discipline of nursing through potentially increasing nurses' engagement in applying evidence to practice. Furthermore, these results may foster the provision of continuous education on EBP to help nurses to adopt and use EBP in practice consistently and competently.

Nature of the Study

Facilitation and practice context are the key factors in the successful translation of knowledge into practice (Bergstrom et al., 2012). The factors that facilitate implementation of EBP are a presence of a structured EBP education program, protected time, supportive leadership, and easy access to the EBP literature. Lack of these facilitating factors serves as a barrier to implementation of EBP and sustainability in changing clinical practices (Wallin et al., 2003). Other common barriers for nurses are a lack of knowledge about EBP, a lack of EBP mentors, negative attitudes toward research, inadequate resources at the bedside, a lack of time, and competing priorities (Fineout-Overholt et al., 2005). Nurses must have adequate training to improve their knowledge and skills of EBP and to enhance EBP in their work settings.

The purpose of this quasi-experimental study was to examine the effects of an EBP educational intervention on nurses' knowledge of, EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP at the point of care in a county hospital in California. Another focus will be to investigate the correlations between nurses' knowledge of, beliefs about and attitudes toward EBP and their perceived ability to implement EBP after implementation of the intervention. The target population included the practicing registered nurses in the public hospitals. The accessible population included the registered nurses employed at a county hospital in the San Francisco Bay Area, California. The knowledge and attitude subscales of the EBPQ were used to measure nurses' knowledge of EBP and attitudes toward EBP. The EBPB Scale and the EBPI Scale were used to measure nurses' beliefs about EBP and their perceived ability to implement EBP respectively.

Overview of the Research Method

Quantitative studies use deductive reasoning to test a hypothesis through empirical research. Testing a hypothesis serves as a frame for selecting an appropriate research design and methodology (Krathwohl & Smith, 2005). The content of the hypotheses specifies the choice of participants, settings, independent and dependent variables, data collection procedures, and schedule. The design of a research study begins with the selection of a paradigm, one or more research questions, and a guiding purpose. A paradigm is a fundamental set of beliefs, values, and methods that guide researchers to take action, understand the world, and conduct a study based on the researcher's selected epistemological, ontological, and methodological premises (Denzin & Lincoln, 2007). A structured EBP education program is the intended intervention for

the study. Based on the original nature of the research questions, a quantitative quasi-experimental research method is appropriate to be used to investigate the effects of an educational intervention as a means of facilitating EBP implementation.

The Promoting Action on Research Implementation in Health Services (PARiHS) model is a theoretical framework for implementing evidence into practice (Stetler, Damschroder, Helfrich, & Hagedorn, 2011). The PARiHS model provides practitioners and researchers a conceptual map to contemplate the interactions of evidence, context, and facilitation in the process of applying evidence into practice and into formulating a research design. The three essential elements (evidence, context, and facilitation) interact with each other without predetermined directions. Kitson, Harvey, and McCormack (1998) developed the PARiHS model to explain the interrelationship of the elements that contribute to successful EBP implementation. Ullrich, Sahay, and Stetler (2014) conducted a qualitative study to explore the applicability of the PARiHS model to the EBP implementation research in nine Quality Enhancement Research Initiative (QUERI) Centers. The U.S. Department of Veterans Affairs established the QUERI programs to improve the quality of health care by EBP implementation. The PARiHS model was found to be intuitive and easy to use in the research projects at various levels related to EBP implementation (Ullrich, Sahay, & Stetler, 2014). The choice of this conceptual framework is based on the findings of this study to set a boundary around an area of investigation for this dissertation study.

Overview of the Research Design Appropriateness

The purpose of this study was to examine the effects of an EBP educational intervention on nurses' knowledge of, EBP, their beliefs about and attitudes toward EBP,

and their perceived ability to implement EBP. Another focus of the study was to examine the correlations between nurses' knowledge of, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP after implementation of the intervention. A quasi-experimental method was used for this dissertation study. In this quasi-experimental study, a pretest/posttest randomized research design was appropriate to examine the effects of the intervention by comparing results from the experimental group with the control group (Cooper & Schindler, 2014; Trochim, 2000). The findings of this study would provide empirical evidence and statistical quantification to assess the differences between the outcomes from the experimental group and the control group with the implementation of an intervention (Vogt, 2007; Spector, 1981). Participants were assigned to either an interventional group or a control group randomly. The sample was composed of nurses recruited from a county hospital in the San Francisco Bay Area, California. Biases were eliminated to a minimum by using a randomized assignment of the participants into an experimental group or a control group. Outcome measures for the experimental group and control group were collected before the educational intervention, immediately after, and four weeks after the intervention.

Studies have supported that educational interventions improve nurses' knowledge, beliefs, and attitudes toward EBP and enhance their perceived ability to implement EBP (Estabrooks et al., 2003; Sherriff et al., 2007). However, a few studies have established significant correlations between an EBP educational intervention and nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses' perceived ability to implement EBP (Black et al., 2015; Underhill et al., 2015). Increasing demands from the regulatory agencies and nursing professional associations for efficient, safe, and high-

quality healthcare constitute a need for the best evidence of effective educational interventions to train nurses to become competent in EBP (Cronenwett et al., 2009; Stevens, 2013).

Target Population, Accessible Population, and Sampling Method

The target population refers to a group of individuals to which the results of the study will be generalized. The accessible population is a subset of the target population, from which participants were drawn for the study (Hulley, Newman, & Cummings, 2007). For this study, the target population consisted of the registered nurses working in the public hospital settings in California. The accessible population was the registered nurses employed at a county hospital in the San Francisco Bay Area in California. The sampling approach was purposive, and the research participants were recruited from the accessible population without costly expenditure (Cozby & Bates, 2011; Spector, 1981). With the use of purposive sampling, the nurses employed at the local county hospital were invited to participate in the study. Then, participants were assigned to the experimental group or the control group at random. Randomization of the participants to either the experimental group or the control group would minimize the introduction of bias into the sample (Cosby & Bates, 2011; Polit, 2010; Spector, 1981).

Research Questions and Hypotheses

Research questions link research design, data measurement, and data analysis to meet the purposes of a study (Vogt, 2007). The purpose of this study was to investigate the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. Koehn and Lehman (2008) demonstrated positive correlations between nurses' knowledge and

skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP. To further support the existence of such relationships, this study was focused on examining correlations between nurses' knowledge of, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP after completion of the educational intervention. The following research questions and hypotheses, derived from the research problems for this dissertation study, were as follows:

RQ1: What are the effects of an EBP educational intervention on nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP?

HO1: There is no difference in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP before and after an EBP educational intervention.

HA1: There is an increase in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP after an EBP educational intervention.

RQ2: What is the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention?

HO2: There is no relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

HA2: There is a positive relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

Study Variables

The independent variable (IV) was the EBP educational intervention for the hypotheses related to Research Question 1. The IV was a nominal variable. The dependent variables (DV) included the nurses' knowledge of EBP, nurses' beliefs about and attitudes toward EBP, as well as their perceived ability to implement EBP. The DVs were measured at the ordinal level. Meanwhile, the independent variables were nurses' knowledge of EBP, beliefs about and attitudes toward EBP for the hypotheses related to Research Question 2. The dependent variable was nurses' perceived ability to implement EBP. In Research Question 2, the independent and dependent variables were measured at the interval level.

Conceptual Framework

A well-defined conceptual or theoretical framework provides a lens through which one views a research problem more acutely (Roberts, 2010). Using a theoretical framework as a guiding tool helps to limit the scope of a study and identify specific variables in data collection, data analysis, and data interpretation. Bordage (2009) described a conceptual framework as an analytical tool used to organize a broad set of ideas and concepts that help to frame a research question. According to Bordage (2009), a conceptual framework can be referred to as a lighthouse that illuminates certain parts of a problem or research question. A conceptual framework also can be compared to a magnifying glass that magnifies certain elements of the problem.

A conceptual framework helps to connect different aspects of inquiry. Omery (n.d.) stated that a theory-based research study provides clear links from the literature to the research goals, research questions, and research design. The choice of research design depends on the questions asked. A theory or conceptual framework provides reference points for discussion of the methodology and data analysis. The purpose of a conceptual framework is to define variables, explain the relationships between the variables, guide the interpretation of results, and challenge the existing theories (Bordage, 2009). Research increases or revises existing knowledge by discovering new facts. Knowledge is organized according to conceptual frameworks, theories, or models (Boersema, 2009). The model that was used for this study was the PARiHS Model.

The Promoting Action on Research Implementation in Health Services Model

A group of nursing researchers developed and published the PARiHS conceptual framework in the late 1990s. These researchers used the PARiHS Model to devise strategies to translate evidence into practice (Kitson, Ahmed, Harvey, Seers, & Thompson, 1996; Kitson et al., 1998). Kitson et al. (1998) used a case study design to investigate the interaction of the three core elements for successful implementation (SI) of knowledge translation. The three determining factors are evidence (E), context (C), and facilitation (F). The evidence is used to assess the strength and nature of the involved stakeholders. Context values the culture of the organization. Facilitation determines the implementation process. The appropriateness and comprehensiveness of the PARiHS model have been tested in several qualitative and quantitative studies (Helfrich, Li, Sharp, & Sales, 2009; Perry et al., 2011; Stetler et al., 2011). Some

diagnostic and evaluative instruments have been developed for assessing the three elements and their sub-elements in different countries (Stetler et al., 2011).

An educational intervention may improve nurses' knowledge, beliefs, and attitudes toward EBP to enhance their perceived ability to implement EBP (Estabrooks et al., 2003; Sherriff et al., 2007; Stokke et al., 2014). However, a few studies established significant correlations between an EBP educational intervention and nurses' knowledge of EBP, beliefs, and attitudes toward EBP (Black et al., 2015; Underhill et al., 2015). The increasing demands from the regulatory agencies for efficient, safe, and high-quality health care constitute a need for the best evidence of effective educational interventions to train nurses to become competent in EBP (Cronenwett et al., 2009; Stevens, 2013).

Evidence-based practice is an ongoing process that integrates appropriate scientific evidence, clinical expertise, and patient preferences in making decisions about the care of individual patients (Rubin, 2008). The Iowa Implementation Model of Evidence-based Practice (Doody & Doody, 2011), the ACE Star Model of Knowledge Transformation (Stevens, 2004), and other EBP models are useful for guiding evidence-based nursing care and educational programs (Titler, 2008). The goals of EBP are to assure the highest quality of care and to leverage evidence to promote best outcomes or optimal care at lower costs. Based on the current and relevant evidence, the quality improvement initiatives aim to improve patient safety, comfort, and satisfaction.

Unlike other EBP models, the PARiHS model identifies evidence, context, and facilitation as the three core elements of the application of evidence into practice. Sharp, Pineros, Hsu, Starks, and Sales (2004) recognized that support from leadership and administration ensures a conducive environment to promote an organizational culture for

EBP. Facilitating conditions such as providing computer-based educational programs and having a computer dedicated to EBP are found to enhance EBP implementation (Hart et al., 2008). Sharp et al. (2004) used the PARiHS model in their study to identify barriers and facilitators to the implementation of an empirical intervention. Health care professionals participated in their qualitative study, which emphasized the understanding of an identification of barriers and facilitators to the intervention process. The understanding of the intervention process was crucial to the successful EBP implementation but often was overlooked. The PARiHS model is one of the theoretical models that can explore the real-world situations and highlight areas in which new strategies can be developed in planning for an intervention (Sharp et al., 2004). Additionally, PARiHS model researchers continue to revise and refine the model with clearer concepts and definitions of the tenets. Kitson et al. (2008) released refinements to the PARiHS model. Three years later, Stetler et al. (2011) published a revised framework and detailed guidelines for applying the concepts of evidence, context, and facilitation in research utilization studies.

The PARiHS framework provides a relatively comprehensive view of the best available evidence for changing practice for nurses and quality improvement healthcare leaders (Rycroft-Malone, 2004; Squires et al., 2013). The three most essential parts of the framework are evidence, context, and facilitation (Rycroft-Malone, 2004; Rycroft-Malone & Bucknall, 2010; Stetler et al., 2011). Rycroft-Malone (2004) described the three elements as having a dynamic and simultaneous relationship. The sub-elements of each core elements are positioned on a continuum from high to low. High evidence, high context, and high facilitation in conjunction are optimal attributes for the successful

implementation of EBP. High context means transformational leadership, role clarity, effective teamwork, efficient organizational structures, and democratic decision-making processes that enable facilitators to coach staff in change management. For example, two enabling approaches to teaching nursing staff are the innovative partnership between academic and clinical sites, and formation of a nursing journal club (Missal, Schafer, Halm, & Schaffer, 2010; Patel et al., 2011). These approaches belong to a high leadership profile in the PARiHS framework that enables successful and sustained changes.

The culture of an organization is crucial to the successful implementation of EBP initiatives. In other words, fostering or hindering EBP initiatives is based on the values and beliefs of the organization. Over the years, many strategies have been developed to assess the readiness of an organization for EBP initiatives. The PARiHS model is one of the widely used frameworks to evaluate organizational readiness (Helfrich et al., 2009). One essential component of the PARiHS framework is to assess the determinants of crucial implementation of key EBP initiatives.

The complexity of the implementation process of EBP stems from the nature of the healthcare system. The strength of evidence, the appropriateness of the intervention, practitioners' expertise, clients' attributes, and organizational context can help to facilitate or hinder the successful implementation of EBP. Different EBP models can supplement and enhance the capacity of health professionals and scientists (including nursing leaders, scholars, and practitioners) to successfully transform evidence to practice. Unlike other EBP models that provide a sequential and step-wise approach to translating evidence into practice (Keele, 2011), the PARiHS model is considered to

provide a comprehensive view to explain the complexity of the implementation process. The strength of evidence and the effects of the organizational context in which the changes take place and the mechanism by which the changes are facilitated are equally important (Sharp et al., 2004).

Definitions of Key Terms

Evidence-based practice (EBP). There are a variety of definitions of EBP. According to Fawcett and Garity (2009), EBP referred to the use of evidence to guide nursing practice. Evidence-based practice also referred to the critical use of theories about human's health-related experience to guide nursing actions in the nursing process. Keele (2011) preferred to distinct evidence-based nursing practice from the EBP in other disciplines. Melnyk and Fineout-Overholt (2011) defined evidence-based practice as a problem-solving approach to practice that involves the conscientious use of the best evidence with considerations of individual preferences and values along with health care professionals' expertise. Also, Melnyk and Fineout-Overholt (2015) refined EBP as the integration of evidence with clinicians' expertise, and patients' preferences to improve clinical outcomes and the quality and safety of care. Though the definitions are varied, most definitions involve the careful use of the best evidence, clinical expertise, and individual preferences to solve clinical practice problems and to improve the quality of care.

Nurses' knowledge of the evidence-based practice. Munroe et al. (2008) referred to nurses' knowledge of EBP as their degree of familiarity with the concept of EBP in nursing. Nurses must learn to develop the ability to access, summarize, and apply the best and the latest evidence from the literature to daily clinical practice.

Nurses' beliefs about the evidence-based practice. Melnyk et al. (2008) defined nurses' beliefs about EBP as nurses' affirmation of the idea that EBP improved patient outcomes when the best evidence was used. Nurses may increase confidence in using evidence in practice after having knowledge and skills in EBP. Nurses' beliefs about the benefits of EBP and their confidence in implementing evidence in practice determine their decision to make a change in behavior toward implementing EBP. To make a commitment to the change, nurses must think that the change will benefit the patients and the work environment. Melnyk et al. (2008) proposed that the nurses' beliefs can predict the successful implementation of EBP, but this had yet to be tested.

Nurses' attitudes toward evidence-based practice. Munroe et al. (2008) considered nurses' attitudes toward EBP to be a way of nurses' thinking or feeling about nursing practice decisions based on evidence. Likewise, attitudes toward EBP were referred to the health professional's valuation of the importance and usefulness of EBP to make sound clinical decisions (Tilson et al., 2011). Having a positive attitude toward EBP and seeing the value of EBP for patients has been reported to be associated with EBP implementation. Nurses who received EBP training might feel more competent in implementing EBP (Majid et al., 2011). Positive attitudes toward EBP may change nurses' knowledge and practice by attending continuing education training and workshops on EBP.

Implementation of evidence-based practice. Melnyk et al. (2008) defined the implementation of EBP as engagement in pertinent behaviors such as seeking and appraising empirical evidence and disseminating research findings or data with peers or patients. Nurses and health care providers collect and evaluate outcome data critically,

and then apply the results of research to change practice. Evidence-based practice is an ongoing process that allows nurses to explore new evidence and technology to solve clinical problems, resulting in improved clinical outcomes. The PARiHS model holds that successful implementation (SI) of EBP is a function of evidence (E), context (C), and facilitation (F). The evidence is defined as empirically best practice (Rycroft-Malone, 2004; Rycroft-Malone & Bucknall, 2010; Stetler et al., 2011). Context is defined as the circumstance or situation in which the EBP is implemented. Facilitation is defined as an act or a process in which a facilitator makes things easier for others (Kitson et al., 2008; Rycroft-Malone et al., 2002).

Assumptions

Several assumptions were taken for granted in the proceedings of this study. First, it was assumed that the purposive sample had similar demographic characteristics of the target population and, therefore, that the findings of this study would provide significant insight into the population of interest. In principle, results on the purposive sample could approximate the results, but less precise, that would have been obtained from a random sample (Cooper & Scheidler, 2014; Shadish, Cook, & Campbell, 2002). Selection criteria for the sample were defined well to represent the main characteristics of the target population that pertain to the research question (Shadish et al., 2002). The demographic data for this study included the age, gender, work unit, position, years of experience in nursing, and the highest degree in nursing. A quasi-experimental research method was adopted in this study. Adding randomization to this pretest/posttest design was expected to improve the internal and external validity of the study (Shadish et al., 2002; Spector, 1981; Trochim, 2000).

Second, the sample size in this study was assumed to be large enough to improve the external validity regarding people, context, and settings (Shadish et al., 2002; Spector, 1981; Vogt, 2007). The sample size was determined based on power, effect size, and alpha level using the version 3.1.9.2 of G-Power (2014) software. In a consideration of feasibility and financial costs, the number of participants was calculated based on the desired effect size and power of the study. The desired sample size was computed to be large enough to detect a reasonable effect size (.4) with a power of 80% or greater.

Third, the data collection was assumed to be accurate, and the participants were trusted to answer the questionnaires truthfully (Cosby & Bates, 2011). Participants would be more likely to respond to the survey honestly if they were anonymous (Vogt, 2007). Anonymity and confidentiality of the participants were preserved by concealing their identities with code numbers. Participants in the study had the right to withdraw from the study at any time without any ramifications if they should suspect a breach of confidentiality and privacy.

Scope

The scope of this study was confined to the inclusion criteria and the expected generalizability of findings. The expected results were limited to assessing the effects of an educational intervention on nurses' knowledge of EBP, beliefs about and attitudes toward EBP, along with nurses' perceived ability to implement EBP. The study included registered nurses who had various levels of the experiences, ranging from the beginner's level to highly proficient levels. In Research Question 1, the independent variable of this study was an EBP educational intervention; the dependent variables of the study were nurses' knowledge of, beliefs about, and attitudes toward EBP, and nurses' perceived

ability to implement EBP. In Research Question 2, the independent variables were nurses' knowledge of, beliefs about, and attitudes toward EBP; the dependent variable was the EBP educational intervention.

Limitations

Limitations are the shortcomings of the study beyond the researcher's control (Hulley et al., 2007). In this quasi-experimental study, purposive sampling was selected because of limited resources such as money, time, and workforce. With purposive sampling, all the individuals in the population would not have equal chances of being included in the sample. In this study, a sample was limited to the nurses employed at the county hospital in the San Francisco Bay Area, California, which would restrict the study to the hospitals that have similar organizational contexts. The limitation was the inability to know the extent to which the purposive sample may represent the larger population (Shadish et al., 2002; Trochim, 2000).

Delimitations

Randomized assignment of the participants to either the experimental group or the control group would minimize selection bias. Moreover, randomization would balance the experimental and control groups on confounding variables (Spector, 1981; Trochim, 2000). The pretest/posttest randomized research design was selected for examining the effects of interventions by detecting the statistical differences between the outcomes of the experimental and control groups (Keele, 2011; Trochim, 2000). Sample size with adequate effect size and power and randomized assignment in this pretest/posttest research design might improve the external validity of the study to the

population of the interest and the internal validity of the study (Shadish et al., 2002; Trochim, 2000; Vogt, 2007).

Summary

The purpose of the study was focused on examining the effects of a structured EBP educational intervention on nurses' knowledge of EBP, nurses' beliefs about EBP and attitudes toward EBP, and their perceived ability to implement EBP. Another focus was to examine the correlations between nurses' knowledge of, beliefs about, and attitudes toward EBP and their perceived ability to implement EBP after completion of the intervention. The relevant historical, social, and political perspectives of the background information had been presented as an introduction to the need for this study. Using a theoretical framework as a guiding tool helped to limit the scope of a study through a focus on specific variables and viewpoints that were considered in data collection, data analysis, and data interpretation (McKenna & Slevin, 2008).

The purpose of this study did not focus on the process of implementing an intervention in a clinical practice. Instead, it was a scientific inquiry to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP in a county hospital in Northern California. Based on the assessment of the pros and cons of using the PARiHS model, the PARiHS model was considered to be the best fit for this study.

A review of relevant literature, both historical and current, was discussed in Chapter 2. The discussion in Chapter 2 included critical analysis of contemporary publications related to EBP, educational interventions in EBP, nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perceived ability to

implement EBP. The core of Chapter 2 was the critical review of the peer-reviewed studies that are relevant to the establishment of effective EBP educational interventions. A gap in the literature might emerge and provide a research area of interest to formulate a research question for this study. The results of this study may be used to inform nurse leaders the strategies to provide nursing staff with opportunities for learning EBP in clinical settings. The nurse leaders may adopt the findings to promote an organizational culture of EBP. The research design and sampling used in this study will become practical methods to conduct a study in the nursing science and a real world.

Chapter 2

Literature Review

An extensive review of the literature related to EBP, the PARiHS model, nurses' beliefs about, and attitudes toward EBP, and the facilitators and barriers to implementing EBP will be covered in Chapter 2. A review of the literature was done to examine the existing evidence focusing on the effects of EBP in continuing education training for nurses. Furthermore, previous works and evidence from the published research will be discussed and analyzed to identify the knowledge gaps in the research on determining an effective educational intervention on EBP for nurses. This literature review also elucidated the literature that supported the research questions and the research strategies employed in this study. The following section begins with a summary of the process for conducting the literature review.

Methods for Conducting the Literature Review

The literature search for English-language articles involved research studies and scholarly articles about the effects of an EBP educational intervention on nurses' knowledge and attitudes toward EBP and their perceived ability to implement EBP. The search for pertinent information included peer-reviewed journals, books, and dissertations from the University of Phoenix Online Library. The references were obtained from the following online databases: EBSCO, MEDLINE, CINAHL Complete, ProQuest, Sage Journals, and PubMed. A search engine such as Google was used to find relevant websites, and Google Scholar was used to searching for relevant scholarly articles. The keywords for the search were the PARiHS model, evidence-based practice, research utilization, evidence-based practice education, and facilitators and barriers to EBP.

The publications reviewed also extended to research articles on theory, concepts, and challenges of EBP implementation in public health care systems, and EBP beliefs and attitudes scales. The sources of information were searched from the websites of the California Department of Health Services website and the Insure the Uninsured Project website. A total of 1,009 articles were identified. Each reference was reviewed and appraised based on the relevance to the research questions and for possible inclusion; a total of 145 papers were collected for further appraisal and critique. References to the collected articles were examined for additional items. Each citation was evaluated and screened based on its relevance to the research questions.

Inclusion criteria. Articles related to facilitators and barriers to implementation of EBP, the effects of an EBP educational intervention, and evidence-based nursing practice were included for review. Other key terms were nurses' knowledge and attitudes toward EBP, nurses' perceived ability to EBP implementation, and the PARiHS model or conceptual framework. The other inclusion criteria included that the articles were written in English, and indexed in the EBSCO, MEDLINE, CINAHL Complete, ProQuest, Sage Journals, or PubMed database. Peer-reviewed articles published between January 1, 2000, and December 31, 2016, were included in the literature review.

Exclusion criteria. Articles that were written in languages other than English or published before the year 2000 were excluded from the literature review. Articles published outside of peer-reviewed journals, such as organizational project papers and clinical guidelines, were excluded from the literature search. Commentary articles and abstracts were excluded from the review.

Historical Overview

Evidence-based practice has evolved conceptually over many decades since the 1970s. Cochrane, a British epidemiologist, criticized health care providers for deemphasizing the use of evidence from well-designed studies to optimize clinical decision-making in his book published in 1972 (Pugh, 2012). Sackett, Rosenberg, Gray, Haynes, and Richardson (1996) defined evidence-based medicine as the integration of evidence with clinical expertise, individual patient's health state, and personal preferences. The paradigm shift to EBP positions nurses and health care providers to make significant changes in the application of scientific evidence to health care decision-making. The Institute of Medicine (IOM) stressed five core competencies for health care professionals in a report published in 2003. The five competencies include patient-centered care, quality improvement, informatics, evidence-based practice, and work in an interdisciplinary team. Nurses should have the knowledge and skills of EBP, and a higher level of education to provide safe, quality, and patient-centered care in working with interprofessional teams (IOM, 2011).

Delay in applying evidence to practice can be due to many barriers to EBP implementation in nursing practice (Morris, Wooding, & Grant, 2011). A lack of organizational support and nurses' EBP knowledge is the common barrier to EBP implementation (Brown, Wickline, & Glaser, 2009; Kim et al., 2013; Retsas, 2000). Barriers to EBP implementation must be overcome to improve patient outcomes. Melnyk et al. (2004) explored the possible relationship between nurses' knowledge, beliefs, and skills of EBP and the levels of nurses' engagement in EBP implementation. Further rigorous nursing research is needed to describe better such relationships (Black et al.,

2015). Melnyk et al. (2004) showed that nurses who believe that EBP improves clinical outcomes reported being engaged in EBP initiatives. Melnyk et al. (2004) also indicated that nurses who had knowledge about EBP reported being involved in integrating evidence into practice. Further experimental studies are needed to examine whether an EBP educational intervention may enhance nurses' perceived ability to implement EBP in nursing practice or not (Melnyk et al., 2004)

The evidence-based practice movement escalated nursing practice to the application of the best available evidence to practice and advocated for the effectiveness of innovative strategies directed to improve the quality of care. Nursing science produces new knowledge and evidence with emphasizing on the betterment of humankind (Fawcett & Garity, 2009). Nurse researchers are expected to assure the protection of these human rights and ensure the appropriateness of the research protocol while facilitating the development of scientific knowledge in nursing. Nurse educators play the role of change agents to assist clinical staff and students learning the principles of EBP in clinical settings (Melnyk & Fineout-Overholt, 2015). The EBP process involves (a) formulating clinical questions, (b) orchestrating systematic searches for evidence, (c) analyzing evidence critically, and (d) appraising the evidence (Rubin, 2008). Nurses are expected to integrate EBP with clinician expertise and patients' values. Inevitably, multiple barriers to EBP exist in clinical settings and the gap between theory, research, and practice remains (Penz & Bassendowski, 2006).

Conceptual Framework

Rapp et al. (2010) used a naturalistic approach to identify barriers to EBP implementation in six community mental health centers in one Midwestern state. The

state sought to implement supported employment and integrated dual diagnosis treatment at multiple sites. Data from documents, observations, notes, and meeting minutes were collected and analyzed. In a multiple case study, Gerrish, McDonnell, Tod, Kirshbaum, and Guillaume (2012) identified factors that influenced advanced practice nurses' ability to promote EBP among frontline nurses. Twenty-three advanced practice nurses (APNs) from the hospital and primary care settings participated in the study. Mancini (2011) used critical discourse analysis within a participatory action research framework to offer insights into changes in practice in community mental health practices. Researchers and health care providers are encouraged to apply these results in forming a partnership to develop and utilize collaborative models to implement and sustain changes in practice.

The process of EBP implementation is a multifactorial process involving interprofessional collaboration across different disciplines at the organizational level. Rapp et al. (2010), Garrish et al. (2012), and Mancini (2011) emphasized the increasing need for the appropriate facilitation to improve the chances of successful implementation of evidence into clinical practice. The preparation of nurses and the interprofessional team is required regarding synthesizing evidence and the receptivity of the organizational context, such as the resources, culture, ethics, and leadership styles. Choosing a practical and conceptually robust framework is important for us to understand the complex and multifactorial process of knowledge translation into practice as well as to guide the development of research design.

The PARiHS model guiding the study. The design of a research study begins with the selection of a paradigm, a research question, and the purpose of the study. A paradigm is a core set of belief, values, and methods that researchers bring to research

that is based on the investigators' epistemological, ontological, and methodological premises (Denzin & Lincoln, 2007). The PARiHS model provides practitioners and researchers with a conceptual map to determine the interactions of evidence, context, and facilitation in the course of translating evidence into practice and in the formulation of a research design. The model is versatile enough to provide flexibility for researchers to conduct qualitative or quantitative studies to explain the complexity of the process of EBP implementation.

The choice of a conceptual framework is necessary to set a boundary around an area of investigation. The purpose of this dissertation study is to examine the effects of a structured EBP educational intervention on nurses' knowledge, beliefs, and attitudes toward EBP, and their perceived ability to translate evidence into practice. Also, this study is focused on examining the correlations between these variables after completion of the EBP educational intervention. The PARiHS model serves as a conceptual model to guide the development of the research design. The inquiry of seeking answers to the research questions leads to adopting a quasi-experimental study to examine the effects of the intervention and the correlations between the variables.

According to Rycroft-Malone and Bucknall (2010), successful implementation of EBP depends on evidence, context, and facilitation. Several studies have revealed that negative attitudes toward EBP are correlated with lack of knowledge about EBP and lack of skills needed for using EBP (Brown, Wickline, Ecoff, & Glaser, 2009; Linton & Prasun, 2013; Rycroft-Malone, 2004). These two factors are the most cited barriers impeding nurses' adoption of EBP. The use of several strategies, including an

educational intervention with administrative support, is considered as a successful strategy for nurses to adopt EBP in their clinical settings.

The PARiHS model provides a framework for the development of the study and evaluation of EBP teaching outcomes. Contextual elements, such as individual beliefs and attitudes, and organizational barriers, affect individuals' ability to master EBP skills (Tilson et al., 2011). The PARiHS model is found to be a well-established and widely-cited conceptual framework. The function of a theoretical model is to identify a set of variables and examine the relationships of these variables to the phenomenon of interest. It is hypothesized that successful implementation (SI) is a function (*f)* of evidence (E), context (C), and facilitation (F). Successful implementation of new evidence in practice is assumed to result from the thoughtful assessment of the interplay among the three essential and interacting elements (Kitson et al., 2008; Rycroft-Malone et al., 2013).

Three tenets of the PARiHS model. The evidence is defined as information relevant to a particular EBP. Evidence can be derived from research, published guidelines, clinical experience, patient experience, and local practice information (Stetler et al., 2011). Context is defined as the condition of the environment or setting in which the empirical evidence is implemented. Facilitation is described as a method or a mean by which one person makes things easier for others (Kitson et al., 2008; Rycroft-Malone et al., 2002; Rycroft-Malone et al., 2013). The PARiHS model embeds implicit and explicit theoretical propositions and attempts to explain the interrelationships of the essential elements and the complex facets of circumstances that permit action to be taken. The framework can be applied to the individual, team, unit, and organizational levels

(Stetler et al., 2011). Intended users can be nurses, physicians, educators, researchers, scholars, multidisciplinary professionals, and policymakers.

The epistemological notion of evidence is to gain knowledge of nature and scope of human knowledge. The axiological idea of evidence is to study value and goodness. The empirical concept of evidence is to acquire knowledge using observation and experiment. All three notions of evidence are fundamental to science (Boersema, 2009). Science can be advanced if evidence is shared, analyzed, and tested in the real world. In contemporary nursing, practice is driven by evidence-based practices, which focus on the use of rigorous and replicable research findings. Large panels of experts develop standards of care based on a well-thought-out a synthesis of the available evidence to create interventions (Keele, 2011). Standards of care are regarded as state of the art in evidence-based practice (Stevens, 2013). However, qualitative research produces evidence about personal lived experiences and interpretations of health and illness in a variety of social, cultural, spiritual, and historical contexts. The richness of discovery in qualitative findings can be a gold mine for clinical insights (Kearney, 2001).

Studies have shown that education and training enhance the uptake of EBP and improve the involvement of staff nurses in making EBP clinical changes (Keele, 2011; Pagoto et al., 2007; Reavy & Tavernier, 2008). Studies have indicated that using an EBP conceptual framework may facilitate the implementation of evidence into practice (Rycroft-Malone & Bucknall, 2010). A pretest/posttest randomized design was utilized in this study to determine changes in nurses' knowledge of EBP, beliefs about, and attitudes toward EBP, and perceptions of their ability to implement EBP before and after an EBP intervention. An invitation to participating in the study was sent to the nurses

employed in a county hospital in Northern California through different communications media. The participation in the study was on a voluntary basis.

The strength of evidence, appropriateness of the intervention, practitioners' expertise, clients' attributes, organizational culture, and context can facilitate or form barriers to implementation of EBP. Facilitation and practice context are the critical factors in the successful translation of knowledge into practice (Bergstrom et al., 2012). The factors that affect the facilitation include supportive leadership, supportive organizational culture, adequate EBP training, protected time, structured programs, and easy access to the EBP database. Lack of these facilitating factors will be barriers to implementation of EBP and sustainability in changing clinical practices (Wallin et al., 2003).

Evidence-based Practice

Sackett et al. (1996) stressed that evidence-based medicine is not confined to randomized trials and meta-analyses. The empirical evidence from the randomized trials and meta-analyses is considered as the gold standard to produce positive interventions and desired patient outcomes. Sackett et al. (1996) stated that evidence-based medicine is not "cookbook" medicine either. Taking an evidence-based practice approach allows clinicians to have various ways of managing similar patient health problems by incorporating patient preferences and values and clinician expertise into clinical judgment and decision-making. In other words, EBP is not a static and changeless process. Nursing practice continually evolves in the emergence of the best available evidence and the process of applying, testing and adapting the new evidence (Malloch & Porter-O'Grady, 2015).

Evidence. Best research evidence does not only include research data from randomized controlled trials and systematic reviews but other types of quantitative research and qualitative research as well (Titler, 2008). The evaluation of the strength of scientific evidence provides a guide for clinicians in determining research for applicability of concrete evidence to health care decision-making. There are various rating systems and hierarchies to assess the levels of evidence based on the methodological quality of the research design, validity, reliability, and applicability of patient care. Health care practitioners may seek the best available evidence as described by a hierarchy of evidence. When the highest level of evidence is unavailable for a particular clinical problem, the health care practitioners will descend the hierarchy to find the most relevant studies' results (Keele, 2011).

Melnyk and Fineout-Overholt (2011) developed a hierarchy of evidence for nurses to determine the strength of nursing intervention studies. The hierarchy of evidence is ranked on seven levels. The level one of evidence, which is the highest level of confidence, includes evidence from systematic review and meta-analysis of randomized controlled trials. The level two of evidence is the data from one or more randomized controlled trials. The level three of evidence includes data from controlled trials. The level four of evidence refers to empirical findings from case-control or cohort studies. The level five of evidence relates to a synthesis of evidence from a systematic review of descriptive or qualitative studies. The level six of evidence includes data gathered from a single descriptive or qualitative study. The level seven of evidence is the expert opinion.

Clinical expertise. In the expansion of EBP into the field of nursing, nurses increasingly use research evidence to make effective clinical decisions and enhance clinical performance. Clinical problems that are intervention-focused require the hierarchies of evidence to designate the clinical trials as the best valid source of evidence. The determination of strongest to weakest evidence with a focus on the effectiveness of interventions has dominated the discussion in the EBP movement (Stevens, 2013). Keele (2011) and Melnyk and Fineout-Overholt (2015) unequivocally acknowledged that EBP is the integration of the best available evidence with the tacit knowledge of the clinical experts and patient experiences into decision-making. Mantzoukas (2008) recommended that nurses use the hierarchies of evidence to appraise the research studies critically, but should not solely rely on the empirical evidence in making clinical decisions. Their clinical expertise and tacit knowledge of practice are equally necessary for clinical decision-making. Clinical experts are not only knowledgeable and experienced clinicians but also are capable of providing an insightful assessment of a patient's clinical conditions. They can make sound decisions after evaluating the best available evidence and patient preferences (Deng et al., 2015).

Patient preferences and values. The Institute for Healthcare Improvement (IHI, 2015) defined patient-centered care as providing care and engaging patients in the decision-making process concerning individual needs, preferences, and values. Patient preferences and values are one of the core elements of EBP. Studies conducted to address patient-centered care provide insight into the importance of an individual's preferences, autonomy, and needs of patient care. In a qualitative study, Hesselink et al. (2012) identified barriers to integrating patient preferences and values into EBP. The

barriers were categorized into four themes. First, time constraint and competing priorities interfered with patient and family education. Second, inconsistent discharge communication among health care providers varied from simple instruction to shared decision-making. Third, discharge planning was not individualized. Fourth, insufficient hospital beds and high hospital census hastened the release process.

Building organization culture on the integration of patient preferences and values into EBP is crucial to transforming patient care. In a literature review, Burman, Robinson, and Hart (2013) identified four essential elements for integrating patient preferences into EBP. First, nurse leaders need to redesign healthcare systems to improve the patient experience of care. Second, the use of the chronic care model, technology, and evidence aids improved communication between patients and clinicians to support well-informed decision-making. Third, building organization culture that empowers nurses to develop knowledge and skills to change clinical practice will help the integration of EBP. Fourth, providing EBP mentors and opportunities for nurses to learn EBP will increase beliefs and organizational readiness for EBP.

Nurses' Knowledge of Evidence-based Practice

Upton and Upton (2006) developed the Evidence Based Practice Questionnaire (EBPQ) to assess factors facilitating EBP adoption and implementation in nursing practice. The instrument consists of (a) a practice of EBP subscale, (b) attitude toward EBP subscale, and (c) knowledge and skills in EBP subscale. Between 2006 and 2012, the questionnaire was administered to a variety of healthcare professional groups across 27 studies. The instrument was translated into five different languages (Upton, Upton, & Scurlock-Evans, 2014). Nurses were involved in 70% of these studies. Upton et al.

(2014) showed that the psychometric properties of the original EBPQ written in English revealed strong internal reliability and consistency of the subscales. The EBPQ is a robust, quick, and easy instrument to use in nursing research to assess nurses' knowledge of EBP, attitudes toward EBP, and their practice of EBP.

Nurses' Beliefs about and Attitudes Toward Evidence-based Practice

Linton and Prasum (2013) conducted a descriptive survey of 286 practicing nurses to examine nurses' attitudes and knowledge of EBP and nurses' perceptions of organizational support of EBP. The majority of the respondents disclosed that they thought that they were incapable of appraising the level of evidence. Fifty-eight percent of the respondents indicated that they felt capable of implementing evidence-based nursing care (Koehn & Lehman, 2008). Nurses who had a bachelor's degree or higher degrees had significantly higher levels of knowledge of and positive attitudes toward EBP. The study suggested that if baccalaureate and graduate nursing programs were to include research and EBP in the curriculum, it would improve nurses' knowledge and attitudes toward EBP. The associate degree nursing programs do not include research classes in the curriculum. Continuing education on EBP and creating an environment to support EBP are essential for improving nurses' knowledge and competencies in applying evidence in practice.

Similar results were found in other countries including Iceland. Thorsteinsson (2013) conducted a national survey of registered nurses' (RNs) readiness for EBP using a translated EBP Beliefs Scale. A random sample of 540 RNs participated in the study. The response rate was 82%, and respondents reported that they would ask their peers for clinical advice rather than seek empirical evidence from reliable databases such as

Medline and CINAHL. Half of the respondents stated that they had received training in the use of these electronic peer-reviewed databases, but only one-third of the participants indicated that they used the databases confidently. The rest of the participants disclosed that they did not have adequate training in the search skills in navigating the databases and the skills to appraise the literature critically. Lack of literature search and analysis skills hindered nurses from applying evidence in practice. The results of the study demonstrated that positive beliefs of Iceland RNs about the value of EBP were associated positively with the use of evidence in practice.

Stokke et al. (2014) conducted a cross-sectional study to determine a positive correction between nurses' beliefs about EBP and nurses' perceived ability to implement EBP in a Norwegian hospital. Stokke et al. (2014) used the Norwegian translation of the EBP Beliefs Scale and the EBP Implementation Scales. The questionnaires were distributed to 356 nurses who worked in a specialty hospital specialized in cancer treatment. A total of 185 nurses returned the completed surveys. The results indicated that nurses' beliefs about EBP positively correlated with their perceived ability of EBP. Participants who involved actively in EBP related activities had higher scores on the EBP Beliefs Scale than those participants who did not. Participants who had learned about EBP through work or continuous education had higher scores on the EBP on the EBP Beliefs Scale than those participants who did not. Nurses who had EBP knowledge and were involved in EBP-related activities appeared to have strong beliefs about the positive value of EBP. Nurses who had EBP knowledge and were involved in EBP-related activities reported that they were confident in their ability to implement EBP.

Nurses' Perceived Ability to Implement Evidence-based Practice

Researchers have used surveys to describe nurses' perceptions and facilitators of and barriers to EBP. Koehm and Lehman (2008) conducted a descriptive, cross-sectional study and recruited nurses in a metropolitan hospital to examine nurses' perceptions, attitudes, knowledge, and skills related to EBP. These investigators sent out over 1,000 survey questionnaires to over 1,000 nurses. The Evidence Based Practice Questionnaire (EBPQ) and the Attitudes to Evidence Based Practice Questionnaire (AEBPQ) were used to measure nurses' perception, attitudes, knowledge, and skills related to EBP. A total of 422 RNs completed the survey and returned the responses. Koehm and Lehman (2008) indicated that RNs who had average scores related to practice and their attitudes toward EBP had lower scores on their knowledge and skills. Nurses with a bachelor's degree or higher had higher scores on the subscales of practice, attitudes, knowledge, and skills than RNs with an associate's degree or a nursing diploma.

Barriers to Evidence-based Practice

Koehn and Lehman (2008) investigated the factors affecting nurses' perceptions of their ability to implement EBP in a large medical center in the United States in 2006. The study was a descriptive, cross-sectional survey using validated self-report questionnaires. A total of 408 nurses returned their completed survey. The majority of the respondents (77.7%) were staff nurses; the minority of the respondents were unit managers, clinical advisors, clinical nurse specialists, educators, and administrators. Koehn and Lehman (2008) found that the two most often cited barriers to implementing EBP were a lack of time and knowledge. Their study described the importance of

implementing EBP educational interventions to increase the use of evidence in practice among nurses.

Estabrooks et al. (2003) conducted a meta-analysis of 20 studies to examine the individual determinants of applying research findings to practice among nurses. Six main categories of nurses' characteristics were found to influence the use of research in nursing. The six classes of the determining characteristics were (a) beliefs and attitudes toward research utilization, (b) nurses' active participation in quality improvement activities, (c) information seeking, (d) education, (e) professional attributes, and (f) other socio-economic factors. This systemic review offered a detailed analysis. Estabrooks et al. (2003) found that education was the most commonly studied factors influencing nurses' perceptions of their skills and knowledge in implementing EBP. The results of the meta-analysis supported that there was a positive association between nurses' beliefs and attitudes and increased research utilization in clinical practice.

McKenna, Ashton, and Keeney (2004) conducted a cross-sectional descriptive study to identify barriers to EBP among physicians and community nurses in primary care. Self-reported questionnaires were mailed to 356 physicians and 356 community nurses. The sample of community nurses included 85 practice nurses, 96 health visitors, 146 district nurses, and 29 treatment nurses. Among the 462 respondents who returned the completed survey, 78% were community nurses. Ten individuals stated that they were nurse practitioners, and one person claimed to be a research nurse. Among the respondents, 83% of the participants reported that they had not enrolled in a research course. The barriers to EBP were small computer space, inadequate equipment, poor patient compliance, difficulty in creating EBP culture and changing practice, the

uncertainty created by conflicting research findings, and lack of funding and time. Furthermore, McKenna et al. (2004) suggested that provision of education in EBP, research appraisal, and research utilization were the main components of creating EBP cultures in a healthcare organization. Other important factors were the improvement in organizational infrastructure and administrative and managerial support regarding financial and staffing resources.

Many factors impede the uptake and utilization of EBP by frontline nurses. Rapp et al. (2010) conducted a qualitative case study design to explore barriers to EBP implementation using an empirically employment and treatment program for mentally ill patients. The participants were patients, direct service workers, supervisors, and administrators in six community mental health centers. The barriers to EBP implementation include lack of expectations, especially from supervisors, and lack of active participation of frontline staff, supervisors, and other professionals. The supervisors, who preferred a laissez-faire leadership style, did not set up any EBP expectations (Rapp et al., 2010). Frontline practitioners were indifferent to an implementation of EBP under laissez-faire leadership or in a hostile working environment. Lack of training or education on EBP was found to be the primary barriers to the effective EBP implementation. Support from the upper-level administration might increase the use of EBP in clinical practice by providing adequate funding, resources, and continuous education and training of frontline staff (Malloch & Porter-O'Grady, 2015; Rapp et al., 2010).

Brown et al. (2009) identified barriers to research utilization and applying evidence to practice among nurses in hospitals. In this multi-institutional study, these

authors found that the obstacles included lack of time to implement EBP, lack of ability to interpret research findings and insufficient support from administrators. The provision of education and mentoring was shown to yield higher autonomy in nursing practice with increasing nurses' confidence in applying evidence to solving clinical problems.

Brown et al. (2009), Koehn and Lehman (2008), McKenna et al. (2004), and Rapp et al. (2010) discussed the barriers and facilitators to implementing EBP at the individual and institutional levels in detail. It is essential to understand the contexts in which obstacles occur and to identify the high-priority needs to facilitate tailored interventions to address barriers and enhance the facilitation of EBP. The next section summarizes selected studies on the facilitators of improving nurses' perceptions of knowledge of and skills in EBP.

Facilitators Improve Nurses' Perceptions of Knowledge and Skills

White-Williams et al. (2013) conducted a cross-sectional, descriptive study to examine nurses' knowledge of, attitudes toward, and use of EBP in a large academic, Magnet-designated hospital. A total of 593 nurses filled out the clinical effectiveness and EBP questionnaire from November 2011 to March 2012. Ninety-six percent of the nurses stated that they knew about EBP and the existence of the Research Council. The Research Council aimed to promote research utilization and EBP implementation. White-Williams et al. (2013) indicated that the nurses scored the highest on the attitudes subscales, followed by the knowledge, skills, and practice subscales. White-Williams et al. (2013) also showed that continuous nursing education on EBP, active participation in EBP, and research activities improve nurses' attitudes, knowledge and use of EBP in practice.

Sherriff et al. (2007) conducted a pretest/posttest quasi-experimental study to evaluate the effect of an EBP educational program on nurses' attitudes toward and perceptions of EBP knowledge and skills. The education program included a four-hour workshop and accompanying workbook developed by the Health Services Department in South East Queensland, Australia. The goal of the program was to introduce the basics of EBP and beginning skills in literature research and reviews. Fifty-seven registered nurses participated in the educational program. Forty-three nurses completed all three questionnaires that were administered immediately before the workshop, one week after the workshop, and three months after the workshop. The surveys were comprised of 38 items to measure nurses' perceptions of EBP knowledge and skills. The findings indicated that an educational program incorporating workshop and didactic session improved nurses' skills significantly in conducting literature searches and evaluating research reports. Sherriff et al. (2007) used descriptive statistics to describe sample characteristics and to measure the participants' attitudes toward EBP; they used a one-way analysis of variance (ANOVA) to assess the changes in attitudes toward EBP over time. They set the baseline before the workshop and evaluated the changes one week and three months after the workshop. The researchers concluded that education had a positive but not statistically significant effect on nurses' attitudes toward EBP and perceptions of EBP knowledge and skills.

Munroe et al. (2008) conducted a pretest/posttest study to assess the effects of implementation of organizational supports on nurses' knowledge, skills, and attitudes about EBP, and utilization of research. Nurse leaders provided organizational supports such as establishing a mentorship program and conducting three educational workshops.

Mentors guided the nurses to review policies based on EBP and publish monthly EBP tip sheets. The administrators provided the nurses time to display information about the EBP activities and outcome measures on bulletin boards. Additionally, the administration provided financial assistance for nurses attending EBP education and research activities. However, the response rate was low. Forty nurses, including 23 staff nurses and 17 nurse leaders, completed the questionnaire. Munroe et al. (2008) used descriptive and inferential statistics to compare the pretest and posttest responses of the three variables. The three variables were (a) knowledge about EBP, (b) skills regarding literature searches, and (c) attitudes about the use of EBP. The benefits of nurses' knowledge about, skills of, and attitudes toward EBP were not statistically significant. Likely, the lack of statistical significance was due to a small sample size. Despite the undesirable results, Munroe et al. (2008) suggested that organizational supports improved the overall knowledge, and the skills needed to implement EBP confidently.

Teaching Evidence-based Practice in Hospitals

Although nurses tend to believe in the value of EBP in improving patient outcomes, the practicing nurses may not have any opportunities to receive formal training in EBP knowledge and skills. A survey found that 56.7% of registered nurses in the United States obtained their primary nursing education in associate degree programs (U.S. Department of Health and Human Services, 2010). Associate degree nursing programs often do not incorporate structured programs on EBP into their curriculum. Though most of the baccalaureate and graduate nursing programs incorporate EBP into the curriculum, a lack of electronic databases and organizational support remain the barriers to EBP implementation in hospitals (Munroe et al., 2008). Practicing nurses at

the point of care are essential healthcare professionals to the implementation of EBP. It is inevitable for nurse leaders and administrators to provide educational opportunities for bedside nurses to acquire EBP knowledge and skills and create an organizational culture to sustain EBP. Keele (2011) recommended that the EBP educational programs contain the following key topics:

1. Introducing the principles of EBP.
2. Developing clinical questions in the patient population (P), intervention (I), comparison (C), outcome (O), and time (T) format.
3. Searching for the best evidence.
4. Synthesizing the evidence critically.
5. Integrating the evidence with clinical expertise and patient preferences and values.
6. Evaluating the outcomes and sustaining the practice changes.
7. Disseminating EBP results.

Balakas and Fineout-Overholt (2015) discussed several educational strategies in teaching EBP in acute care settings. One of the strategies was to build a team of EBP educators and mentors so that they may play a crucial role in enabling bedside nurses to succeed in translating knowledge and evidence into practice. Abdullah et al. (2014) conducted a systematic review to evaluate the effectiveness of mentoring related to the increasing use of evidence in clinical practice among healthcare professionals. Out of 10,669 peer-reviewed articles published from 1998 to 2012, ten eligible studies were selected for evaluating the effectiveness of mentoring related to the healthcare professionals' knowledge about EBP, beliefs of EBP, and organizational outcomes such

as turnover rate. The 10 selected studies included six clustered randomized controlled trials, one controlled trial, one controlled before and after the test, and two pretest/posttest studies. The results of the systematic review demonstrated inconsistent findings on patients' outcomes, healthcare professionals' knowledge about EBP, beliefs of EBP, mentees' job satisfaction, and attribution rate, although no adverse impacts were found. Abdullah et al. (2014) discovered that the mentors and mentee who met regularly in-person or online, either individually or in group meetings improved mentees' outcomes such as their EBP knowledge and skills. The mixed findings of the systemic review were due to some limitations of the study. These limitations were (a) broad eligibility criteria, (b) inconsistent description of the act of mentoring, (c) restriction to English articles, and (d) using different sampling methods that included multiple disciplinary professionals.

A hospital in Canada established a research training program to provide research mentors to bedside nurses who volunteered to participate in small-scale studies related to EBP activities (Black, Balnezves, & Garossio, 2015). The studies were funded by a local foundation to develop three workshops that provided fundamental knowledge of research methods, ethics, literature critique techniques, and EBP knowledge and skills. The mentors and mentees had to design their studies related to EBP activities in three months and then conducted their studies within one year. A total of 27 teams and 153 healthcare professionals including 78 registered nurses were selected to enroll in the training program. Black et al. (2015) used the Knowledge, Attitudes, and Practice (KAP) survey to evaluate the impacts of the training and mentoring program on the health professionals' knowledge, attitudes, and practice related to EBP. Van Mullen et al. (1999) developed the KAP survey to predict nurses' knowledge, attitudes, and practices

of research activities. Surveys were administered at the beginning of the training program, three months after the completion of the program and at the time of completion of their similar studies. The authors indicated that the research training program in conjunction with the support of mentorship significantly improved health professionals' research and EBP knowledge and abilities.

Journal clubs have been used in clinical settings to foster skills development such as literature search and critical appraisal of research among nurses (Lachance, 2014; Patel et al., 2011). Journal clubs have been a teaching strategy commonly used by physicians in residency training for decades. Nurses and other healthcare professionals have been adopting journal clubs slowly to bridge the gap between research and clinical practice (Lachance, 2014). A group of nurses with interest in using research efficiently to impact patient care for the betterment of health usually gather together regularly to form a journal club. The collective group systematically searches the literature, critically appraises studies, and translates the research findings into the clinical practice. Lachance (2014) analyzed 20 peer-reviewed articles related to journal clubs, evidence-based practice, continuing education, and EBP skill development. The literature review revealed many benefits to nursing journal clubs. For example, journal clubs provide an open forum for nurses to keep abreast with the recent literature and use empirical evidence to transform nursing care. Journal clubs facilitate nurses to develop knowledge and skills in EBP to improve critical appraisal skills and research comprehension for knowledge translation into practice (Lachance, 2014). Barriers to successful journal clubs are a lack of interest and absenteeism. Facilitators with excellent social skills,

clinical competence, and adequate research and EBP knowledge play a pivotal role in improving the journal club process (Lachance, 2014).

A partnership with academic institutions may be a feasible strategy to promote teaching EBP and facilitate research project implementation in hospitals (Balakas & Fineout-Overholt, 2015; Patel et al., 2011). According to Patel et al. (2011), a hospital that values EBP may partner with a nursing school and invites faculty to join the nursing journal club and hospital research council. The faculty collaborates with the hospital-based nurse educators to facilitate discussion in the journal clubs, the EBP process and oversee the research projects. After a critical appraisal of the literature, nurses incorporate their clinical expertise and patient preferences and values with the new research findings in determining the best patient outcomes and the best nursing practice. Such academic liaisons coach bedside nurses and nurse educators from practice change and education to completion of research or quality improvement projects.

Research Methods Used in Previous Studies

Few studies have examined the effects of an EBP educational intervention on nurses' knowledge and skills, beliefs about and attitudes toward EBP, and nurses' perceived ability to implement EBP (Hart et al., 2008; Mollon et al., 2012). However, the results of these studies were contradictory to each other. Hart et al. (2008) used a descriptive, pretest/posttest research design to evaluate the effectiveness and cost-efficiency of a computer-based education. Hart et al. (2008) recruited a convenience sample of 744 nurses working in an integrated healthcare system located in a southeastern state in the United States. The participants were registered nurses and licensed practical nurses. The computer-based education program consisted of three

modules on principles of EBP and research utilization. The participants spent 15 to 20 minutes to complete each module. Each module was posted to the intranet education site one month apart to allow ample time for completion. The participants completed a survey immediately before the educational intervention and two weeks after completing the three modules. These nurses significantly increased their perceptions of knowledge, attitudes, and skills of EBP implementation after completion of the computer-based education intervention.

On the contrary, Mollon et al. (2012) found different results in their study. These researchers used a descriptive, pretest/posttest design study to evaluate the effectiveness of an online educational intervention on clinical staff's practice, attitudes, knowledge, and skills regarding EBP. The clinical staff participating in the study included registered nurses, licensed vocational nurses, case managers, social workers, and other healthcare professionals. The online learning module contained an overview of EBP, steps of EBP, and examples of EBP projects; the module was posted on the intranet education site for two months. Participants completed the survey before and after completion of the online educational intervention. A total of 609 clinical staff completed the questionnaire. Mollon et al. (2012) indicated that there was no statistically significant improvement in the clinical staff's perceptions of practice, attitudes, knowledge, and skills after the online education on EBP.

Gap in the Research Literature

There is a lack of randomized studies focused on investigating causal effects of an educational intervention on nurses' knowledge, beliefs, and attitudes toward, and implementation of EBP (Black et al., 2015). Parrish and Rubin (2011) assessed the

effectiveness of a seven-hour EBP workshop related to social workers' self-efficacy, knowledge of EBP, their attitudes toward EBP, and their beliefs about the feasibility of EBP in social work. A pretest/posttest design was used to assess the outcomes of the study. Four workshops were provided at four different times and dates in four major cities in Texas. The seminar contents contained an overview of EBP process, instruction and practice of the five steps of EBP and a discussion on the feasibility of EBP in social work. The five steps of EBP included (a) asking a clinical question, (b) searching for the evidence, (c) appraising the evidence critically, (d) integrating the evidence into practice, and (e) evaluating the practice based on the evidence. A total of 69 participants attended the workshops and completed the pre-test survey and post-test surveys immediately after the training and three months after. Statistical analysis revealed that the continuing education about the EBP process significantly improved the participants' familiarity with, attitudes toward, perceived practicability of EBP, and their motives to engage in EBP.

A paradigm shifted has occurred from adopting the traditional practice of following physicians' orders to using evidence to guide practice in patient care (Dizon, Grimmer-Somers, & Kumar, 2011, 2014). Dizon et al. (2014) conducted a double-blind, randomized controlled study to assess the effectiveness of the EBP training intervention for the physiotherapists in their knowledge of, attitudes toward, and skills and behaviors related to EBP. The training program was a one-day program including the didactic and practice sessions. Contents covered the introduction of EBP process and the five steps of EBP process. The participants had access to an EBP online support and an EBP Checklist to assist them in applying evidence to practice. The study recruited 54 physical therapists with 27 participants allocated to the experimental group and 27 participants

assigned to the control group. The participants completed the questionnaire before the training. Fifty-two participants completed the survey after the training, and 26 participants completed the questionnaire three months after the training. Compared to the control group, the participants in the experimental group significantly improved their knowledge, skills, and attitudes toward EBP, as well as their behaviors immediately after and three months after completion of the EBP training.

Effective EBP continuing education is immensely in need for improving nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and their perceived abilities to implement EBP (Dizon et al., 2014; Hart et al., 2008; Mollon et al., 2012; Parrish & Rubin, 2011). Educating the frontline nurses helps them to shift their paradigm to adopt evidence in their practice to improve safety, quality care, and outcomes of the patients. Stillwell (2010) emphasized that practicing nurses, including the new graduates, required continuing education on EBP so that they may become knowledgeable and competent in the skills of using EBP in nursing. Online EBP education has provided inconsistent results in improving nurses' knowledge, attitudes, and perceived abilities in the studies by Hart et al. (2008) and Mollon et al. (2012). Conversely, Parrish and Rubin (2011) and Dizon et al. (2014) found different results in their studies. The findings of the studies demonstrated that the classroom training was more effective than web-based training in improving health professional's knowledge of EBP, attitudes toward EBP, and their ability to implement EBP (Dizon et al., 2014; Parrish & Rubin, 2011).

Educational interventions improve nurses' knowledge, beliefs, and attitudes toward EBP resulting in enhancing their perceived ability to implement EBP (Estabrooks et al., 2003; Sherriff et al., 2007). However, further rigorous studies are needed to

examine the effects of an EBP educational intervention on nurses' knowledge and skills of EBP, or their beliefs about and attitudes toward EBP (Black et al., 2015). Regulatory agencies and nursing professional associations advocate EBP (Cronenwett et al., 2009; Stevens, 2013). These regulatory requirements constitute a need for the best evidence of effective educational interventions to equip nurses with knowledge and skills to become EBP competent. Evidence-based practice is the highest standard of nursing practice and nursing education; it is comprised of at least three overlapping factors. First, the best available scientific evidence is based on findings of well-conducted studies. Second, interventions are based on the opinion of expert nurses. Third, patient preferences are based on patient's culture and the situational circumstances (Rubin, 2008). Nurses must accept that EBP is an ongoing process and lifelong learning process. Nurses must adapt their interventions to different patient preferences and clinical situations while using the best practices based on the findings of recent, rigorously conducted studies.

Conclusion

The essential step in implementing any strategy to teaching EBP in hospitals is to obtain the support from leadership and administration. Nursing leaders and management must take the responsibility to create visions and goals of establishing an organizational structure to promote EBP and address EBP barriers (Keele, 2011; Rubin, 2008). Evidence-based practice education and skills-building should be the high priority to target clinicians at various levels of practice (Schmidt & Brown, 2009). Educational programs on the principles of EBP and the potential improvement of patient care are needed for bedside staff to deliver care based on evidence (Keele, 2011). Active

participation in the journal clubs often depends on some knowledge of the research appraisal process and the EBP process (Lachance, 2014).

The contents of EBP education should include a comprehensive overview of EBP, the steps of EBP process, innovation and change theories, and application of evidence in practice via quality improvement projects or research (Black et al., 2015). An EBP educational program can be delivered in a combination of didactic classes, workshops, or web-based learning formats. Evidence-based practice is a learned skill that practicing nurses can acquire through education, journal clubs, mentoring, and active engagement in EBP projects (Balakas & Fineout-Overholt, 2015; Patel et al. 2011). Nursing knowledge is gained through nursing research that guides nursing practice with an integration of intuition, clinical judgment, and experiences. However, evidence from rigorous nursing studies such as randomized controlled trials is lacking. The effects of an online or face-to-face EBP interventions on nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP are undetermined (Black et al., 2015). Based on the gap in the research, the need for additional studies on this topic is warranted. Practicing nurses require evidence-based continuing education to augment their skills to seek evidence from research and improve their ability to appraise literature and develop EBP skills. Nurses need EBP knowledge and skills to bridge the gap between research and practice.

Summary

A description of the key terms and the mixed evidence is discussed in detail in this chapter. The discussion includes the effects of online and face-to-face educational programs and organizational support on the nurses' perceptions of knowledge and skills

regarding EBP. Evidence-based practice is an ongoing process that integrates relevant research evidence, clinical expertise, and patient values into decision-making about the care of individual patients (Rubin, 2008). The goals of EBP are to assure the highest quality of care and use evidence to promote the best outcomes for optimal care at lower costs. In this literature review, the existing studies were summarized, and the application of the studies to the research questions was evaluated. Also, other strategies that were useful in teaching EBP in hospitals were discussed in Chapter 2. The findings of this literature review indicate the needs for an EBP educational intervention to assist nurses in EBP uptake. Significant evidence may evolve from the results of this study to narrow the knowledge gap in this area.

Educational interventions may improve nurses' knowledge of, beliefs about, and attitudes toward EBP that enhance their perceived ability to implement EBP (Estabrooks et al., 2003; Sherriff et al., 2007). Minimal research has been focused on the effects of an EBP educational intervention on nurses' knowledge of EBP, attitudes toward EBP, beliefs about EBP, and their perceived ability to implement EBP, or correlations between these variables (Black et al., 2015). Stokke et al. (2014), and Koehn and Lehman (2008) revealed a significant positive correlation between nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP. The nature of this correlation was furthered investigated in this study.

The details of the research methodology used in this dissertation study will be discussed in Chapter 3. A pretest/posttest randomized research design was used to examine the effects of an EBP educational intervention on nurses' knowledge of, beliefs about, and attitudes toward EBP, and their perceived ability to implement EBP in a

county hospital. The discussion in Chapter 3 will include the population of interest, a sampling method, reliability, and validity of the survey tools, informed consent, confidentiality, data collection, and data analysis. The findings of the study may be utilized to support further studies on an EBP educational intervention to help nurses adopt EBP in practice. The results of this study may encourage nurse leaders to promote teaching EBP in acute care settings. Teaching EBP may lead to improving patient care outcomes and nurses' professional growth through active engagement in the application of evidence to practice (Keele, 2011).

Chapter 3

Research Methodology

Evidence-based practice is a problem-solving process by which nurses integrate empirical evidence and clinical data with their expertise and patient preferences to deliver quality care (Melnyk, Fineout-Overholt, Stillwell, et al., 2010; Rycroft-Malone et al., 2013). Education and training may enhance the uptake of EBP and improve the involvement of staff nurses in making evidence-based clinical changes (Pagoto et al., 2007; Reavy & Tavernier, 2008). A theory can be used as a framework to structure a study, and guide data collection and data analysis (McKenna & Slevin, 2008). The PARiHS model was used to frame the design of the study. A pretest/posttest randomized design was selected to examine the effects of an EBP educational intervention on nurses' knowledge of, their beliefs about, attitudes toward EBP, and nurses' perceived ability to implement EBP and examine the correlations between these variables. The discussion was focused on describing the research methodology used to accomplish the research study, including study method, research design, data collection procedures, and methods for data analysis.

Quantitative studies used deductive reasoning to test hypotheses through scientific research (Keele, 2011). Research questions were used to generate hypotheses. A test of the hypotheses serves as a framework for selecting an appropriate research design and methodology to seek answers to the research questions (Krathwohl & Smith, 2005). The content of the hypotheses determined the choice of sample, settings, independent and dependent variables, data collection procedures, and research schedule. The details were

discussed the research methodology used in the study to test the hypotheses and seek answers to the research questions in Chapter 3.

Research Design

The research design for this study was a randomized quasi-experimental design with two post-intervention measures for both the control group and the experimental group. With this type of design, it was assumed that random assignment would distribute confounding variables such as age, years of nursing experiences equally, and the results of the study would be biased the least (Cozby & Bates, 2011; Shadish et al., 2002; Trochim, 2000). Longitudinal designs allowed multiple observations of effects to observe the changes over time (Shadish et al., 2002). In this study, the outcome measures of both the experimental group and the control group were collected before the intervention, immediately after the intervention, and four weeks after the intervention, thus making the design also a longitudinal pretest and posttest design.

Research Method and Design Appropriateness

Linton and Prasun (2013) conducted a survey of 286 nurses and found that the majority of the respondents stated that their practice was evidence-based. Over 50% reported that they had a limited ability to appraise the validity of evidence or to apply evidence to practice. These findings supported the need for an EBP educational intervention for nurses. Also, limited studies had assessed educational effectiveness in the improvement of nurses' knowledge, attitudes, and perceived ability to implement EBP. The stated purpose of this study was to examine the effects of an EBP educational intervention on nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. The dissertation study lacked

randomization and a quasi-experimental research method would be appropriate for the study. A longitudinal pretest/posttest design was an appropriate choice of research design to measure outcomes before the intervention, immediately after, and four weeks after implementation of the intervention (Cooper & Schindler 2014; Trochim, 2000). Random assignment was added to the research design to eliminate the problem of confounding variables and selection bias. The research hypotheses derived from the research questions were directional. Directional hypotheses explain the existence of a positive or negative correlation between variables (Rubin, 2007). A between subject design and a within subject design were selected in an attempt to examine the effectiveness of an EBP educational intervention in the improvement of nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP.

Purposive sampling was used in this quasi-experimental study to select a sample of participants from the target population. Purposive sampling was a non-probability sampling technique (Schmidt & Brown, 2009; Shadish et al., 2002). Adding randomized assignment of the participants to the experimental group or the control group was appropriate to test the hypotheses and the predicted relationships and to minimize any population and selection bias (Cozby & Bates, 2011; Trochim, 2000; Vogt, 2007). The findings of this study would provide empirical evidence and statistical values to assess the existence of the relationships between the independent variable and the dependent variables. A pretest/posttest design with random assignment was feasible because of its simplicity (Cozby & Bates, 2011; Spector. 1981). With the use of pretest/posttest design with random assignment, the differences in the outcome measures between the

experimental group and the control group could be determined with and without the intervention.

Research Questions and Hypotheses

The research questions and hypotheses were derived from the research problems for this dissertation study. The primary purpose of this study was to examine the effects of an EBP educational intervention on nurses' knowledge, beliefs, attitudes, and perceived ability to implement EBP in a county hospital. The secondary purpose of this study was to examine the correlations between nurses' knowledge of, beliefs about, and attitudes toward EBP and nurses' perceived ability to implement EBP after the intervention. The purpose of the study was to seek answers to the following research questions. The following research questions and hypotheses, derived from the research problems for this dissertation study, were as follows:

RQ1: What are the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP?

HO1: There is no difference in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP before and after an EBP educational intervention.

HA1: There is an increase in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP after an EBP educational intervention.

RQ2: What is the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses' perception of their ability to implement EBP following implementation of the intervention?

HO2: There is no relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

HA2: There is a positive relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

Population

The research questions determined the population of interest to the researcher (Cozby & Bates, 2011). A target population was a group of individuals whom the research had an interest in studying (Cooper & Schindler, 2014; Roberts, 2010). The sample was selected from the target population, and the results of a study would infer to the sample (Dawson & Trapp, 2004; Roberts, 2010). The types of research designs and methods provided the rationale for selection of the sample. A sample was a group of individuals, events, or objects that were drawn from a target population (Roberts, 2010). The target population of this study included registered nurses working in public hospitals in California. For this quasi-experimental study, purposive sampling was used, and the sample was composed of a pool of employed nurses in a county hospital in the San Francisco Bay Area in California.

Participants were recruited through personal communications with nurse managers or nursing staff by attending each unit's staff meeting. A flyer and an

invitation letter were the other means to invite nurses to participate in the study. Flyers were posted in staff lounges to draw participants' attention. Nurses who worked in the inpatient units, such as the medical-surgical (med/surg) units, the telemetry unit, the critical care unit (CCU), the intermediate care unit (IMCU), and the emergency department (ED), were invited to the study. An invitation letter was sent to the participants via email. Participation in this study was voluntary. Nurses from the inpatient psychiatric unit and the psychiatric emergency department were welcome as well. Those nurses who worked in the ambulatory settings were excluded from the study.

Sampling Method

The purpose of the research and the research questions determined the population of interest to a researcher (Marczyk, DeMatteo, & Festinger, 2005). A target population was a group of individuals from which a sample of people who met the study criteria was selected (Cooper & Schindler, 2014). After researchers had defined the target population, they used the criteria to select a small group from a larger group in purposive sampling. They then conducted their study with the sample group to learn about the larger group or population of interest (Cooper & Schindler, 2014; Vogt, 2007).

In this quasi-experimental study, purposive sampling method was used. The sample comprised of the registered nurses from the medical-surgical units, telemetry unit, critical care unit, intermediate care unit, the emergency department and other units in the county hospital. Participation in this study was voluntary. Nurses were invited to the study via a variety of communication channels, such as attendance at the unit staff meetings, posting flyers on the bulletin boards, and e-mails. The randomized assignment was chosen for the purposive sampling to reduce the threat of selection bias and

population bias (Shadish et al., 2002; Trochim, 2000). After enrollment into the study, participants were assigned randomly to the experimental group or the control group.

Power, Sample Size, Effect Size, and Alpha Level

Appropriate sample size and power are necessary for improving the internal validity of a quantitative study. Researchers should determine the sample size, power, and effect size before starting a study (Hudson, 2009). Power refers to the ability of research design to detect a relationship between independent and dependent variables if such a relationship does exist in fact (Norwood, 2000). Effect size quantifies the strength or effectiveness of an independent variable or experimental intervention (Norwood, 2000). Effect size may be small (.20), medium (.50), and large (.80) and, in conjunction with the estimated power level, can be used to plan an adequate sample size (Shadish et al., 2002; Trochim, 2000). A lower level of significance (alpha level) requires a larger sample size. Two-tailed statistical tests of significance require a larger sample size than one-tailed statistical tests do. Likewise, a small sample with weak statistical power is unlikely to detect the effect of an experimental intervention.

When conducting a quantitative study, it is necessary to determine a sample size and the confidence level (Suresh & Chandrashekara, 2013). If the sample size is too small, the study lacks the precision to provide reliable answers to the research questions. If the sample size is too large, the study may not detect the difference between the treatment group and the control group (Suresh & Chandrashekara, 2013; Vogt, 2007). Hence, to avoid wasting financial and human resources or conducting an ineffective or invalid study, it is important to determine sample size first. If a study is too small and if

the treatment is found useful erroneously, it may cause the participants to be subjected needlessly to possibly harmful interventions (Vogt, 2007).

Estimation of Sample Size

In this study, the version 3.1.9.2 of G Power (2014) was used to determine the sample size, effect size, and power of the study based on the statistical tests used in this study. The calculated sample size was 54 (Dizon et al., 2014). Statistical power refers to the ability to reject the null hypothesis. Power is affected by the level of significance (α), the directional nature of a hypothesis, the sample size, and the effect size (Suresh & Chandrashekara, 2013; Vogt, 2007). A power of 0.80 was chosen for determining the appropriate sample size to detect a significant difference between the treatment and control groups. The size of sampling determined statistical power and significance. Statistical power refers to the probability of avoiding a type II error, and statistical significance (α) is the likelihood of preventing a type I error (Shadish et al., 2002; Vogt, 2007). Type II errors occur when a test rejects the null hypothesis, and the null hypothesis is false. Type I errors occur when the test rejects the null hypothesis, but the null hypothesis is true (Steinberg, 2011; Vogt, 2007).

The outcome measures were used as a basis for sample size computation. The outcome measures were nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perceived ability to implement EBP in Research Question 1. These outcomes were measured on an ordinal scale. Non-parametric inferential statistics such as Wilcoxon's signed rank test was used in this study. The sample size was computed using G-power software. When $\alpha = 0.05$, the effect size $r = .4$ (large), and power = .80, the calculated sample size was 54. The calculated sample size was similar to the sample

size used in the study conducted by Dizon et al. (2014). In that study, 54 participants were sufficient to test the hypotheses at the .05 alpha levels, given a power level of .80 and assuming an effect size r at .4. Therefore, a total of 54 physical therapists were recruited to Dizon et al.'s study where the effects of an EBP training program on physical therapists' knowledge, skills, and attitudes toward EBP were investigated.

Internal Validity of the Study

In Chapter 2, the literature review revealed that three nursing studies examined the effects of an EBP educational program using a pretest/posttest research method design. Hagler et al. (2012) used the pretest/posttest design to investigate the effects of an 8.5-day workshop to improve clinical preceptors' knowledge and skills of EBP, and their attitudes toward EBP. The structured workshop on EBP significantly improved and sustained the preceptors' knowledge, attitudes, and skills of EBP immediately and 25 months after completion of the workshop. However, Hagler et al. (2012) did not discuss the pros and cons of the selected research design. Kim et al. (2013) also conducted a pretest/posttest study to evaluate the effects of a 9-month EBP fellowship program on practice, knowledge, and barriers to implementing EBP. However, the lack of a control group and randomization in the pretest/posttest study posed a threat to the internal validity of the results. In this study, randomization of participants to the intervention or control groups was the appropriate technique to strengthen internal validity.

A variety of threats may affect the validity of a study depending on the type of research being conducted. The threat of history refers to particular events that occur between the first and second measurements that can influence the dependent variables (Norwood, 2000). The threat of maturation refers to processes within an individual

related to the passage of time that can affect the dependent variable. In a longitudinal pretest/posttest randomized study, history might threaten the ability to conclude that any differences in pretest and posttest scores were due to the intervention (Norwood, 2000; Spector, 1981). For example, unexpected events such as a nurses' strike or federal budget cuts might occur during the period between the pretest and posttest. Maturation is another common threat to pretest and posttest studies. In pretest and posttest studies, participants' behaviors and effects can change over time (Cozby & Bates, 2011; Schmidt & Brown, 2009). The prolongation of the study was avoided to minimize the effects of history and maturation. The longer the study lasted, the more likely history and maturation would affect internal validity. In addition to the threats from history and maturation, a testing effect is another significant threat to the internal validity of a pretest/posttest research design (Dimitrov & Rumrill, 2003). Testing effects likely happened in quasi-experimental research design (Dimitrov & Rumrill, 2003). A pretest and a posttest were involved in this quasi-experimental study. Participants took the same survey more than once that might influence their scores in the posttest and might confound the results. The testing effect might occur and affect the outcomes of the study potentially (Dimitrov & Rumrill, 2003).

Internal validity refers to the ability to inferences about causal relationships between independent variables and dependent variables (Cozby & Bates, 2011; Shadish et al., 2002). The non-probability and purposive sampling technique were used to recruit participants into the study. The sample in this dissertation study included only employed registered nurses from the participation site. The purposive sampling technique was likely to introduce bias into the samples (Cozby & Bates, 2011; Shadish et al., 2002).

The samples were not randomly selected. The lack of representation of the population of the interest might constitute threats to internal validity (Cozby & Bates, 2011; Shadish et al., 2002).

External Validity of the Study

External validity refers to the extent of generalization of the study results that can be extrapolated to the target population (Vogt, 2007). Threats to external validity may affect the inference of the results (Cooper & Schindler, 2014; Shadish et al., 2002). For instance, a high rate of dropouts in a study causes missing data. The missing data affect the internal validity and undermines external validity (Polit, 2010). Providing the training in one day would minimize the probability of dropouts. The eight-hour educational intervention was conducted in one day at one location so that the participants did not need to travel multiple times or to different places.

Purposive sampling was used in this study. The sample being studied was not representative of the population of interest in general. The purposive sampling might constitute threats to external validity and limit the generalization of the results of the study to intended population (Cozby & Bates, 2011; Shadish et al., 2002). The randomized assignment of the participants to the interventional and control groups was added to the pretest/posttest design to reduce population or selection bias and improve external validity (Cooper & Schindler, 2014; Trochim, 2000).

Intervention: Evidence-based Practice Education Program

The training program included six hours of didactic sessions and 90 minutes of the workshop. Appendix E illustrated the curriculum and the outlines of the contents. The curriculum covered the concepts of the PARiHS model, identification of EBP

questions using the PICOT concepts (see below), conducting a literature search and appraisal, and implementation of evidence-based practice. Nurses in the control group did not receive the EBP education program. The intervention in this study was an EBP training program. Empirically, there was substantial evidence to support that the EBP educational intervention could provide nurses the skills, knowledge, and attitudes required for the successful facilitation of EBP adoption. The educational intervention included the following main topics:

- Evidence-based practice process.
- PICOT model.
- Literature search skills.
- Fundamental research critiques
- Level of evidence.
- Quality improvement strategy
- Plan-Do-Study-Act (PDSA) rapid cycle model.

A well-constructed clinical question should include the five essential components that are referred to as PICOT. This acronym stands for a patient, population, or problem (P), intervention (I), comparison (C), outcomes (O) and time (T) it takes for the intervention to achieve the outcomes. The PICOT model is used in an evidence-based practice process to develop clinical questions.

Instrumentation

Demographic survey shown in Appendix D was used to collect participants' demographic data. The knowledge and attitude subscales of the EBPQ, the EBP Beliefs Scale, and the EBP Implementation Scale were used in this experimental study. These

instruments were used to measure nurses' knowledge of EBP, attitudes toward EBP, beliefs about EBP, and their perceived ability to implement EBP, respectively. The two subscales of the 24-item EBPQ for nurses, developed by Upton and Upton (2006), were used to measure nurses' attitudes toward EBP and their knowledge of EBP. The other two instruments were the 16-item EBP Beliefs Scale and the 18-item EBP Implementation Scale developed by Melnyk et al. (2008). The practice of EBP subscale was not used in this study. Instead, the EBP Implementation Scale was used because the 18 items of the scale were designed to measure nurses' perceived ability to implement EBP. Nurses' perceived ability to implement EBP was one of the outcome measures in this study. The other outcome measure was nurses' beliefs about EBP and measured by using The Evidence Based Practice Beliefs Scale. These instruments were incorporated into a web-based survey together with the demographic data collection. Permission to use these instruments were obtained from the original authors.

Validity and Reliability of the Instruments

The core ethical value for researchers is conducting an unbiased and objective search for new knowledge by applying a valid and reliable methodology to derive accurate results about the phenomenon being studied and to report the results honestly (Shadish et al., 2002). Reliability refers to the consistency of measurement or design, and validity refers to the truth or accuracy of the research (Cozby & Bates, 2011; Vogt, 2007). If the research design is reliable, the study can be replicated. If the instruments are reliable, researchers will obtain consistent measurements over time (Shadish et al., 2002).

Instrumentation may pose a threat to the internal validity of a study. Researchers must select reliable and valid instruments cautiously. Attitudes toward EBP refer to the health professional's view of the importance and usefulness of EBP in making sound clinical decisions (Tilson et al., 2011). Upton and Upton (2006) created a 24-item EBP assessment scale that included subscales to measure the practice of EBP, attitudes toward EBP, and knowledge and skill in EBP. The questionnaire was a self-report scale for measuring individual practice of EBP, personal attitudes, and relevant knowledge and skills. The EBPQ comprised three subscales and 24 questions. The overall Cronbach's alpha of this instrument was .87 (Upton & Upton, 2006).

The reliability and validity of the practice subscale were not discussed here because this subscale was not used in this study. The Cronbach's alpha was .79 for the attitude subscale and was .91 for the knowledge subscale (Upton & Upton, 2006; Upton, Upton, & Scurlock-Evans, 2014). Construct validity was assessed through convergent and discriminant validity. Convergent validity was assessed by evaluating the correlations between individuals' knowledge of EBP and attitude toward EBP (Upton & Upton, 2006; Upton, Upton, & Scurlock-Evans, 2014). The correlation coefficients ranged between .3 and .4 for the construct validity ($p < .0001$). The findings indicated the correlations were moderate (Upton & Upton, 2006; Upton, Upton, & Scurlock-Evans, 2014). The discriminant validity for each subscale was evaluated by comparing individuals with knowledge of EBP initiative and individuals without. The difference was statistically significant. The individuals who had knowledge of EBP initiative had better attitudes toward EBP, $t\ (332) = 2.5$, $p < .01$, and better knowledge of EBP, $t\ (360) = 5.2$, $p < .001$ (Upton & Upton, 2006).

The EBPQ attitude subscale consisted of four items. Four items were rated on a Likert-type scale of one (*closest to the statement number one*) to seven (*closest to the statement number two*). The minimum of the total scores was four, and the maximum scores were 28. The EBPQ knowledge subscale consisted of 14 items. Each item was rated on a five-point Likert-type scale ranging from one (*strongly disagree*) to five (*strongly agree).* The total scores of the 14 items could range from 14 to 98. The highest scores indicated a more positive attitude or greater knowledge of EBP.

The Evidence Based Beliefs Scale had 16 items and was used to measure nurses' beliefs about the value of EBP. The survey consisted of 16 statements describing nurses' agreement or disagreement with each statement about EBP. Each item was on a five-point Likert-scale ranged from one (*strongly disagree*) to five (s*trongly agree*). The total scores could range from five to 80. In the study conducted by Melnyk et al. (2008), a total of 394 nurses completed the two scales after attending continuing education workshops on EBP provided by Melnyk and her colleagues in 2005 and 2006. Reliability was assessed using the Cronbach's procedure for measuring internal consistency and the Spearman-Brown procedure for measuring the intrascale correlation. Cronbach's α and Spearman-Brown *r* reliability coefficients of the EBP Beliefs Scale were .90 and .87 respectively (Melnyk et al., 2008). Melnyk et al. (2008) chose a principal component analysis (PCA) as a measure to evaluate the construct validity of each scale. Principal component analysis was a multivariate statistical technique that utilizes an orthogonal linear transformation to explain the variance in the internal structure of the data (Abdi & Williams, 2010; Trochim, 2000). Each item on the EBP Beliefs Scale had a factor loading of greater than .35.

The Evidence Based Implementation Scale has 18 items which were on a five-point frequency scale ranging from zero (*zero times*) to four (*more than eight times*) (Melnyk et al., 2008). Cronbach's α and Spearman-Brown *r* reliability coefficients were .96 and .95 respectively (Melnyk et al., 2008). The total scores could range from zero to 72. The result of the PCA indicated that all items on the EBP implementation scale have loadings of greater than .60 (Melnyk et al., 2008). The combination of high loadings and a high Cronbach's α indicated that the scale was a valid and reliable instrument. Melnyk et al. (2008) provided empirical support for the reliability and validity of the Beliefs and Implementation Scales. The Evidence Based Practice Beliefs and Evidence Based Practice Implementation Scales were used commonly to examine the effects of an EBP educational program (Melnyk, Fineout-Overholt, Giggleman, et al., 2010; Varnell, Haas, Duke, & Hudson, 2008).

Procedures

Purposive sampling was used to recruit nurses with similar characteristics in a county hospital in an attempt to strengthen the application of the findings to the target population. The organizational leaders of the county hospital reviewed the proposal and permitted the study and data collection procedures. Permission to use the facility and approval from the participating site was indicative of administrative support for the study and the provision of EBP educational intervention to the nurses. The Institutional Review Board (IRB) process for the participating hospital was completed upon approval of the dissertation study before data collection. A listserv was developed to send emails to enrollees in the study. The email consisted of the letter of introduction, informed consent, and the link to access the survey. The contents of the email described the

purpose of the study and voluntary participation. The participants had the right to withdraw from the study at any time by notifying the researcher in writing via e-mail or inter-office mail. In this case, the individual's information was deleted from data collection and analysis. The initial survey was forwarded to the participants together with the invitation email two weeks before the EBP educational intervention. The link to the web-based survey was sent to the participants via e-mail four weeks after completion of the EBP training intervention.

Half of the participants were assigned randomly to the treatment group training course during the study. The other half of the participants were assigned randomly to the control group. All participants completed the three sets of questionnaires before the EBP training intervention, immediately after the intervention, and four weeks after the EBP training intervention. Participants completed a demographic survey as well regarding their characteristics, such as their workplace, age, gender, their highest level of education in nursing, and relevant work experience. Quantitative data were collected electronically via a web-based survey that included the demographics, the knowledge and attitude subscales of the EBPQ Scale, the EBPB Scale, and the EBPI Scale.

The two subscales of the Evidence Based Practice Questionnaire were used. The two subscales were the attitudes toward EBP and knowledge of EBP. The attitudes subscales were used to evaluate nurses' EBP attitudes. The knowledge subscales were used to measure nurses' knowledge of EBP. The Evidence Based Practice Beliefs Scale was used to measure nurses' beliefs about EBP. The Evidence Based Practice Implementation (EBPI) Scale was used to measure nurses' perceived ability to implement EBP.

The EBPQ attitude subscale consists of four items. Four items are rated on a Likert-type scale of one (closest to the statement number one) to seven (closest to the statement number 2). The nurses selected a number on the Likert scale of each item to represent their attitudes toward EBP. The EBPQ knowledge subscale is composed of 14 items. The nurses rated their knowledge and skills of EBP by choosing a number on a seven-point Likert scale ranging from one (*poor*) to seven (*the best*) on each item. The EBPB scale contains 16 statements describing individual's beliefs about EBP. The participating nurses were asked to indicate their agreement with each item on a five-point Likert scale ranging from one (*strongly disagree*) to five (*strongly agree*) on the EBPB Scale. To evaluate nurses' perceptions of their ability to implement EBP, participants responded to each question about perceived ability by answering from one (*not at all*) to five (*eight or more times)* on a five-point scale. The participants in the experimental group completed the survey at three different data collection points. The first data collection point was before the educational intervention. The second data collection point was immediately after completion of the intervention. The third data collection point was at four weeks after the end of the intervention. The participants in the control group were instructed to complete the questionnaire three times. The first time was preferably in the morning. Eight hours later, the participants completed the survey for the second time. Four weeks after the completion of the first survey, the participants completed the survey again for the third time.

The data were stored on an encrypted flash drive after collection of the data. The flash drive was stored in a locked cabinet in the office. The access to the data was

restricted to the researcher. The office was in a secured area. The research records would be retained for at least three years after the completion of the study.

Data Analysis

Descriptive statistics were used to describe and compare the demographic characteristics of the participants in the intervention and control groups. The descriptive statistics included frequency, percentages, cross-tabulations, and accurate measures of central tendency and variability (Field, 2009; Polit, 2010; Shadish et al., 2002). The Demographic data included gender, age, work unit, position, the highest degree of education in nursing, and the years of experience in nursing. Data about gender, work unit, position, were collected at the level of nominal measurement. Data about the highest degree of education in nursing were collected at the level of ordinal measurement. An ordinal measurement was used to gather data about age, and the years of experience in nursing. The median is the middle number in statistics (Polit, 2010) and was used to measure central tendency of the demographic data in descriptive statistics. The range of a set of data in descriptive statistics is the difference between the maximum and minimum scores (Polit, 2010) and was used to measure the variability of a distribution of the demographic data. The mode is commonly used to determine central tendency on a set of ordinal scales (Field, 2012; Polit, 2010) and was used for describing the central tendency of the demographic data.

A between and within subject design was adopted for data analysis in Research Question 1. A between subject design was used for comparison of pretest and posttest scores between the experimental group and the control group. A within subject design was used for comparison of pre-posttest repeated measures with the same group of

participants. The Statistical Package for the Social Sciences (SPSS) (Version 21.0) software was used for statistical analysis. The Wilcoxon's signed-rank test was a non-parametric equivalent of a matched pair t-test that was used to examine the differences between two related samples in Hypothesis 1 (Field, 2012; Polit, 2010). In Hypothesis 1, the dependent variables were nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. The independent variable was the EBP educational intervention. The dependent and independent variables were measured on an ordinal scale. The non-parametric Wilcoxon's signed-rank test was an appropriate statistical test for a small sample to examine between-group differences between the intervention and control group on each dependent variable (Field, 2012; Shadish et al., 2002; Trochim, 2000). Also, the Wilcoxon's signed-rank test was used to measure differences between pretest and posttest scores within the experimental group or control group (Field, 2012; Shadish et al., 2002; Trochim, 2000). The level of significance, *p*, was set at .05. When the calculated values of *p* were less than .05, the findings would demonstrate a significant difference between the scores before and after the intervention (Field, 2012; Polit, 2010).

In Hypothesis 2, the multiple correlation tests were used to examine the strength of correlations between the variables. For the hypothesis corresponding to Research Question 2, the three independent variables were nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and the dependent variable was nurses' perceived ability to implement EBP. These variables could be measured at interval scale. This parametric statistical test was used to assess the existence of correlations between a dependent variable and the independent variables (Field, 2009; Polit, 2010; Steinberg, 2011). The

purpose of using multiple correlation tests was to predict a variable from more than one independent variables simultaneously (Polit, 2010; Steinberg, 2011). The multiple correlation coefficient, R, is a positive value ranging from the lowest score of zero to the highest score of one. A higher value indicates a better predictability or a stronger relationship between the dependent variable and the predictors (Steinberg, 2011; Vogt, 2007). The closer R is to one, the stronger the correlation is (Field, 2009; Polit, 2010). There is no linear correlation between the dependent and independent variables when R equals to zero (Field, 2009; Polit, 2010). Also, the value of zero indicates no relationship between the dependent variable and the independent variables (Steinberg, 2011; Vogt, 2007).

Ethical and Legal Considerations

To ensure the scientific rigor and merit of this study, special considerations regarding ethics supported every step of the research process. Ethical requirements, such as those outlined in the Belmont Report and the Nuremberg Code, were ensured not to violate fundamental human rights. The Belmont Report was issued in 1979 by the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research. It explained the application of the three most important principles of research to practice - respect for persons, beneficence, and justice (Marczyk et al., 2005).

The Collaborative Institutional Training Initiative (CITI) provides research courses for training researchers at all levels regarding the history and ethics of the Nuremberg Code, the Belmont Report, and the Code of Federal Regulations. The CITI website also provides standardized modules for certifying novice or expert researchers in

participating in human's research locally, nationally, and globally. The CITI certification course guides researchers through the historical and historical aspects of experiments conducted using human subjects and assists in understanding and complying with the core ethical principles and requirements of research.

Beneficence is one of the fundamental ethical principles used to protect research participants from harm (Keele, 2011; Schmidt & Brown, 2009). The CITI certification was obtained to ensure compliance with the ethical requirements and to protect the human rights of participants. The research participants were protected from potential harms such as embarrassment, loss of employment, or civil liability. Participants' confidentiality and privacy were maintained (Keele, 2011; Schmidt & Brown, 2009). Participants were provided with informed consent, and they voluntarily chose to participate in studies without coercion. The names of participants were removed from their data and replaced with numerical codes to protect the anonymity and confidentiality of the participants. Only codes were entered for data collection and data analysis. A separate list of participants' identities and assigned codes were secured in a locked area.

The ethical principles were addressed by taking serious considerations to ensure the reliability and validity of the research study. These ethical principles were upheld to maintain trust from the public and the integrity of the study. All ethical principles were followed throughout the multiple aspects of the research process, including research design, sampling, implementation, data collection, and analysis without bias. Cody (2006) stated that scientists are human and persons have their values. Science cannot be value-free and takes account of moral and cognitive values (Cody, 2006). However, reasonable doubts should be pursued related to their peculiar situation and studies based

on an understanding of ethical values that attribute to human well-being (Bernstein, 1999; Freire, 1993; Habermas, 1973).

This investigation will involve human participants whose rights must be protected (Keele, 2011; Schmidt & Brown, 2009). This dissertation study was approved by the IRB of the University of Phoenix and the participating hospital before the start of the study. The rights of human participants include, but are not limited to, informed consent, confidentiality, and privacy (Roberts, 2010). Participation in the study was voluntary. All enrollees received the information about the purpose of this study, the expected duration, the description of the procedure or intervention, the benefits, and the risks of the proceedings or intervention. Anonymity was used to ensure the confidentiality and privacy of the participants in the study. A two-digit identification number was assigned to each participant to conceal his or her identities. Participants were assured that their responses were disclosed in an unidentifiable format. All electronic or paper files containing participants' confidential data were locked, encrypted, and secured to prevent public access.

Compliance with ethical principles is essential in nursing research (Keele, 2011; Schmidt & Brown, 2009). Researchers are required to comply with ethical principles to produce credible evidence for the benefit of society, knowledge of the discipline, and health of individuals (Cozby & Bates, 2011). Organizations establish an IRB to ensure ethical principles are in place for the protection of human participants. Approval was obtained from the University of Phoenix IRB and the participating hospital IRB before conducting this study. Permission to use the premises, the name and participants were sought from the administrative leaders of the participating hospital.

Additionally, an informed consent form provided adequate information about nature, risks, and benefits of this study to the participants (Cozby & Bates, 2011). The informed consent was contained in the web-based survey. The participants acknowledged that they understood the nature of the study and the potential risks when they completed the web-based survey. Also, the informed consent notified the participants about their identities kept confidentially. The participants gave their permission to serve as a participant in the study voluntarily by completing the survey. Informed consent procedures were a primary means of protecting research participants' rights, especially their right to self-determination, full disclosure, and privacy. Moreover, the confidentiality of participants' identity and their privacy were protected. No identifying data were collected to ensure the privacy of all participants. A list of participants with corresponding code numbers was secured in a locked cabinet to protect participants' confidentiality and privacy. The data were stored on a password-protected flash drive. The flash drive was kept in a secure cabinet.

Summary

The research method used in this study on nurses' perceptions of knowledge and skills in implementing EBP was discussed in Chapter 3. The first section offered a discussion of the research method and design. The second section delineated the rationale for using the proposed research method and design approach, explaining the fitness of the research method to the research problems and questions. The discussion also included the setting, sampling procedure, instrumentation, and data collection plan, with an emphasis on the importance of ethical considerations threading through each step of the research process.

The intervention provided for the experimental group consisted of six-hour educational training and a one-and-half-hour workshop with a focus on enhancing nurses' knowledge and skills about EBP (Dizon et al., 2014). Non-parametric Wilcoxon statistical test was used to evaluate the effects of an educational intervention between the interventional and control groups (Polit, 2010; Steinberg, 2011). A between subject and within subject design was used for data analysis in Research Question 1. Also, the existence of the relationships between nurses' knowledge of, beliefs about, and attitudes toward EBP, and their perceived ability to implement EBP was evaluated after completion of the intervention. The multiple coefficient test would be used for data analysis in Research Question 2. The discussion in Chapter 4 would include the procedures taken to analyze the quantitative data. The descriptive, non-parametric and parametric statistical tests of the data obtained from the web-based survey were analyzed by using SPSS software. Findings were presented in a clear and logical manner together with tables and detailed discussion.

Chapter 4

Results

The research methods were discussed and summarized in Chapter 3. In a quasi-experimental research method, a between subject and within subject design was used to in the pretest-posttest study. The aim of the data analysis was to examine the effects of an EBP educational intervention on nurses' knowledge about EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP using a between subject and within subject comparisons. The other aim of the data analysis was to examine the correlations between nurses' perceived ability to implement EBP and nurses' knowledge of, beliefs about, and attitudes toward EBP after the EBP educational intervention. The Statistical Package for the Social Sciences (IBM SPSS Version 21.0) was administered for data analysis. The descriptive statistics, non-parametric and parametric statistical tests, such as Wilcoxon signed-rank test and Pearson's r test were used to perform data analysis. The findings from the study are presented in Chapter 4. The results are organized in the following subsections: response rate, demographic data, and the findings for the research questions. This chapter is closed with a summary of the findings.

Response Rate

The registered nurses, who were working in a county hospital in the Bay Area, California, were invited to participate in the study. A total of 40 nurses expressed their interest in the study. The participants accessed the web-based survey on Survey Monkey®. The EBP course took place in a computer room where the participants of the experimental group used computers to practice literature search and completed the survey

immediately after the class. Data were collected from the experimental and control groups before the intervention, immediately after the intervention, and one month after the intervention. One out of the 40 nurses resigned. The 39 participants were assigned randomly to the experimental and control groups. Out of the 39 participants, ten nurses in the control group completed the survey and nine nurses in the experimental group showed up in the EBP course. Among the ten nurses in the control group, one nurse completed the pretest survey only and the data from the participant was excluded from analysis. A few participants completed the survey four weeks after the intervention. Data from this point were excluded for analysis. The demographic information, the pretest scores, and posttest scores from the nine participants in the experimental group and the nine participants in the control group were included in data analysis.

Demographic Data

Demographic data provided descriptive information about the participants' age, gender, and the highest degree of nursing, ethnicity, and years of nursing experiences, primary role, and the work unit. Descriptive statistics revealed the distribution and variances of the data for the experimental and control groups. The demographic characteristics of the experimental and control groups are presented in Table 1.

Table 1

Demographic Characteristics of Experimental Group and Control Group

	Experimental Group (N = 9)		Control Group (N = 10)	
	N	%	*N*	%
Age				
20-29 years	1	11.1	0	0.0
30-39 years	1	11.1	5	55.6
40-49 years	4	44.4	3	33.3
50-59 years	3	33.3	0	0.0
60-69 years	0	0.0	1	11.1
Gender				
Male	5	55.6	4	44.4
Female	4	44.4	5	55.6
The Highest Degree of Nursing				
ADN	4	44.4	1	11.1
BSN	4	44.4	6	66.7
MS/MSN	1	11.1	1	11.1
DNP	0	0.0	0	0.0
PhD	0	0.0	1	11.1
Ethnicity				
Caucasian	6	66.7	1	11.1
Africa American	1	11.1	0	0.0
Hispanic or Latino	0	0.0	1	11.1
Asian/Pacific Islander	2	22.2	6	66.7
Other	0	0.0	1	11.1
Years of Nursing Experience				
< 10 years	5	55.6	4	44.4
10 – 20 years	3	33.3	3	33.3
20 – 30 years	1	11.1	1	11.1
30 – 40 years	0	0.0	0	0.0
> 40 years	0	0.0	1	11.1
Primary Role				
Staff Nurse	5	55.6	8	88.9
Charge Nurse	3	33.3	0	0.0
Quality Manager	0	0.0	0	0.0
Nurse Manager	0	0.0	0	0.0
Other	1	11.1	1	11.1
Work Unit				
Med/Surg/Telemetry Unit	2	22.2	0	0.0
IMCU	2	22.2	5	55.6
ICU	3	33.3	2	22.2
Other	2	22.2	2	22.2

Age and gender. Four participants in the experimental group were aged between 40 and 49 years (44.4%) and three participants were aged between 50 and 59 years (33.3%). Two participants were aged 39 years and below (22.2%). Five participants in the control group were within the age range of 30-39 years (55.6%), and three participants were in the age range of 40 years and 49 years (33.3%). Eleven participants in the control group were aged 60 years and above (11.1%). The majority of the experimental group were male nurses (55.6%), and the majority of the control group were female nurses (55.6%).

The highest level of nursing education and ethnic group. Six participants (66.7%) in the control group stated that they had a bachelor's degree in nursing (BSN) as their highest level of education. In the experimental group, four participants (44.4%) reported associated degree in nursing (ADN) as their highest level of education attained and four nurses (44.4%) identified BSN as their highest level of education. Six participants (66.7%) in the control group indicated that they were Asian/Pacific Islanders and six participants (66.7%) in the experimental group reported that they were Caucasian as seen in Table 1.

Years of nursing experience and primary role. Eight participants in the experimental group (88.9%) reported that they had less 20 years of nursing experiences. Seven participants in the control group (77.7%) reported that they had less than 20 years of nursing experiences (see Table 1). Five participants (55.6%) in the experimental group reported that they were staff nurses, and three were charge nurses (33.3%). One participants stated that the individual was a nurse educator. In the control group, eight participants (88.9%) indicated that they were staff nurse (see Table 1).

Work unit. Three participants (33.3%) in the experimental group were ICU nurses. Two participants reported that they worked in medical/surgical/telemetry units (22.2%). Two participants (22.2%) reported that their work units were IMCU, and the other two participants (22.2%) stated that they worked in the med/surg units. In the control group, five participants (55.6%) were IMCU nurses, two participants (22.2%) were ICU nurses, and two participants (22.2%) working in other units (see Table 1).

Findings

Research Question 1 and hypothesis 1. What are the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP?

HO1: There is no difference in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP before and after an EBP educational intervention.

HA1: There is an increase in nurses' knowledge and skills of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP after an EBP educational intervention.

Between subject design. A between subject comparison was used to determine the differences of pretest and posttest scores for the experimental group and control group on nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. Table 2 provided information about the ranked scores of nurses' knowledge and skills of EBP for the experimental group and control group. The group with the lowest mean rank was the group with the greatest number of lower scores. Likewise, the group with the highest mean rank would have a larger

number of high scores in the group. Compared to the control group, the experimental group had lower mean rank in the pretest scores but had higher mean rank in the posttest scores.

Table 2

Ranks of Pretest and Posttest Scores of Nurses' Knowledge and Skills of EBP Between the Experimental Group and Control Group

	Group	*N*	Mean Rank	Sum of Ranks
Knowledge of EBP (Pretest)	Experimental	9	9.39	84.50
	Control	9	9.61	86.50
	Total	18		
Knowledge of EBP (Posttest)	Experimental	9	10.83	97.50
	Control	9	8.17	73.50
	Total	18		

Table 3 provided the test statistics for the value of the Wilcoxon signed-rank test, *W*, and the corresponding z-score. The significance value of the two-tailed probability was used when no prediction had been made about which group would differ in the pretest scores on nurses' knowledge of EBP between the experimental group and control group. The significance value of the one-tailed probability was used when it was predicted that nurses would increase their knowledge of EBP after intervention in the experimental group. The findings indicated that the Wilcoxon signed-rank test was non-significant (two-tailed) for the pretest scores on nurses' knowledge of EBP ($p > .05$) and

non-significant (one-tailed) for the posttest scores ($p > .05$). Therefore, the null hypothesis was accepted.

Table 3

Test Statistics of Pretest and Posttest Scores on Nurses' Knowledge and Skills of EBP Between the Experimental Group and Control Group

	Knowledge of EBP (Pretest between experimental and control groups)	Knowledge of EBP (Posttest between experimental and control group)
Wilcoxon *W*	84.500	73.500
Z	-.095	-1.190
Exact Sig. (2-tailed)	.948	.326
Exact Sig. (1-tailed)	.474	.163

Note: *W* was the value of the Wilcoxon signed-rank test. *Z* was the corresponding z-score. Exact sig. (1-tailed) represented the significance value of the test (one-tailed).

Table 4 provided information about the ranked scores of nurses' beliefs about EBP for the experimental group and control group. The group with the lowest mean rank was the group with the greatest number of lower scores. By the same token, the group with the highest mean rank would have a larger number of high scores in the group. Compared to the control group, the experimental group had lower mean rank in the pretest scores but had higher mean rank in the posttest scores.

Table 4

Ranks of Pretest and Posttest Scores of Nurses' Beliefs About EBP Between the Experimental Group and Control Group

	Group	*N*	Mean Rank	Sum of Ranks
Beliefs about EBP (Pretest)	Experimental	9	7.33	66.00
	Control	9	11.67	105.00
	Total	18		
Beliefs about EBP (Posttest)	Experimental	9	10.39	93.50
	Control	9	8.61	77.50
	Total	18		

Table 5 provided the test statistics for the value of the Wilcoxon signed-rank test, *W*, and the corresponding z-score. The significance value of the two-tailed probability was used when no prediction had been made about which group would differ in the pretest scores on nurses' beliefs about EBP between the experimental group and control group. The significance value of the one-tailed probability was used when it was predicted that nurses would increase their beliefs about EBP after intervention in the experimental group. The findings indicated that the Wilcoxon signed-rank test was non-significant (two-tailed) for the pretest scores on nurses' beliefs about EBP ($p > .05$) and non-significant (one-tailed) for the posttest scores ($p > .05$). Therefore, the null hypothesis was accepted.

Table 5

Test Statistics of Pretest and Posttest Scores on Nurses' Beliefs About EBP Between the Experimental Group and Control Group

	Beliefs about EBP (Pretest between experimental and control groups)	Beliefs about EBP (Posttest between experimental and control groups)
Wilcoxon *W*	66.000	77.500
Z	-2.188	-.972
Exact Sig. (2-tailed)	.071	.635
Exact Sig. (1-tailed)	.035	.318

Note: *W* was the value of the Wilcoxon signed-rank test. *Z* was the corresponding z-score. Exact sig. (1-tailed) represented the significance value of the test (one-tailed).

Table 6 provided information about the ranked scores of nurses' attitude toward EBP for the experimental group and control group. In the Wilcoxon signed-rank test, the mean rank would be the lowest for the group having the greatest number of lower scores. Similarly, the mean rank would be the highest for the group having a larger number of high scores in the group. Compared to the control group, the experimental group had lower mean rank in the pretest scores but had higher mean rank in the posttest scores. The experimental group increased the mean rank in the posttest scores after intervention. In contrast, the control had lower mean rank in the posttest scores than in the pretest scores.

Table 6

Ranks of Pretest and Posttest Scores of Nurses' Attitude Toward EBP For the Experimental Group and Control Group

	Group	*N*	Mean Rank	Sum of Ranks
Attitudes toward EBP (Pretest)	Experimental	9	8.39	75.50
	Control	9	10.61	95.5
	Total	18		
Attitudes toward EBP (Posttest)	Experimental	9	8.78	79.00
	Control	9	10.22	92.00
	Total	18		

Table 7 provided the test statistics for the value of the Wilcoxon signed-rank test, *W*, and the corresponding z-score. The significance value of the two-tailed probability was used when no prediction had been made about which group would differ in the pretest scores on nurses' attitude toward EBP between the experimental group and control group. The significance value of the one-tailed probability was used when it was predicted that nurses would improve their attitude toward EBP after intervention in the experimental group. The findings indicated that the Wilcoxon signed-rank test was non-significant (two-tailed) for the pretest scores on nurses' attitude toward EBP ($p > .05$) and non-significant (one-tailed) for the posttest scores ($p > .05$). Therefore, the null hypothesis was accepted.

Table 7

Test Statistics of Pretest and Posttest Scores on Nurses' Attitude Toward EBP Between the Experimental Group and Control Group

	Attitude toward EBP (Pretest between experimental and control groups)	Attitude toward EBP (Posttest between experimental and control groups)
Wilcoxon *W*	75.500	79.000
Z	-.908	-.598
Exact Sig. (2-tailed)	.372	.609
Exact Sig. (1-tailed)	.186	.305

Note: *W* was the value of the Wilcoxon signed-rank test. *Z* was the corresponding z-score. Exact sig. (1-tailed) represented the significance value of the test (one-tailed).

Table 8 provided information about the ranked scores of nurses' perceived ability to implement EBP for the experimental group and control group. The mean rank was the lowest for the group having the greatest number of lower scores. The mean rank would be the highest for the group having a larger number of high scores in the group. Compared to the control group, the experimental group had lower mean rank in the pretest scores but had higher mean rank in the posttest scores. The experimental group increased the mean rank in the posttest scores after intervention. In contrast, the control had lower mean rank in the posttest scores than in the pretest scores.

Table 8

Ranks of Pretest and Posttest Scores of Nurses' Perceived Ability to Implement EBP For the Experimental Group and Control Group

	Group	*N*	Mean Rank	Sum of Ranks
Perceived ability to implement EBP (Pretest)	Experimental	9	7.89	71.00
	Control	9	11.11	100.00
	Total	18		
Perceived ability to implement EBP (Posttest)	Experimental	9	9.89	89.00
	Control	9	9.11	82.00
	Total	18		

Table 9 provided the test statistics for the value of the Wilcoxon signed-rank test, *W*, and the corresponding *z*-score. The significance value of the two-tailed probability was used when no prediction had been made about which group would differ in the pretest scores on nurses' perceived ability to implement EBP between the experimental group and control group. The significance value of the one-tailed probability was used when it was predicted that nurses would improve their perceived ability to implement EBP after intervention in the experimental group. The findings indicated that the Wilcoxon signed-rank test was non-significant (two-tailed) for the pretest scores on nurses' perceived ability to implement EBP ($p > .05$) and non-significant (one-tailed) for the posttest scores ($p > .05$).

Table 9

Test Statistics of Pretest and Posttest Scores on Nurses' Perceived Ability to Implement EBP Between the Experimental Group and Control Group

	Perceived ability to implement EBP (Pretest between experimental and control groups)	Perceived ability to implement EBP (Posttest between experimental and control groups)
Wilcoxon *W*	71.000	82.000
Z	-1.351	-.335
Exact Sig. (2-tailed)	.214	.843
Exact Sig. (1-tailed)	.107	.422

Note: *W* was the value of the Wilcoxon signed-rank test. *Z* was the corresponding z-score. Exact sig. (1-tailed) represented the significance value of the test (one-tailed).

In the between subjects comparisons, there was no difference on the pretest and posttest scores between the experimental group and control group on nurses' knowledge of EBP, their beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. This would indicate that the two groups were not significantly different.

Within subject design. The knowledge subscale of the EBPQ was used to measure nurses' knowledge and skills of EBP. The knowledge subscale of the EBPQ was composed of 14 items. The Wilcoxon signed-rank test was used to verify the difference of the knowledge subscale scores of the EBPQ between the pretest and posttest in the experimental and in the control groups. Nurses in the experimental group significantly improved their knowledge and skills of EBP ($p = .034$) significantly as shown in Table 10. There was insignificant improvement of nurses' knowledge and

skills of EBP in the control group ($p > .05$) in Table 2. The null hypothesis was rejected, and the alternate hypothesis was accepted.

Table 10

Comparison of Knowledge and Skills EBP Scale Scores Before and Immediately After the Intervention Within the Experimental Group and the Control Group

	Experimental group ($N = 9$)			Control group ($N = 9$)		
Knowledge and skills of EBP Scale Scores	Pre-test	Post-test	*p*	Pre-test	Post-test	*p*
	Mean Rank	Mean Rank		Mean Rank	Mean Rank	
	9.39	10.83	.034*	9.61	8.17	.564

Note. Wilcoxon signed-rank test was used to examine the difference of pretest and posttest scores within the experimental group and control group. *N* = total number of participants.
*$p < .05$.

The EBP Beliefs Scale was used to measure nurses' beliefs about EBP. The EBP Beliefs Scale consisted of 16 items. The Wilcoxon signed-rank test was used to verify the difference of the EBP Beliefs Scale scores between the pretest and posttest in the experimental and control groups. Nurses in the experimental group demonstrated significant improvement ($p = .046$) on the EBP Beliefs Scale as seen in Table 11. There was insignificant improvement of nurses' beliefs about EBP in the control group ($p > .05$). The null hypothesis was rejected and the alternate hypothesis was accepted.

Table 11

Comparison of EBP Beliefs Scale Scores Before and Immediately After the Intervention Within the Experimental Group and the Control Group

	Experimental group (N = 9)			Control group (N = 9)		
EBP Beliefs Scale Scores	Pre-test	Post-test	*p*	Pre-test	Post-test	*p*
	Mean Rank	Mean Rank		Mean Rank	Mean Rank	
	7.33	10.39	.046*	11.67	8.61	.180

Note. Wilcoxon signed-rank test was used to examine the difference of the pretest and posttest scores within the experimental group and control group. N = total number of participants.
*$p < .05$.

The attitude subscale of the EBPQ was used to measure nurses' attitudes toward EBP. The attitude subscale was composed of four items. The Wilcoxon signed-rank test was used to verify the difference of the attitude subscale scores of the EBPQ between the pretest and posttest in the experimental and control groups. Table 12 showed that nurses in the experimental and control did not demonstrate significant changes in their attitudes toward EBP ($p > .05$). The null hypothesis was accepted for the within subject comparison.

Table 12

Comparison of Attitudes Toward EBP Scale Scores Before and Immediately After the Intervention Within the Experimental Group and the Control Group

	Experimental group (N = 9)			Control group (N = 9)		
Attitudes toward EBP Scale Scores	Pre-test	Post-test	*p*	Pre-test	Post-test	*p*
	Mean Rank	Mean Rank		Mean Rank	Mean Rank	
	8.39	8.78	.096	10.61	10.22	.380

Note. Wilcoxon signed-rank test was used to examine the difference of the pretest and posttest scores within the experimental group and control group. N = total number of participants.
*$p < .05$.

Evidence Based Practice Implementation (EBPI) Scale was used to assess nurses' perceived ability to implement EBP. The EBPI Scale consisted of 18 questions to assess the number of times of performing EBP tasks. The Wilcoxon signed-rank test was used to verify the difference of the EBP Implementation Scale scores between the pretest and posttest in the experimental and control groups. The nurses in the experimental group expressed that they significantly enhanced their perceived ability to implement EBP (p = .025) as shown in Table 13. In contrast, nurses in the control group did not demonstrate significant improvement in their perceived ability to implement EBP. The null hypothesis was rejected based on the within subject comparison and the alternate hypothesis was accepted.

Table 13

Comparison of EBP Implementation Scale Scores Before and Immediately After the Intervention Within the Experimental Group and the Control Group

	Experimental group (N = 9)			Control group (N = 9)		
Perceived ability to implement EBP Scale Scores	Pre-test	Post-test	*p*	Pre-test	Post-test	*p*
	Mean Rank	Mean Rank		Mean Rank	Mean Rank	
	7.89	9.89	.025*	11.11	9.11	.257

Note. Wilcoxon signed-rank test was used to examine the difference of the pretest and posttest scores within the experimental group and control group. N = total number of participants,
*$p < .05$.

The findings demonstrated the EBP education intervention significantly improved nurses' knowledge and skills of EBP, beliefs about EBP, and their perceived ability to implement EBP in a within subject comparison. The results of the within subject comparison showed that the EBP educational intervention did not significantly improve nurses' attitudes toward EBP. Therefore, for Research Question 1, the null hypothesis was rejected. The alternative hypophysis was accepted. Nurses' knowledge and skills of EBP, beliefs about EBP, and their perceived ability to implement EBP were improved after the EBP education intervention in the experimental group. The null hypothesis was accepted for nurses' attitudes toward EBP; no improvement was found in nurses' attitudes toward EBP.

Research Question 2 and hypothesis 2. What is the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses'

perception of their ability to implement EBP following implementation of the intervention?

HO2: There is no relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

HA2: There is a positive relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

Research Question 2 was intended to examine the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses' perception of their ability to implement EBP following implementation of the intervention. The research plan was to use the multiple correlation coefficient, R, to determine the possible relationship between the variables. The use of multiple correlation coefficient, R, was planned to assess a statistical association between nominal data of the variables (Field, 2009; Polit, 2010). In this study, nine nurses participated in the experimental group and completed the intervention. In Hypothesis 2, the post test scores only could be used for the calculation for the experimental group. Due to the small sample size of nine participants, the appropriate statistical analysis could not be conducted with the use of multiple correlation coefficient.

To provide the correct analysis with large effect size and power, the parametric statistical test, Pearson bivariate correlation coefficient, was used to replace the multiple correlation tests. Pearson correlation coefficient, r, was used to determine the strength of correlation between two variables (Field, 2009; Polit, 2010). Three different hypotheses

were developed to seek answers to Research Question 2. Each hypothesis predicted the existence of a relationship between two variables.

HO2.1: There is no relationship between nurses' knowledge of EBP and their perception of their ability to implement EBP following implementation of the intervention.

HA2.1: There is a positive relationship between nurses' knowledge of EBP and their perception of their ability to implement EBP following implementation of the intervention.

HO2.2: There is no relationship between nurses' beliefs about EBP and their perception of their ability to implement EBP following implementation of the intervention.

HA2.2: There is a positive relationship between nurses' beliefs about EBP and their perception of their ability to implement EBP following implementation of the intervention.

HO2.3: There is no relationship between nurses' attitudes toward EBP and their perception of their ability to implement EBP following implementation of the intervention.

HA2.3: There is a positive relationship between nurses' attitudes toward EBP and their perception of their ability to implement EBP following implementation of the intervention.

Pearson correlation coefficient (one-tailed), r, was used to evaluate the strength of the relationships between the variables. A one-tailed test was used because the three alternate hypotheses predicted the positive correlations between the variables. The statistical findings presented in Table 14 illustrated that there was no positive correlation between nurses' beliefs about EBP and their perceived ability to implement EBP.

Pearson's r presented in Table 15 showed that there was no positive relationship between nurses' attitudes toward EBP and their perceived ability to implement EBP. Pearson's r listed in Table 16 demonstrated that there was no positive relationship between nurses' knowledge and skills of EBP and their perceived ability to implement EBP.

Table 14

Correlation Between Nurses' Beliefs about EBP and Nurses' Perceived Ability to Implement EBP in the Experimental Group

		EBPB-post
EBPI-post	*r*	.184
	p	.318
	N	9

Note. Pearson correlation coefficient (one-tailed), *r*, is used to examine the relationship between nurses' beliefs about EBP and nurses' perceived ability to implement EBP. *N* = total number of participants, *r* = Pearson correlation coefficient.
*$p < .05$.

Table 15

Correlation between Nurses' Attitudes Toward EBP and Nurses' Perceived Ability to Implement EBP in the Experimental Group

		Attitude-post
EBPI-post	*r*	.095
	p	.404
	N	9

Note. Pearson correlation coefficient (one-tailed), *r*, is used to examine the relationship between nurses' attitudes toward EBP and nurses' perceived ability to implement EBP. *N* = total number of participants, *r* = Pearson correlation coefficient.
*$p < .05$.

Table 16

Correlation between Nurses' Knowledge and Skills of EBP and Nurses' Perceived Ability to Implement EBP in the Experimental Group

		Knowledge-post
EBPI-post	*r*	.369
	p	.164
	N	9

Note. Pearson correlation coefficient (one-tailed), *r*, is used to examine the relationship between nurses' knowledge and skills of EBP and nurses' perceived ability to implement EBP. *N* = total number of participants, *r* = Pearson correlation coefficient.
**p* < .05.

Research Question 2 was intended to examine the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses' perception of their ability to implement EBP following implementation of the intervention. However, the small number of research subjects prevented the desired analysis. The desired multiple correlations were replaced with three bivariate correlations for the experimental group, with no significant correlations found.

Summary

This chapter provided an analysis of the data obtained from the nurses working in a county hospital in California. The data analysis for this study was to examine the effects of an EBP educational intervention on nurses' perceived ability to implement evidence-based practice. The resulting sample size was 19 registered nurses, which accounted for a 45.0% participation rate. One of these was deleted, so that the final analysis included only 18 participants. That meant nine nurses were in the experimental group and nine nurses were in the control group. Demographic characteristics of both

groups were summarized for these categories: age, gender, the highest degree earned in nursing, ethnicity, years of nursing experiences, and job roles. For Research Question 1, in the between subject comparison, there was no difference between the pretest and posttest scores for the experimental group and control group on nurses' knowledge of EBP, their beliefs about and attitude toward EBP, and their perceived ability to implement EBP. In the within subject comparison, the findings demonstrated that the EBP education intervention significantly improved nurses' knowledge and skills of EBP, beliefs about EBP, and their perceived ability to implement EBP. The results of the within subject comparison showed that the EBP educational intervention did not improve nurses' attitudes toward EBP significantly.

For Research Question 2, the sample size was too small for multiple correlation coefficient, possibly resulting in inaccurate results. Instead, Pearson bivariate correlation coefficient, r, was used and three alternative hypotheses were developed to examine the bivariate relationship independently. The first alternative hypothesis was to examine the relationship between nurses' knowledge of EBP and their perceived ability to implement EBP following implementation of the intervention in the experimental group. The second alternative hypothesis was to examine the relationship between nurses' beliefs about EBP and their perceived ability to implement EBP following implementation of the intervention in the experimental group. The third alternative hypothesis was to examine the relationship between nurses' attitudes toward EBP and their perceived ability to implement EBP following implementation of the intervention in the experimental group. The relationships between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP were found non-concordant.

Further discussion about interpretation of findings, generalization, limitations, implications, and recommendation would be addressed in Chapter 5.

A brief overview of the problem, purpose, methodology and the findings of the study were summarized in the early sections of Chapter 5. Studies in the literature review were referenced again in next Chapter to support or contradict the results of the study. The discussion of the relevant literature together with the interpretation of the results would lead to the implications of the study. The implications of the study for leadership, health policies, and nursing would be discussed in the middle sections of Chapter 5. Then, Chapter 5 would be concluded with recommendations for leadership and future research that were beneficial to the nursing profession and advancement in nursing knowledge.

Chapter 5

Conclusions and Recommendations

Summary

The background, problem statement and literature review of this quasi-experimental pretest-posttest study highlighted the needs of an effective EBP educational intervention to improve nurses' perceived ability to implement EBP. Evidence-based practice for nursing refers to applying the best and latest evidence in nursing practice (Melnyk & Fineout-Overholt, 2015; Schmidt & Brown, 2009). Evidence-based practice is expected to improve the quality of healthcare service delivery, and nurses are expected to be capable of applying evidence to practice, which leads to improved outcomes (The Institute for Health Improvement, 2015).

The purpose of this quasi-experimental pretest-posttest study was to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP. Also, this study was focused on examining relationships between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP after the intervention. The PARiHS model was adopted to outline the study design. The core tenets of the PARiHS model, evidence, context, and facilitation, were threaded through the discussion in this chapter especially about the implications of this study. Data collected from a sample of 19 registered nurses working in a county hospital in the Bay Area in California were analyzed. The knowledge and attitude subscales of the Evidence Based Practice Questionnaire (EBPQ), the Evidence Based Practice Beliefs Scale (EBPB) Scale, and the Evidence Based Practice Implementation Scale (EBPI)

Scale were used to measure nurses' knowledge of EBP, attitudes toward EBP, beliefs about EBP, and nurses' perceived ability to implement EBP.

Two research questions were identified from the literature search. The existing literature revealed that there is a need of an effective EBP education intervention to improve nurses' knowledge and skills of EBP, attitudes toward EBP, beliefs about EBP, and their perceived ability to implement EBP (Melnyk, Fineout-Overholt, Gallagher-Ford, & Kaplan, 2012). Two hypotheses were developed from the two research questions. These two hypotheses guided the design of the study. Findings from this study have critical implications for nurse leaders and educators to reinforce the needs of EBP education programs to improve nurses' perceived ability to implement EBP in their institutions.

Forty registered nurses voluntarily participated in the study from April 2016 to November 2016. These participants were assigned to the experimental and control group randomly. During the eight months, 12 EBP courses were provided for the nurses in the experimental group to complete the intervention. The nurses in the experimental group chose the date that they could take time off to attend the course. Nine nurses in the experimental group completed the EBP educational intervention, the pretest and posttest questionnaire. Nine nurses in the control group completed the pretest and posttest survey without taking any of the EBP educational courses. A web-based survey was used for data collection. The survey included a demographic questionnaire, the knowledge and attitude subscales of the EBPQ, the EBPB Scale, and the EBPI Scale. A majority of the participants did not continue to complete the questionnaire at the third time point. Data

collected from the survey before and immediately after the intervention were extracted for statistical analysis.

When a between subject design was used to perform data analysis for Research Question 1, there was no significant difference between the pretest and posttest scores for the experimental group and control group on each dependent variable. No difference between the pretest scores for the experimental group and control group demonstrated that the two groups are equivalent. No significant difference was found between the posttest scores for the experimental group and control group on each dependent variable. The results of the between subject data analysis indicated that the null hypothesis was not rejected.

In a within subject design, the results of data analysis indicated that the null hypothesis was rejected in Research Question 1. The findings demonstrated that the nurses in the experimental group improved their knowledge and skills of EBP, their beliefs about EBP, and their perceived ability to implement EBP significantly ($p < .05$).

The sample size was too small in the experimental group to provide correct data analysis using multiple correlation tests in Research Question 2. Instead, Pearson's correlation coefficient (one-tailed) was used to examine the existence of a positive relationship between one independent variable and one dependent variable at a time. Because of statistical insignificance, the null hypothesis for Research Question 2 was accepted, and the alternative hypotheses were rejected.

Conclusion

The demographic characteristics of the experimental and control group were similar except that the majority of the participants in the experimental group were

Caucasians, and the majority of the participants in the control group were Asians and Pacific Islanders. In the within subject comparison, the study found significant effects of the EBP educational interventions on nurses' knowledge and skills of EBP, nurses' beliefs about EBP, and their perceived ability to implement EBP. In the between subject comparison, the study found no significant effects of the EBP educational interventions on nurses' knowledge of EBP, their beliefs about and attitude toward EBP, and their perceived ability to implement EBP. Also, the findings of the study did not demonstrate positive relationships between nurses' perceived ability to implement EBP and nurses' knowledge and skills of EBP, nurses' beliefs about EBP, and attitudes toward EBP. The interpretations of finding conclusion are discussed in the following paragraphs.

Discussion

Interpretations of findings and conclusions. A summary of the results was included in discussion with interpretations of the findings presented in the following sections: demographics, research questions, generalizations, limitations, and implications. The discussion included the agreement of the findings with existing literature or the contradictory to previous research. Also, the discussion covered the limitations of the study and the implications of the findings for leadership, health policy, and future research. The section was concluded with recommendations for nursing leadership and practice.

Demographics. In this quasi-experimental study, the data computed from the demographic questionnaire provided characteristics of the sample. Nine participants in the control group and nine participants in the experimental group completed the survey before and after the intervention. A majority of the participants in the control group

identified as Asian/Pacific Islanders (66.7%), followed evenly by Caucasian (11.1%), Hispanic (11.1%), and other (11.1%). Whereas, a majority of the participants in the experimental group identified as Caucasian (66.7%), followed by Asian/Pacific Islander (22.2%), and African-American (11.1%). The experimental and control groups were ethnically different. In addition, compared to the experimental group, more participants in the control group attained bachelor's degree in nursing as their highest level of nursing education (44.4% vs. 66.7%). Participants from various units were in the experimental group, and no participant from the medical, surgical, and telemetry unit was in the control group.

Research questions. Two research questions guided the quests in this study. The first research question examined the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP. The second research question addressed the existence of a relationship between nurses' EBP knowledge and skills, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP after the intervention. The results were elaborated and interpreted in sequence and relative to each research question.

RQ1: What are the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP?

The purpose of this investigation was to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP. The knowledge

and attitude subscale of the EBPQ, the EBPB Scale, and the EBP I Scale were used to support data collection. The selection of the instruments based on the literature review of the concepts of nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and their perceived ability to implement EBP. The non-parametric test, Wilcoxon signed-rank test, was an appropriate statistical test for a within subject design and a between subject design (Field, 2009; Polit, 2010; Spector, 1981). Wilcoxon signed-rank test was useful to examine the effects of an EBP educational intervention on nurses' knowledge of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perception of their ability to implement EBP.

The findings indicated that the null hypothesis for Research Question 1 was rejected based on the results from the within subject comparison. The nurses in the control group who did not receive any EBP educational intervention reported no changes in the pretest and posttest scores in all the four measures ($p > .05$). The results for the experimental group were elaborated in the following paragraph. The nurses in the experimental group who received an EBP educational intervention reported significant improvement in their beliefs about EBP ($p = .046$) on the EBPB Scale. The nurses in the experimental group reported that the EBP educational intervention helped to improve their perceived ability to implement EBP on the EBPI Scale. The experimental group reported that the EBP education intervention improved their skills in converting information needed into a research question ($p = .047$), and increasing nurses' awareness of main data types and sources ($p = .027$).

Also, the findings of the within subject data analysis indicated that the EBP educational intervention improved nurses' knowledge and skills of EBP significantly ($p =$

.034) on the knowledge and attitude subscales of the EBP. The EBP educational intervention increased nurses' knowledge of retrieving evidence (p = .016) and nurses' ability to critically analyze evidence against a set standard (p = .034). The results of this study indicated that nurses' attitudes toward EBP were not improved in the experimental group. Education alone cannot improve nurses' beliefs about EBP, EBP knowledge and skills, attitudes toward EBP, and perceived ability to implement EBP (Hauck, Winsett, & Kuric, 2012; Melnyk et al., 2016). Organizational culture supportive to EBP and positive leadership behaviors influences nurses' beliefs about EBP and attitudes toward EBP, and implement of EBP in nursing (Hauck et al., 2010; Melnyk et al., 2012; Rycroft-Malone et al., 2013). Availability of EBP mentors, adequate infrastructure and resources are considered as successful strategies to promote nurses engage in the implementation of EBP in nursing (Melnyk et al., 2012; Rycroft-Malone et al., 2013).

Forty registered nurses volunteered to participate in the study from April 2016 to November 2016. Nine participants in the control group completed the pretest and posttest survey. Nine participants in the experimental group attended the EBP course and completed the pretest and posttest survey. The version 3.1.9.2 of G Power (2014) was used to recalculate the sample size, effect size, and power for the use of Wilcoxon signed-rank test for the within subject data analysis. The calculation indicated that the effect size was .9 with the power of .63 for a sample size of 9 in the experimental group at alpha level = .05. The power of a test refers to the likelihood of rejecting the null hypothesis when the null hypothesis is incorrect (Field, 2009; Polit, 2010; Trochim, 2000). The calculated power level was .63, which meant there was 63% probability a type II error would be committed (Polit, 2010). The power level less than .8 was not

desirable (Field, 2009; Polit, 2010). The results of the dissertation study supported findings from the studies by Sherriff et al. (2007) and White-Williams et al. (2013). The findings of these studies indicated that an EBP educational intervention with didactics and workshops improved nurses' knowledge of EBP, beliefs about EBP, and the perception of their ability to implement EBP.

In a between subject design, random assignment of participants to the experimental group and control group was used in the pretest and posttest study. The Wilcoxon signed-rank test, W, was adopted for a between subject data analysis for Research Question 1. No significant difference was found in the pretest scores for the experimental and control groups, which indicated that the pretest scores for the two groups were equivalent. The effect size, r, was calculated based on the equation, $r = Z/\sqrt{N}$ (Field, 2012). Nurses' knowledge of EBP in the experimental group did not differ significantly from the control group, $W = 73.50$, $Z = -1.19$, $p > .05$, $r = -.28$. The effect size was below .3 that represented a medium effect for the knowledge of EBP. Also, nurses' beliefs about EBP in the experimental group did not differ significantly from the control group, $W = 77.50$, $Z = -.972$, $p > .05$, $r = -.236$. The effect size was below .3 that represented a medium effect on the beliefs about EBP. Furthermore, nurses' attitude toward EBP in the experimental group did not differ significantly from the control group, $W = 79.00$, $Z = -.598$, $p > .05$, $r = -.141$. The effect size was below .3 and close to .1 that represented a small to medium effect on the attitude toward EBP. Lastly, nurses' perceived ability to implement EBP in the experimental group did not differ significantly from the control group, $W = 82.00$, $Z = -.335$, $p > .05$, $r = .079$. The effect size was below .1 that represented a small effect on nurses' perceived ability to implement EBP.

RQ2: What is the relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and nurses' perception of their ability to implement EBP following implementation of the intervention?

The sample size of nine in the experimental group was too small for the correct analysis using multiple correlation tests for the originally designed Hypothesis 2. Three alternative hypotheses were developed to examine the existence of a positive relationship between two variables at a time. Pearson's correlation coefficient (one-tailed), *r*, is parametric, bivariate correlation statistical test to examine the strength of a relationship between an independent variable and a dependent variable (Field, 2012; Polit, 2010). The G-Power software was used to determine the reasonable sample size, effect size, and power for the use of Pearson correlation coefficient test. The calculated results indicated that the effect size was .78 with the power of .95 for a sample size of nine at alpha level = .05. The evidence from data analysis in Research Question 2 supported the null hypothesis. The findings suggested that no relationship was found between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perception of their ability to implement EBP following implementation of the intervention.

Pearson's r test was used to examine the relationship between bivariate variables in Research Question 2. Results revealed a non-concordant relationship between nurses' knowledge of EBP, beliefs about and attitudes toward EBP, and their perceived ability to implement EBP. The non-concordant correlations between the variables might indicate a lack of nurse engagement in EBP and their perceived inability to implement EBP. Lack of nurse engagement in EBP and their perceived inability to implement EBP might imply insufficient organizational readiness for EBP and administrative support for nurses to

implement EBP (Malloch & Porter-O'Grady, 2015; Melnyk et al., 2012; Rycroft-Malone et al., 2013). As discussed earlier, providing time for nurses to attend EBP training, supportive organizational culture, and positive leadership behavior were facilitating factors to successful EBP implementation. These factors influenced nurses' beliefs about EBP, EBP knowledge and skills, attitudes toward EBP, and perceived ability to implement EBP (Hauck, Winsett, & Kuric, 2012; Melnyk et al., 2012; Melnyk et al., 2016).

Rycroft-Malone et al. (2013) stressed that successful implementation of EBP depends on the intertwining relationship of evidence, context, and facilitation in the PARiHS model. Lack of any of these three essential components may hinder successful implementation of EBP. When the evidence was relevant and easy to use and contextual and organizational culture was supportive to EBP together with a high degree of successful facilitation, the implementation of EBP was likely successful (Rycroft-Malone et al., 2013). Lacking any of these factors might affect nurses' perceived ability to implement EBP (Rycroft-Malone et al., 2013). Evidence-based practice improved the quality of healthcare, clinical outcomes, and cost-effectiveness (Melnyk et al., 2016). Nurses' perceived inability to implement EBP was considered as a barrier to implementing evidence to practice that affected the quality of healthcare and increased healthcare costs inadvertently (Melnyk et al., 2016; Stevens, 2013).

Generalizations. The quasi-experimental design of this study provided a weak basis for a causal inference as well as a generalization (Shadish et al., 2002; Spector, 1981). Besides, the adoption of purposive sampling in this study likely introduced bias into the sample. The sample represented the target population of registered nurses employed in

public hospitals (Keele, 2011; Shadish et al., 2002). The results of the study might not be generalizable to the larger population due to lack of representativeness of the sample (Cozby & Bates, 2011).

A low response rate might be due to insufficient leadership support in the implementation of EBP in the organization across multiple levels (Dogherty et al., 2013; Stetler, Ritchie, Rycroft-Malone, & Charns, 2014). Nurses had to use their own time to complete the survey and attend the EBP educational course. Also, implementation of EBP in nursing practice had not been established as a part of performance evaluations in the organization (Stetler et al., 2014). A lack of EBP performance expectations from leaderships might hinder nurses' engagement in research-related activities, such as participating in this dissertation study (Dogherty et al., 2013; Stetler et al., 2014). A small sample size might reduce external validity to the extent that the results of this study might not be generalized beyond the sample (Shadish et al., 2002).

Similar results were found in the studies conducted by Sherriff et al. (2007) and Munroe et al. (2008). Sherriff et al. (2007) evaluated the effects of an EBP educational intervention on nurses' attitudes toward EBP and perceptions of EBP knowledge and skills. In the study, 43 registered nurses attended an EBP educational intervention and completed the questionnaire before the intervention, one week and three months after the intervention (Sherriff et al., 2007). The results indicated that an EBP educational intervention had a positive but not statistically significant effect on nurses' attitudes toward EBP and perceptions of EBP knowledge and skills. In the study conducted by Munroe et al. (2008), 40 nurses completed the pretest and posttest questionnaires after attending three EBP educational workshops. Munroe et al. (2008) study found no

significant effects of EBP education on nurses' knowledge and skills of EBP, and nurses' attitudes toward EBP because of small sample size.

Limitations. Limitations of this study included small sample size, purposive sampling, low response rate, and high attribution rates, which reduced the generalizability of the findings. The sample size was small in this study, and only nurses employed in a public hospital in the Bay Area in California were sampled. Power analysis for each hypothesis was re-calculated to ensure correct findings. In this study, Wilcoxon signed-rank test was used for data analysis in Research Question 1. In a within subject data analysis, the version 3.1.9.2 of G Power (2014) was used to recalculate the sample size, effect size, alpha level, and power of the study. The results of the computation supported that the sample size of nine was adequate to determine the effects of the intervention with large effect size at the alpha level of .05. The power was .63 with a high probability of committing type II error. In a between subject data analysis, the effect size was medium ($r < .3$) for each dependent variable between the experimental group and control group. The sample size was too small for the correct data analysis using multiple correlation tests in Research Question 2. Pearson's r test was deemed appropriate to replace multiple correlation tests in Research Question 2 after the version 3.1.9.2 of G Power (2014) was used to recalculate the sample size, effect size, alpha level, and power. The results of the computation supported that the sample size of nine in the experimental group was enough to examine the existence of a relationship between the independent variable and dependent variable with large effect size and power ($p = .05$).

Maturation and history played a threat to the internal validity of this longitudinal pretest and posttest study (Polit, 2010; Shadish et al., 2002). Two reminders were sent to

participants via email to complete the survey in the course of the study. Most of the participants completed the survey before and immediately after the intervention but did not complete the survey in the four weeks after intervention. Data analysis for the outcome measures in the fourth week was not performed because of insufficient data.

A few participants completed the survey four weeks after the intervention; data were not sufficient to evaluate the sustained effects of an EBP educational intervention. Similar results were discovered in the study conducted by Sherriff et al. in 2007. Sherriff et al. (2007) found no statistically significant effects of an EBP educational program on nurses' attitudes toward EBP and nurses' knowledge and skills of EBP. Saunders, Vehvilainen-Julkunen, and Stevens (2016) recruited 85 nurses to participate in a randomized control study. The objective of the study was to evaluate the effectiveness of an EBP education intervention. The outcomes were measured at four different times: before the intervention, within one week after, eight weeks after, and four months after the intervention. Eight nurses either withdrew from the study or did not complete the posttest survey. The attrition rates were approximately 9.4 percent. Lack of time, lack of understanding of repeated measures, and extended leave were the reasons for the attrition. Similar reasons were found accounted for the high attrition rates in this dissertation study. Future research is needed to collect evidence to examine nurses' EBP education and skill building in EBP and outcome management after completion of an EBP educational intervention over time.

Implications for leadership. Melnyk et al. (2016) surveyed 276 nurse executives across 45 states in the United States and found that the nurse leaders believed in EBP and they lacked knowledge and skills of the implementation of EBP. The

national survey revealed that the nurse executives needed educational and skills building in EBP. The results of the study showed that the EBP educational program improved nurses' knowledge of EBP, their beliefs about and attitude toward EBP, and perceived ability to implement EBP. The nurse leader should seek an efficient educational program for the development of their EBP education and skills building.

Leadership played an essential role in promoting organizational culture and developing infrastructure to support EBP (Dogherty et al., 2013; Hauck et al., 2012; Melnyk et al., 2016). Facilitation was a process of enabling the implementation of evidence into practice (Rycroft-Malone, 2004; Rycroft-Malone & Bucknall, 2010). Nurse leaders were recommended to provide EBP educational activities and mentors to help themselves and nurses to improve their EBP knowledge and skills and change their attitudes toward EBP (Melnyk et al., 2016). Nurse leaders and administrators were encouraged to adequate resources to support an implementation of EBP. The resources included financial and personnel support in establishing nurses' EBP competencies, access to the electronic library database, and time. Provision of protected time for nurses and EBP mentors were essential for successful facilitation (Munroe et al., 2008; White-Williams et al., 2013).

In a qualitative study, Dogherty et al. (2013) used a critical incident technique that might facilitate EBP mentors to enable nurses to implement evidence into their practice successfully. Five influential factors were identified to sustain nurses' behavioral changes and an organizational culture supportive of EBP implementation. First, the needs of practice changes were identified and driven by nurses at the point of care. Second, the more relevant application of the evidence is, the easier is for the nurses to

adopt the evidence effectively into practice. Third, a partnership of the multidisciplinary team members empowered the stakeholders to overcome barriers to implementing evidence to practice. Fourth, a strategic plan is highly recommended to ensure adequate resources provided for nurses. Fifth, EBP mentors or facilitators must be clinical and process experts to support staff and administration across levels. Future research was needed to discover effective strategies to promote and sustain nurses' behavioral changes and an organizational culture supportive to EBP implementation.

Implications for health policy. The Institute of Medicine (IOM) (2011) published a vision for the future of nursing and projected that 90% of healthcare decisions would be based on evidence in 2020. Ability to implement EBP was considered as one of the five competencies for the health professional educational programs (IOM, 2011). The evidence-based practice had become the driver of healthcare transformation for attaining affordable care, healthy people, and communities with improved care (Institute for Healthcare Improvement, 2015; Institute of Medicine, 2011; Melnyk et al., 2012). Barriers to implementation of EBP still existed in healthcare institutions (Melnyk et al., 2012). The main reported barriers were a lack of EBP knowledge and skills in nurses, negative attitudes toward EBP, and a lack of organizational context supportive to EBP (Melnyk et al., 2012; Pagoto et al., 2007; Rapp et al., 2010). These findings suggested that a face-to-face educational program would be an effective strategy to improve nurses' knowledge and skills of EBP. Moreover, supportive organizational culture and leadership were crucial to successful implementation of EBP. Improving nurses' ability to implement EBP and organizational

readiness for EBP implementation would increase the likelihood to meet the goals of IOM (2011) by 2020.

Implications for nursing. In 2012, Melnyk et al. conducted a representative survey with 1015 randomly selected nurses across the country to assess their readiness for EBP implementation. The findings of Melnyk et al. (2012) survey revealed that nurses were not ready to implement EBP or embrace EBP because of lack of organizational support and individual knowledge and skills, and misperceptions about EBP. This dissertation study might provide nurse educators and nurse leaders a written EBP curriculum to promote adoption and sustainability of EBP in an organization. A large pool of EBP mentors was needed to establish and sustain EBP cultures and environment throughout a healthcare system (Dogherty et al., 2013; Melnyk, 2014). Evidence-based practice mentors were usually advanced practice nurses with expert knowledge and skills of EBP to facilitate individual behavioral change and organizational culture changes (Balakas & Fineout-Overholt, 2015; Melnyk, 2014).

As demonstrated by a within subject comparison, the participants in the experimental group that received an EBP educational program with workshops had improved their knowledge of EBP, beliefs about EBP, and the perception of their ability to implement EBP significantly. The dissertation study was conducted in a public hospital. The findings indicated that the EBP educational intervention improved nurses' knowledge of EBP, beliefs about EBP, and their perceived ability to implement EBP sign in an acute care setting. Maintaining evidence-based practice competencies for practicing nurses is a paramount strategy for sustaining evidence-based nursing care and high-quality care (Keele, 2011; Melnyk & Fineout-Overholt, 2015). Nursing leaders may

adopt the EBP educational intervention to develop EBP competencies for practicing nurses in acute care settings. The intervention may help to prepare nurses to have necessary knowledge, skills, and attitudes to improve the quality and safety of the healthcare system in which they work.

Recommendations

Leadership. Organizational context including infrastructure, resources, and administrative support is related to successful implementation of EBP in an organization (Rycroft-Malone, 2004; Rycroft-Malone et al., 2010; Rycroft-Malone et al., 2013). Organization culture is a belief system of an organization (Melnyk & Fineout-Overholt, 2015; Stetler et al., 2011) that governs the practice inside and outside the organization. It takes persistent efforts to build and sustain an organizational culture. Improving EBP culture in organizations affected nurses' beliefs about EBP and their perceived ability to implement EBP positively (Ullrich et al., 2014; White-Williams, 2013). Nurse leaders and executives are in prominent positions to shape a supportive EBP culture. Organizational culture is reflected in the daily practice, vision, mission, and goals of an organization (Melnyk & Fineout-Overholt, 2015). More important, nurse leaders need to provide nurses with time, EBP educational activities, and access to resources in an organization. These organizational supports are necessary for nurses to implement EBP and correct their misperceptions about EBP (Melnyk et al., 2016).

Research. A quasi-experimental pretest and posttest research design with random assignment is a possible study design in education research in clinical settings (Cooper & Schindler, 2014; Cozby & Bates, 2011). Random assignment reduced selection bias in sampling. One of the strengths of this study included a novel approach

to using a within subject design and a between subject design to examine the effects of an educational intervention on nurses' perceived ability to implement EBP. Determination of equivalency of pretest scores for the experimental and control group increased the credibility of the findings. Another strength of this study was a calculation of effect size to test the difference of the effects of the intervention between the experimental group and the control group. However, the limitations of this study were a small sample size and purposive sampling. A large sample size is more representative of the population and is more likely to obtain a significant result in the quasi-experimental study (Cozby & Bates, 2011; Field, 2009; Trochim, 2000). In this quasi-experimental study, the sample size was too small to achieve significant results. Future studies with a larger sample size and random sampling are highly recommended to obtain significant results for generalization.

Supportive organization context and leadership to EBP is the crucial factor for successful implementation of EBP (Melnyk et al., 2016; Rycroft-Malone, 2004; Rycroft-Malone et al., 2010; Rycroft-Malone et al., 2013). Future studies are needed to assess the organizational contexts for EBP implementation and to gain some insights about the organizational readiness for EBP. The study may be replicated in another geographic region to evaluate the effects of an EBP educational intervention in different organizational contexts.

Future studies are needed to identify the facilitators to EBP implementation and to overcome the barriers. Correcting misperceptions about EBP requires a paradigm shift in healthcare organizations across the country (Dogherty et al., 2013; Melnyk et al., 2016). The paradigm shift is reflected in the standards of practice and daily practice based on the

best available evidence with improved quality of care and lower costs (Keele, 2011; Melnyk et al., 2016). Future research is needed with a larger sample size in multiple sites across the United States. A larger sample size may improve the internal and external validity of the study to demonstrate the effects of an EBP educational intervention (Cozby & Bates, 2011; Polit, 2011). Generalization can occur when a study is conducted with a larger sample size (Cozby & Bates, 2011; Polit, 2011).

Educational interventions may improve nurses' knowledge of, beliefs about, and attitudes toward EBP that enhance their perceived ability to implement EBP (Estabrooks et al., 2003; Sherriff et al., 2007). Minimal research has been focused on the effects of an EBP educational intervention on nurses' knowledge of EBP, attitudes toward EBP, beliefs about EBP, and their perceived ability to implement EBP, or correlations between these variables (Black et al., 2015). The findings of this study demonstrated that a face-to-face EBP educational program did not improve nurses' knowledge of EBP, beliefs about EBP, and their perceived ability to implement EBP. Further rigorous studies are needed to evaluate the beneficial effects of various educational strategies in teaching EBP in acute care settings. The EBP strategies may include online training, in-person classroom setting, journal clubs, and workshop (Keele, 2011: Melnyk & Fineout-Overholt, 2015).

The findings of this study do not demonstrate that there is a positive relationship between nurses' knowledge and skills of EBP, beliefs about EBP, attitudes toward EBP and their perceived ability to implement EBP. The findings are contradictory to the results found in the cross-sectional study conducted by Stokke et al. (2014). Stokke et al. (2014) found that nurses who had EBP knowledge and involved in EBP-related projects

had reported that they had strong beliefs about the positive value of EBP. Nurses who had EBP knowledge and participated in EBP-related projects stated that they were confident in their ability to implement EBP. The difference between this study and the study conducted by Stokke et al. (2014) is that majority of the participants in this study do not participate in any EBP-related improvement projects actively. Another reason for the difference is the small sample size of the dissertation study. Training on EBP in combination with active involvement in EBP-related improvement projects may improve nurses' knowledge and skills of EBP, beliefs about EBP, attitudes toward EBP, and nurses' perceived ability to implement EBP (Stokke et al., 2014). Further research is needed to examine the effects of the combination of an EBP educational intervention and involvement in EBP-related activities on nurses' perceived ability to implement EBP.

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Appendix A

Evidence Based Practice Questionnaire

Evidence Based Practice Questionnaire (EBPQ).

This questionnaire is designed to gather information and opinions on the use of evidence based practice amongst health professionals. There are no right or wrong answers for we are interested in *your* opinions and *your* own use of evidence in *your* practice.

1. Considering your practice in relation to an individual patient's care over the *past* year, how often have you done the following in response to a gap in your knowledge (please √ or X):

Formulated a clearly answerable question as the beginning of the process towards filling this gap:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Tracked down the relevant evidence once you have formulated the question:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Critically appraised, against set criteria, any literature you have discovered:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Integrated the evidence you have found with your expertise:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Evaluated the outcomes of your practice:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

Shared this information with colleagues:
Never ☐ ☐ ☐ ☐ ☐ ☐ ☐ **Frequently**

2. Please indicate (by √ or X) where on the scale you would place yourself for each of the following pairs of statements:

My workload is too great for me to keep up to date with all the new evidence	☐ ☐ ☐ ☐ ☐ ☐ ☐	New evidence is so important that I make the time in my work schedule
I resent having my clinical practice questioned	☐ ☐ ☐ ☐ ☐ ☐ ☐	I welcome questions on my practice
Evidence based practice is a waste of time	☐ ☐ ☐ ☐ ☐ ☐ ☐	Evidence based practice is fundamental to professional practice

I stick to tried and trusted methods rather than changing to anything new ☐ ☐ ☐ ☐ ☐ ☐ ☐ My practice has changed because of evidence I have found

3. On a scale of 1 to 7 (with 7 being the best) how would you rate your:

Please circle one number for each statement							
	Poor						**Best**
Research skills	1	2	3	4	5	6	7
IT skills	1	2	3	4	5	6	7
Monitoring and reviewing of practice skills	1	2	3	4	5	6	7
Converting your information needs into a research question	1	2	3	4	5	6	7
Awareness of major information types and sources	1	2	3	4	5	6	7
Ability to identify gaps in your professional practice	1	2	3	4	5	6	7
Knowledge of how to retrieve evidence	1	2	3	4	5	6	7
Ability to analyze critically evidence against set standards	1	2	3	4	5	6	7
Ability to determine how valid (close to the truth) the material is	1	2	3	4	5	6	7
Ability to determine how useful (clinically applicable) the material is	1	2	3	4	5	6	7
Ability to apply information to individual cases	1	2	3	4	5	6	7
Sharing of ideas and information with colleagues	1	2	3	4	5	6	7
Dissemination of new ideas about care to colleagues	1	2	3	4	5	6	7
Ability to review your own practice	1	2	3	4	5	6	7

4. Finally, some information about you:

Your profession:_____ Year qualified:_____

Your position/grade:_____ Your specialty:_____

Please circle the most appropriate answer as it concerns you:

Your sex: Male Female

Your age range: 20-29 30-39 40-49 50-59 60-69

Please use this space to write any comments you wish.

Please return your questionnaire in the Freepost envelope provided.
All information will be treated as confidential and will not be traceable to individuals.

Appendix B

Evidence Based Practice Beliefs Scale

Below are 16 statements about evidence-based practice (EBP). Please circle the number that best describes your agreement or disagreement with each statement. There are no right or wrong.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
1. I believe that EBP results in the best clinical care for patients.	1	2	3	4	5
2. I am clear about the steps of EBP.	1	2	3	4	5
3. I am sure that I can implement EBP.	1	2	3	4	5
4. I believe that critically appraising evidence is an important step in the EBP process.	1	2	3	4	5
5. I am sure that evidence-based guidelines can improve clinical care.	1	2	3	4	5
6. I believe that I can search for the best evidence to answer clinical questions in a time efficient way.	1	2	3	4	5
7. I believed that I can overcome barriers in implementing EBP.	1	2	3	4	5
8. I believe that I can overcome barriers in implementing EBP.	1	2	3	4	5
9. I am sure that implementing EBP will improve the care that I deliver to my patients.	1	2	3	4	5
10. I am sure about how to measure the outcomes of clinical care.	1	2	3	4	5
11. I believe that EBP takes too much time.	1	2	3	4	5
12. I am sure that I can access the best resources in order to implement EBP.	1	2	3	4	5

13. I believe EBP is difficult.	1	2	3	4	5
14. I know how to implement EBP sufficiently enough to make practice changes.	1	2	3	4	5
15. I am confident about my ability to implement EBP where I work.	1	2	3	4	5
16. I believe the care that I deliver is evidence-based.	1	2	3	4	5

Appendix C

Evidence Based Practice Implementation Scale

Below are 18 questions about evidence-based practice (EBP). Some health care providers do some of these things more often than other health care providers. There is no certain frequency in which you should be preforming these tasks. Please answer each question by circling the number that best describes how often each item has applied to you in the past 8 weeks.

In the past 8 weeks, I have:

	0 times	1-3 times	4-5 times	6-7 times	8 or more times
1. Used evidence to change my clinical practice…					
2. Critically appraised evidence from a research study…					
3. Generated a PICO question about my clinical practice…					
4. Informally discussed evidence from a research with a colleague…					
5. Collected data on a patient problem…					
6. Shared evidence from a study or studies in the form of a report or presentation to more than 2 colleagues…					
7. Evaluated the outcomes of a practice change…					
8. Shared an EBP guideline with a colleague…					
9. Shared evidence from a research study with a patient/family member…					
10. Shared evidence from a research study with a multi-disciplinary team member…					
11. Read and critically appraised a clinical research study…					
12. Accessed the Cochrane database of systematic reviews…					
13. Accessed the National Guidelines Clearinghouse…					
14. Used an EBP guideline or systematic review to change clinical practice where I work…					

15. Evaluated a care initiative by collecting patient outcome data…
16. Shared the outcome data collected with colleagues…
17. Change practice based on patient outcome data…

Appendix D

Demographic Survey

Participant Code Number _____

Questions (circle the appropriate answer)	1	2	3	4	5
What is your age group?	20 - 29	30 – 39	40 - 49	50 – 59	60 - 69
Circle the response appropriate for your gender.	Female	Male			
What is your ethnicity?	Caucasian	African American	Hispanic or Latino	Asian/Pacific Islander	Other
What is your highest degree in nursing?	ADN	BSN	MS/MSN	DNP	PhD
How many years of experiences do you have in nursing?	< 10 years	10 – 20 years	20 – 30 years	30 – 40 years	> 40 years
What is your primary role?	Staff nurse	Charge nurse	Quality manager	Nurse manager	Others (please Specify)
What is your unit?	Med/Surg	Telemetry	IMCU	ICU	Others (please Specify)

Note. Med/Surg = Medical and Surgical units; IMCU = Intermediate Care Unit; ICU = Intensive Care Unit.

Appendix E

An EBP Educational Intervention Design

Name	Evidence-based Practice (EBP)
Instructional goals	1. The nurse will be able to improve knowledge, skills, and attitudes toward EBP. 2. The nurse will be able to implement EBP. These are great goals.
Standards	Evidence-based practice is a problem solving approach to deliver health care with integration of the evidence with clinical expertise, and patient preferences and values resulting in the highest quality of health care and patient outcomes (Melnyk, Fineout-Overholt, Stillwell, & Williamson, 2010). Federal pay-for-performance programs offer incentives and foster health care organizations to provide outcomes-driven evidence-based practice. Medicare no longer reimburses hospitals for treating preventable hospital acquired injuries or infection, such as falls, pressure ulcer, and ventilator associated pneumonia. In addition, the Academy of Medical-Surgical Nursing (2012) established a standard for requiring nurses to "apply research findings in practice decisions, identify problems for research, and when appropriate, participate in the research process" (p.6).
Program length	Six instructional hours and 90-minutes workshop
Delivery method	Lectures with handouts, small group discussion, questioning, and written exercises.
Number of units	Four units
Number of lessons in each unit	Two to four lessons in each unit
Topics of lessons	Evidence-based Practice Unit 1 (1.75 CEs): Lesson 1 – Overview of the PARiHS model (15 min) Lesson 2 – Introduction of the seven steps of evidence-based practice (30 min) Lesson 3 – Ask a PICOT question (30 min) PICOT is an acronym for the clinical question: patient population (P), intervention (I), comparison intervention (C), outcomes (O), and time (T) it takes for the intervention to achieve the outcomes. Lesson 4 – Search for evidence and workshop (30 min) Evidence-based Practice Unit 2 (1.5 CEs): Lesson 1 – Determine the level of evidence (15 min)

	Lesson 2 – Discuss steps of the critical appraisal process (30 min) Lesson 3 – Appraisal: Worth to practice (small group exercise) (15 min) Evidence-based Practice Unit 3 (1.5 CEs) Lesson 1 – Planning for sustainable change (30 min) Lesson 2 – Implementing an evidence-based practice change (30 min) Lesson 3 – Roll out the revised rapid response team (30 min) Evidence-based Practice Unit 4 (1.25 CEs) Lesson 1 – Dissemination of the evidence (30 min) Lesson 2 – Sustaining evidence-based practice change through organizational policies and an innovative model (30 min) Evaluation, Questions and Answers (15 min)
Assessment plan	Nurses are invited to voluntarily participate in the evidence-based practice (EBP) training course because they believe that this course will provide them knowledge and skills that they need to implement EBP and improve patient care. Bloom's taxonomy is appropriate for assessing nurses' abilities of implementing EBP and developing course design. The educators use the mnemonic ABCD to determine objectives, expected behaviors, and outcome measures written as competencies. A stands for audience (registered nurses). B stands for behavior. C stands for condition. D stands for degree. Educators will develop lesson plan in mapping the course objectives, content, and activities to help nurses achieve the competencies identified early in the planning phase of the course design.

Lesson Design

Evidence-based Practice Part 1	
Lesson Topic and length	Lesson 1 – Cultivation of a spirit of inquiry (15 min) Lesson 2 – Introduction of the seven steps of evidence-based practice (30 min) Lesson 3 – Ask a PICOT question (30 min) PICOT is an acronym for the clinical question: patient population (P), intervention (I), comparison intervention (C), outcomes (O), and time (T) it takes for the intervention to achieve the outcomes.

	Lesson 4 – Search for evidence and workshop (30 min) Workshop (30 minutes) – use a workbook as a guide to develop a clinical problem using the PICOT

Lesson Objectives

- Applying the seven steps of evidence-based practice

  Competency: The participants will apply the seven steps of evidence-based practice in solving clinical problems and making decisions based on evidence.

  Explain: Evidence-based practice is a progressive and sequential process to integrate the best practice from well-designed studies with clinical expertise, and patient's preference and value into clinical practice (Melnyk, Fineout-Overholt, Stillwell, & Williamson, 2010).

- Using an online library database to perform literature search

  Competency: Using an online library database, the nurse will perform a literature search on a clinical question obtaining at least five scholarly resources.

  Explain: "Nurses play a key role in quality initiative for patient care improvements, and lead efforts to implement best practice in patient care" (American Nurses Credentialing Center, 2013).

- PICOT

  Competency: The nurse will formulate a PICOT question to evaluate the most current evidence-based practice.

  Explain: "The PICOT question is a consistent, systematic way to identify the components of a clinical issue" (Stillwell, Fineout-Overholt, Melnyk, & Williamson, 2010, p. 59).

Instructional Strategies and Activities

- Lectures: with PowerPoint
  Rationale: Engaging learners with multiple learning styles, increasing visual impact, and improving audience attention.

- Self-instruction: Using a workbook to guide nurses to develop a PICOT clinical questions
  Rationale: Provide a guided exercise for nurses to have hands on practice.

- Computer assisted instruction search: Practice online database to search the evidence.
  Rationale: Provide hands on practice to master the skills of database search using key words.

Media Analysis

PowerPoint slides, laptop, projector, computer, workbook
Assessment Plan
With the use of class activities and the workbook, all participants will meet the learning objectives by identifying a clinical question and using an online database to search the literature and evidence on the identified clinical problem.

Lesson Design

Evidence-based Practice Unit 2	
Lesson Topic and Length	Lesson 1 – Determine the level of evidence (15 min) Lesson 2 – Discuss steps of the critical appraisal process (30 min) Lesson 3 – Appraisal: Worth to practice (small group exercise) (15 min) Workshop (30 minutes) – the group will determine the level of evidence of the selected studies and assess the validity of the studies.
Lesson Objectives	
• Distinguish the hierarchy of evidence for intervention studies Competency: Nurses will classify the selected studies into categories according to study design. What are the criteria to evaluate competency? Explain: Nurses needs to understand how to determine the levels of evidence, how well the study was conducted, and how useful the evidence to practice. • Critically appraise literature. Competency: Given the critical appraisal guide, the nurse will appraise the selected studies critically. Again, what are the criteria for successful attainment of the objective? Explain: Critical appraisal of evidence is an important step to determine the validity and applicability of the evidence to practice. • Synthesis data. Competency: Given appropriate computer software, the nurse will create an accurate table including findings, levels of evidence, intervention, and outcome measures. Explain: As nurses consider the synthesis of the evidence, they will identify the criteria for implementing the intervention, and evaluating the outcomes.	
Instructional Strategies and Activities	

• Lectures: PowerPoint lectures, discussion, real-life examples Rationale: Engaging learners with multiple learning styles, increasing visual impact, and improving audience attention. • Small group problem-based learning: small group exercise provides an opportunity for the nurses to share ideas and knowledge while working on the exercise on determining the levels of evidence and synthesizing data.
Media Analysis
PowerPoint slides, laptop, projector, computer, workbook
Assessment Plan
• Nurses will divide into groups of 3 or 4 people to work on the exercises. Group discussion will lead to the identification of alternatives where participants must evaluate and select the needed interventions. Use of this type of group exercise also encourages critical thinking and constructive communication. Providing immediate feedback to the participants on how they are doing at all times will assist in modifying their beliefs, attitudes, and performance to improve. With the use of a given template, each group will complete a table including the selected studies, levels of evidence, interventions, and outcomes measures.

Lesson Design

Evidence-based Practice Part 3 and 4	
Lesson Topic and Length	Evidence-based Practice Unit 3 Lesson 1 – Planning for sustainable change (30 min) Lesson 2 – Implementing an evidence-based practice change (30 min) Lesson 3 –Implement the sepsis mortality reduction quality improvement project (30 min) Evidence-based Practice Unit 4 Lesson 1 – Dissemination of the evidence (30 min) Lesson 2 – Sustaining evidence-based practice change through organizational policies and an innovative model (30 min) Evaluation, Questions and Answers (15 min) Workshop (30 minutes) – the group will combine the skills of EBP with principles of organizational change and PDSA to implement EBP.
Lesson Objectives	
• Develop an implementation plan. Competency: The nurse will use the checkpoint template to determine the steps for developing an implementation plan. Explain: A strategic plan is needed to create an education, implementation, and communication plan to present to the stakeholders.	

- Develop strategies to engage stakeholders.

  Competency: The nurse will discuss the critical steps and strategies to engage stakeholders.
  Explain Engagement of stakeholder is important to eliminate barriers to successful implementation of change.

- Sustaining evidence-based practice changes.

  Competency: The nurse will formulate necessary steps in creating an evidence-based practice policy.
  Explain: Developing an organization policy based on evidence prepares an environment for changes in practice and sustain the changes.

- Evaluating the outcomes of an evidence-based intervention.

  Competency: The nurse will develop an evaluation plan for practice changes with the quality department.
  Explain: Quality improvement dashboard produces reliable knowledge and feedback mechanism to the evidence based practice and the strategies used to implement the changes.

Instructional Strategies and Activities

- Lectures: PowerPoint lectures
  Rationale: Engaging learners with multiple learning styles, increasing visual impact, and improving audience attention.
- Humor and storytelling: Using humorous real-life examples
  Rationale: Humor and fun brings enthusiasm, positive feelings, and helps the participants feel more comfortable and open to learning.
- Group discussion: The class will be divided into several small groups for discussion.
  Rationale: Group discussion stimulates critical thinking, and challenges the learners to think more deeply and articulate their ideas more clearly.

Media Analysis

PowerPoint slides, laptop, projectors, computers for literature search

Assessment Plan

The learning objectives will be evaluated on the completion of the workbook and the group discussion in the class by discussing key strategies for implementation plan and disseminating evidence. In the last hour of the training course, each group will present its project including a clinical question, literature search, literature appraisal, intervention, and an implementation plan.

AUTHOR BIOGRAPHY

I received a nursing diploma in Hong Kong, a Bachelor degree in nursing from University of Hawaii, a Master's degree in Science from University of California, San Francisco. Currently, I am studying in University of Phoenix and pursuing a doctoral degree in nursing. In the past 18 years after moving to San Francisco from Hawaii, I had years of experience in nursing management and education. I had been an assistant nurse manager, a clinical nurse specialist in a critical care unit, and a teaching faculty in a for-profit private nursing school. Now, I am working as a nurse educator in a county hospital. In the blink of an eye, I have been working in this hospital over six years.

In addition, I had served as a clinical reviewer for Elsevier to review the critical care nursing skills in the year of 2014 and 2015. Striving for excellence and passing the baton to next generation are my goals of nursing career path in next ten years. I had mentored nursing students to complete their capstone projects. It is a very rewarding experience to nurture younger nurses to grow professional. In my spare time, I like walking my dogs, hiking, and gardening.