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Improving Evidence-based Practice Skills of Practicing Registered Nurses

Lora K. Moore
Western Kentucky University, lora.moore@wku.edu

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Acknowledgments

As I pause to ponder the effect of those dear to me during this journey, I am truly humbled and thankful. Thankful for their words of encouragement, continued support, and most importantly their understanding when I went to my room and shut my door to work. I am truly blessed with a wonderful family.

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Abstract

This study evaluated the effect of an educational intervention on improving evidence-based nursing practice (EBP) skills of practicing nurses. In addition, the effects of educational preparation and years of nursing experienced were examined. Using a quasi-experimental pretest-posttest design, the Evidence Based Practice Questionnaire (EBPQ) was administered to a convenience sample of registered nurses from a large regional hospital. The experimental group completed an online EBP educational intervention, the first control group completed an alternate unrelated educational intervention, and the second control group was not provided any type of educational intervention. No significant differences were noted in EBPQ subscale scores of practice, attitude, or knowledge/skills from pre- to posttest for any of the three groups. In addition, no statistical difference in EBPQ subscale scores in regards to educational preparation or years of experience were noted. While use of computer based learning modules are cost efficient and offer several benefits when educating such a diverse population as healthcare professionals, this study demonstrated that use of an online independent learning module as the only strategy may not necessarily be the most effective method for teaching EBP knowledge and skills to practicing nurses.

Keywords: evidence-based practice, nursing, educational intervention

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Evidence-based practice (EBP) incorporates the best research available along with clinical expertise and patient values when making decisions regarding patient care (Duke University, 2013). EBP as a concept is not new but the Institute of Medicine's (Institute of Medicine [IOM]) 2001 report *Crossing the Quality Chasm: A New Health System for the 21st Century* and subsequent IOM reports have brought much needed attention to the concept (Estrada, 2009). The 2001 IOM report identified the use of EBP as one of ten guidelines for healthcare reform emphasizing its role in improving quality and lowering costs (IOM, 2001).

Background and Significance

The literature documents the positive improvements in healthcare quality and patient outcomes as a result of EBP. However, despite EBP's essential role in delivering high quality healthcare, implementation of EBP at the bedside has been difficult to achieve (Melnyk & Fineout-Overholt, 2011). Significant gaps between current research and actual practice have been identified (Curran, Grimshaw, Hayden, & Campbell, 2011; Mollon et al., 2012) and must be addressed in effort to increase utilization of EBP. Regulatory and credentialing agencies such as Joint Commission and the American Nurses Credentialing Center also support the use of EBP through standards requiring use of EBP and achievement of established patient outcomes (American Nurses Credentialing Center, 2014; Fineout-Overholt, Levin, & Melnyk, 2004/2005; Hudson, Duke, Haas, & Varnell, 2008; Joint Commission, 2010). Today's healthcare organizations are challenged to implement EBP in order to achieve the best patient outcomes, maximize payment for services provided (Hauck, Winsett, & Kuric, 2012), decrease healthcare costs (Estrada, 2009; Melnyk & Fineout-Overholt, 2011), increase nurse satisfaction and retention (Levin, Fineout-Overholt, Melnyk, Barnes, & Vetter, 2011), and grow customer base

(Pierson & Schuelke, 2009). Customer base is influenced by EBP as many of today's consumers are well informed and utilize publicly available patient outcome data when choosing healthcare providers and/or healthcare facilities (Pierson & Schuelke, 2009).

Problem Statement

EBP is essential in delivering the highest quality of healthcare possible. Implementing and maintaining a culture of EBP requires healthcare providers to possess particular knowledge and skills. Registered nurses as a collective group may not currently have the knowledge and skills needed to implement and maintain EBP due to lack of educational preparation.

Purpose of the Project

There are four purposes of this project. First, this project attempts to improve registered nurses' practice, attitudes, and knowledge and skills related to EBP. Second, this project will evaluate the effectiveness of an EBP educational intervention on registered nurses' practice, attitudes, and knowledge/skills of EBP. The third project purpose is to examine the relationship between educational preparation and registered nurses' practice, attitudes, and knowledge/skills of EBP. The fourth and final project purpose is to examine the relationship between years of nursing experience and registered nurses' practice, attitudes, and knowledge/skills of EBP.

Clinical Questions

There are two clinical questions that will be addressed during this project. The clinical questions are as follows:

- Among registered nurses in a selected population, how does an EBP educational intervention compared to a non-EBP educational intervention or no intervention affect nurse practice, attitude, and knowledge/skills of EBP?

- Among registered nurses in a selected population, how does educational preparation or years of nursing experience affect nurse practice, attitude, and knowledge/skills of EBP?

Background

Evidence-based practice (EBP) is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). This frequently used definition of EBP is by Dr. David Sackett, a pioneer in evidence-based practice. While the concept of EBP is not new, The IOM 2001 report *Crossing the Quality Chasm: A New Health System for the 21st Century* brought much needed attention to the concept. The report defined EBP as "the integration of best research evidence with clinical expertise and patient values" (IOM, 2001, p. 147) and included the use of evidence-based decision making as one of the "Ten Rules for Health Care Reform".

The originator of the EBP movement is commonly noted as the British epidemiologist, Dr. Archie Cochrane, who encouraged healthcare providers to use systematic reviews when making healthcare decisions as far back as 1972 (Fineout-Overholt, Melnyk, & Schultz, 2005). With Dr. Cochrane's encouragement and the support of other medical professionals, the Cochrane Center was established in 1992 with the primary purpose of creating and disseminating systematic reviews for healthcare interventions (The Cochrane Collaboration, 2014). Since its introduction in the early 1990's, the demand for EBP has expanded to include other health professions including nursing (Heiwe, Johansson, Nilsson-Kajermo, Saflund, & Odlund, 2013). The transition of EBP into nursing has resulted in the creation of several models in effort to implement EBP into everyday nursing practice (Fineout-Overholt et al., 2005).

EBP is essential to delivering the highest quality of healthcare and ensuring the best patient outcomes. Although globally recognized as such, EBP has encountered difficulty in its implementation at the bedside (Melnyk & Fineout-Overholt, 2011). Substantial gaps between practice and current research have been identified (Mollon et al., 2012) and must be addressed in effort to increase implementation of EBP. One reason for this gap in practice is that registered nurses as a collective group do not have the knowledge and skills needed to implement and maintain EBP.

Effective implementation of EBP requires participation by all healthcare providers. Nurses, by far the majority of healthcare providers, are poised to play an invaluable role in changing the healthcare system of the future. With direct patient care roles, nurses have a unique opportunity to implement EBP that not only improves patient outcomes but also places economic value on their actions (IOM, 2010). Unfortunately registered nurses, as a collective group, may lack the knowledge and skills needed to implement and maintain a culture of EBP due to lack of educational preparation (Kajermo et al., 2008; Koehn & Lehman, 2008; Linton & Prasun, 2013). The mean age of registered nurses places their nursing education some twenty years ago or so when EBP skills were not incorporated into nursing education programs (Kajermo et al., 2008; Pravikoff, Tanner, & Pierce, 2005). Even graduates of today's nursing programs are often not exposed or have limited exposure to research utilization compounding the issue even further (Pravikoff, Tanner, & Pierce, 2005).

Rarely do nurses report utilizing EBP in decision-making related to patient care. Instead, nurses report their decision-making as commonly based on prior personal clinical experiences and tradition (Koehn & Lehman, 2008). Additional factors noted as influential in the decision-making processes of nurses are educational preparation, personal values, knowledge, and

organizational practices (Hutchison & Johnston, 2006). Practicing nurses of today have varying levels of knowledge and skill related to EBP depending greatly on their educational preparation, level of experience, and interest in EBP. With pre-licensure educational programs of practicing registered nurses varying from diploma/associate to master's level, so does the exposure to EBP within their respected educational programs vary (Fink, Thompson, & Bonnes, 2005). Overcoming this lack in EBP knowledge and skills is essential to successful implementation of EBP. Therefore, the challenge exists to develop the EBP skills of practicing nurses.

Developing a culture of EBP in nursing takes time and considerable resources. Organizations need to assess nurses' practice, attitudes, and knowledge/skills of EBP in addition to organizational readiness and barriers to EBP in order to develop educational interventions that are most effective in meeting the needs of the organization (Melnyk, Fineout-Overholt, Giggleman, & Cruz, 2010). While the importance of EBP to healthcare is well documented, so too is the need to educate health care professionals in regards to EBP. The 2003 IOM report *Health Professions Education: A Bridge to Quality* highlighted the importance of educating healthcare professionals as did studies by Brown, Wickline, Ecoff, and Glaser (2009), Koehn & Lehman (2008), Mollon et al. (2012), and Sherriff, Wallis, & Chamboyer (2007). The education of practicing nurses is a crucial step in moving an organization or the healthcare system in general towards a culture of EBP (Linton & Prasun, 2013; Rolloff, 2010). Educational interventions have shown positive influence on nurses' attitudes, knowledge/skills, and practice of EBP (Varnell, Haas, Duke, & Hudson, 2008; Levin et al., 2011; Sherriff et al., 2007).

Strategies utilized for implementing EBP into clinical practice often include educational components (Heiwe et al., 2013). Fineout-Overholt, Levin, & Melnyk (2004/2005, p. 30) agree that "EBP knowledge and skills can be gained through both formal and continuing education and

self-paced, on-line tutorials". The variety of educational delivery formats is well-suited for nurses, as the vast number of nurses with varying levels of education, schedules, geographical location, etc. requires creative delivery methods. Computer based technology is favored as an effective and cost-efficient method to educate nurses in regards to utilization of EBP (Hart et al., 2008). Computer web-based instruction has numerous benefits including flexibility of time and location (Adams, 2004; Schmitt, Titler, Herr, & Ardery, 2004), updatable with changing practice, and offers just-in-time learning when needed (Pullen, 2006). In addition, healthcare professionals have shown preference for self-paced web-based educational courses (Pullen, 2006).

Theoretical Framework

The theoretical framework for this study is Rogers' Diffusion of Innovation Theory which has been used previously in nursing studies as a theoretical framework explaining the progression of research utilization in nursing practice (Kim et al., 2013; Mollon et al., 2012; Fink et al., 2005; Schmitt et al., 2004). The Diffusion of Innovation Theory identifies succinct stages in which one passes when adopting a new practice or behavior (Olade, 2004). Rogers identifies five stages in which one will progress when adopting a new innovation. The five stages include knowledge, persuasion, decision, implementation, and confirmation (Schmidt & Brown, 2007). This project will attempt to address the knowledge and persuasion stages of the theory, with the innovation being defined as EBP knowledge and its value to practice. Shirey (2006) identifies questions considered during each stage of the diffusion theory. During the knowledge stage, at which time participants will be exposed to the concept of EBP through an online learning module, questions to be addressed include: (1) What is EBP? (2) How does EBP work? and (3) Why does EBP work? During the persuasion stage, participants will determine their attitude

toward EBP by asking: (1) What if I implement EBP? and (2) What are the advantages to implementing EBP (Shirey, 2006)?

Significance

This study attempts to address the existing challenge of developing the EBP skills of registered nurses at a regional hospital through an educational intervention. In addition the study attempts to measure the effectiveness of an online EBP educational intervention and evaluate the influence of educational preparation and years of experience on nurse attitudes, practice, knowledge/skills of EBP prior to and after an educational intervention. Furthermore, this study addresses limitations of previous EBP research studies through its quasi-experimental methodology utilizing two control groups. Most previous similar studies have been non-experimental or descriptive in design preventing interpretation of causality and generalization to a broader population.

System or Population impact

From an organizational standpoint, this study is a positive move towards developing a culture of EBP within the healthcare organization. Organizational support through continued educational programs and availability of EBP resources will ultimately lead to high quality care and improved patient outcomes. Additional organizational benefits from utilizing EBP include decreasing health care costs (Melnyk & Fineout-Overholt, 2011), maximizing payment for services provided (Hauck et al., 2012), and increasing nurse satisfaction (Levin et al., 2011) and retention. EBP also influences customer base, as many of today's consumers are well informed and utilize publicly available patient outcome data when choosing healthcare providers and/or healthcare facilities (Pierson & Schuelke, 2009). Organizational attainment and maintenance of various accreditation standards and certifications is also influenced by EBP as EBP promotes

high quality care and improved patient outcomes. In summary, EBP is an essential component of today's nursing practice and greatly influences not only patients and organizations but registered nurses as well.

Implementing a culture of EBP does not come without initial costs. Initial expenses include educating nursing staff, providing resources needed for EBP, and supporting nursing staff during implementation of EBP. Organizational fixed costs related to creating a culture of EBP include making resources available to nursing staff and increased staffing to allow time for resource utilization. While implementing a culture of EBP does come with costs, the future cost savings associated with a culture of EBP are enormous. The literature clearly documents the positive relationship between EBP and improved patient outcomes, increased nurse satisfaction, and increased nurse retention (Duffield, Roche, Blay, & Stasa, 2010). Improved patient outcomes lead to improved financial reimbursement, decreased healthcare costs, and increased facility selection based on publicly available patient outcomes. Increased nurse satisfaction and retention is another definite cost savings to a healthcare organization, as increased nurse turnover rates have numerous negative consequences. Recruiting and training a replacement nurse is expensive (Duffield et al., 2010). Jones (2008) estimated the turnover cost per nurse in the U.S. to be $82,000 - $88,000 which does not include loss of any educational expense that the healthcare facility may have made on behalf of the employee (Flinkman, Leino-Kelpi, & Salantera, 2010). In addition to being costly, increased nurse turnover rates are associated with negative patient outcomes (Gess, Manojlovic, & Warner, 2008) and decreased nurse staff satisfaction (Moseley, Jeffers, & Patterson, 2008). Increase nurse turnover decreases remaining staff morale and places additional workload burden on remaining nursing staff through inadequate staffing ratios and mentoring new replacement nurses. Nurses leave the profession

due to inadequate staffing ratios, unfavorable work-life, and lack of autonomy (Kleinman, 2004). The loss of knowledge and experience when a nurse leaves the profession is immeasurable and negatively affects patient care outcomes (Gess et al., 2008).

From a financial standpoint, healthcare facilities must be proactive in their quest to control costs or face nonexistence. With changes in reimbursement moving towards value-based purchasing, healthcare facilities must ensure the best patient outcomes in order to minimize costs and to receive maximum reimbursement for services provided (Hauck et al., 2012). Evidence-based practice is essential to delivering the highest quality of healthcare and ensuring the best patient outcomes (Melnyk & Fineout-Overholt, 2011). Organizations need to invest time, resources, and funding in order to prepare their registered nurses for EBP. So while the literature lacks documentation of how particular educational interventions related to EBP are cost effective, it is abundant in stating the positive relationship between EBP and cost-effectiveness of healthcare in general. Therefore, the future potential in cost savings related to EBP is definitely worth the effort and initial expense. EBP will play a key role in the financial stability of healthcare organizations in the future.

Critical Review of Pertinent Literature

Target Population

Nurses are members of by far the largest healthcare profession and have an immeasurable impact potential on patient outcomes. Unfortunately, the majority of nurses lack the knowledge and skills needed to implement and maintain a culture of EBP due to lack of educational preparation (Kajermo et al., 2008; Koehn & Lehman, 2008; Linton & Prasun, 2013). As nursing research and research utilization are not routinely taught to students in associate or diploma programs and incorporation of research utilization in baccalaureate programs varies, over half of today's practicing nurses did not have exposure to EBP within their educational programs.

According to the 2010 U. S. Department of Health and Human Services report, *The Registered Nurse Population,* 36.1% of RNs have an associate degree as their highest level of nursing education and 13.9% are at the diploma level. As a result, overcoming this lack in EBP knowledge and skills is essential to successful implementation of EBP. Therefore, the challenge exists to develop the EBP skills of practicing nurses.

Systematic Review

Numerous studies have assessed organizational readiness to implement EBP, barriers to implementing EBP, and nurses' attitudes, beliefs, and knowledge/skill of EBP (Koehn & Lehman, 2008; Bonner & Sando, 2008; Brown, Wickline, Ecoff, & Glaser, 2009; Heiwe et al., 2011). However, the literature is lacking in knowledge related to the effects of educational programs on organizational readiness to implement EBP, barriers to implementing EBP, and nurses' attitudes, beliefs, and knowledge/skill of EBP (Mollon et al., 2012; Sherriff et al., 2007).

This literature review focused on finding research examining the relationship between nurses' attitudes, beliefs, and knowledge/skills of evidence-based practice and an educational intervention to promote evidence-based nursing practice. While nine studies were found that met the inclusion criteria of an educational intervention only eight of those studies utilized a pre- and post-intervention assessment of nurses' attitudes, beliefs, and knowledge/skills of evidence-based practice before and after implementation of an educational intervention. Similarities between the studies were nearly nonexistent. Educational strategies utilized varied for each study as did the length of implementation period and measurement instrument(s). Although each of the nine studies did include registered nurses, some studies incorporated a more general sample of healthcare providers. Despite the variation in study designs, educational interventions, and measurement instruments, similarities did exist in that all but two studies reported increased

scores of EBP from pre- to post-survey after implementation of an EBP educational intervention. While improvement in EBP scores were noted for most, not all were statistically significant.

Of the nine peer-reviewed studies published from 2005-2014 exploring the effects of an educational intervention on EBP, three utilized a quasi-experimental approach with one being a time series (Sherriff et al., 2007) and the other two a pre- and post-test design (Hart et al., 2008; Kim et al., 2013). The remaining six studies (Fink et al., 2005; Hauck et al., 2012; Linton & Prasun, 2013; Melnyk et al., 2010; Mollon et al., 2012; Pierson & Schuelke, 2009) were descriptive studies with all but one utilizing a pretest-posttest design. Table 1 summarizes the research design of the nine identified studies.

Table 1

Research Study Design

Study	Design
Fink et al., 2005	Descriptive pre- and post-test
Hart et al., 2008	Descriptive, quasi-experimental with one group
Hauck et al., 2012	Prospective, descriptive comparative
Kim et al., 2013	Quasi-experimental, pre- and post-test with a control group
Linton & Prasun, 2013	Descriptive retrospective study
Melnyk et al., 2010	Descriptive, correlational
Mollon et al., 2012	Descriptive pre- and post-test
Pierson & Schuelke, 2009	Descriptive pre- and post-test
Sherriff et al., 2007	Quasi-experimental, interrupted time series

Instruments varied across studies (see Table 2), with three of the studies (Hauck et al, 2012; Melnyk et al., 2010; Pierson & Schuelke, 2009) using the Evidence-based Practice Beliefs (EBPB) scale, the Evidence-based Practice Implementation (EBPI) scale, and the Organizational Culture and Readiness for System-wide Integration of Evidence-based Practice (OCRSIEP) scale. Studies by Fink et al. (2005) and Mollon et al. (2012) utilized the BARRIERS to Research Utilization Scale). In addition, Mollon et al. (2012) and Kim et al. (2013) utilized the Clinical Effectiveness and Evidence-based Practice Questionnaire (EBPQ) developed by Upton and Upton and Fink et al. (2005) also used the Research Factor Questionnaire (RFQ). Linton & Prasun (2013) also used the EBPQ in addition to the Attitudes to Evidence-Based Practice Questionnaire developed by McKenna et al. A research questionnaire designed by Nagy et al. was used by Sherriff et al. (2007) and Hart et al. (2008) to measure nurse attitudes, perceptions, and knowledge/skills regarding EBP. Lastly, Pierson and Schuelke (2009) also used both the Group Cohesion Scale (GCS) and the Price and Mueller Job Satisfaction (JSS) questionnaire. Internal consistency reliability scores and content validity were reported for each of the instruments utilized except for Sherriff et al. (2007).

Table 2

Measurement Instruments Utilized by Study

Study	Instrument(s)
Fink et al., 2005	BARRIERS, RFQ
Hart et al., 2008	Nagy et al. questionnaire
Hauck et al., 2012	OCRSIEP, EBPB, EBPI
Kim et al., 2013	EBPQ, BARRIERS
Linton & Prasun, 2013	EBPQ, McKenna et al. questionnaire
Melnyk et al., 2010	OCRSIEP, EBPB, EBPI
Mollon et al., 2012	EBPQ
Pierson & Schuelke, 2009	OCRSIEP, EBPB, EBPI, JSS, GCS
Sherriff et al., 2007	Nagy et al. questionnaire

Educational strategies to improve EBP in the studies were as varied as the instruments utilized and are noted in Table 3. Pierson and Schuelke (2009) utilized adult learning theory and developed an EBP independent study packet with post-learning activities to reinforce learning while Sherriff et al. (2007) utilized a four hour EBP workshop and accompanying workbook. Both Hauck et al. (2012) and Fink et al. (2005) utilized multiple strategies including but not limited to journal clubs, research-focused grand rounds, EBP champions, annual multidisciplinary research symposium, research bulletin board, integration of EBP into career ladder program, online learning modules, EBP mentors program, policy revisions to include EBP, EBP recognition awards, increased EBP resources, and employment of full-time nurse researcher. Other educational strategies utilized were a formal education program (Linton &

Prasun, 2013), an online learning module(s) (Hart et al, 2008; Mollon et al., 2012), regional EBP fellowship program (Kim et al., 2013), and implementation of the Advancing Research and Clinical practice through Close Collaboration (ARCC) Model (Melnyk et al., 2010).

Table 3

Educational Strategy and Measurement Time Interval Utilized by Study

Study	Educational Strategy	Time Interval
Fink et al., 2005	Multi-faceted organizational strategies	2 years
Hart et al., 2008	3 Computer-based Learning Modules	2 weeks
Hauck, et al., 2012	Multiple (7) strategies	2 years
Kim et al., 2013	Regional EBP Fellowship Program	9 months
Linton & Prasun, 2013	Formal Educational Program	Not applicable
Melnyk et al., 2010	AARC EBP Mentorship Model	6 months
Mollon et al., 2012	In-house online learning module	2 months
Pierson & Schuelke, 2009	Independent study packet with mentoring	2 weeks & 1year
Sherriff et al., 2007	4 hour educational workshop and workbook	1 week & 1 year

Theoretical or conceptual frameworks were used by five of the nine studies with Rogers Diffusion of Innovation Theory being used in three of those five studies (Kim et al., 2013; Mollon et al., 2012; Fink et al., 2005). Knowle's Adult Learning Theory was incorporated in two studies (Mollon et al., 2012; Pierson and Schuelke, 2009) and the Advancing Research and Clinical practice through close Collaboration (ARCC) Model was utilized in one study (Melnyk et al., 2010).

Demographics of registered nurses were reported in eight of the nine studies, although, not in such a way that would allow calculation across studies. Six studies provided educational degree, six provided mean age, six provided gender, eight provided sample size for registered nurses, and four categorized by type of RN position. Table 4 summarizes sample size of registered nurses, mean age of sample, and average years of registered nurse work experience for each study reviewed if applicable.

Table 4

Study Demographics

Study	Sample Size (RNs)	Mean Age (years)	Mean Work Experience (years)
Fink et al., 2005	215	39	14.0
Hart et al., 2008	744	43.64	16.71
Hauck, et al., 2012	419	43.3	17.0
Kim et al., 2013	142	42	16.0
Linton & Prasun, 2013	286	*	*
Melnyk et al., 2010	40	*	*
Mollon et al., 2012	232	41	12.6
Pierson & Schuelke, 2009	*	*	*
Sherriff et al., 2007	51	42.6	18.6

* Demographics not reported

Utilizing the EBPB scale, Hauck et al. (2012) showed a statistically significant ($P < 0.001$) improvement in EBP belief scores pre- and post-survey after implementation of multiple EBP educational strategies. Melnyk et al. (2010) reported statistically significant correlation in

the participant's beliefs (EBPB) about EBP with organizational readiness for EBP ($r = 0.62$, $P < 0.01$), EBP implementation (EBPI) scores ($r = 0.38$, $P < 0.01$), group cohesion ($r = -0.35$, $P < 0.01$), and job satisfaction ($r = -0.34$, $P < 0.05$) post implementation while Pierson and Schuelke (2009) did not provide statistical data in their article. The EBPI scale reported by Hauck et al. (2012) showed an increase in scores from pre- to post-survey but without statistical significance ($P = 0.061$). EBPI scores for Melnyk et al. (2010) showed statistically significant correlations with organizational culture and readiness ($r = -0.30$, $P < 0.05$) as well as EBP beliefs ($r = 0.38$, $P < 0.01$) but not between EBPI and group cohesion. EBPI scores did indicate that the greater implementation of EBP the higher the RN job satisfaction although not statistically significant.

The OCRSIEP total score reported by Hauck et al. (2012) increased significantly ($P < 0.001$) from pre- to post-survey as did the individual OCRSIEP scores for organizational readiness ($P < 0.001$) and movement towards EBP ($P < 0.001$). OCRSIEP scores for Melnyk et al. (2010) were noted as significantly correlated to EBP beliefs ($r = 0.62$, $P < 0.001$), EBP implementation ($r = 0.30$, $P < 0.05$), and group cohesion ($r = -0.43$, $P < 0.05$) while Pierson and Schuelke (2009) did not report their OCRSIEP scores.

Utilizing the EBPQ, Kim et al. (2013) reported a statistically significant improvement in two of the three subscale scores from pre- to post-test. Practice of EBP ($P < 0.001$) and knowledge/skills associated with EBP ($P < 0.001$) had statistically significant improvements while attitude towards EBP score ($P < 0.198$) improvement was not statistically significant. EBPQ subscale scores reported by Mollon et al. (2012) did not show statistically significant changes in practice, attitudes, or knowledge/skills associated with EBP after implementation of their self-developed online EBP module. Further bivariate analysis by Mollon et al. (2012) demonstrated statistically significant positive correlations with one or more of the three EBPQ

subscales in relation to registered nurse status, white ethnicity, graduate degree, and number of formal EBP classes. Associate's degree/diploma nurse and Hispanic ethnicity had statistically significant negative correlations to EBPQ subscales.

Utilizing the BARRIERS scale, Fink et al. (2005) reported a statistically significant improvement in the perception of the organization as a barrier and in the nurses' perception (adopter) of their own research abilities from pre- to post-survey after implementation of multiple EBP educational strategies. The three greatest barriers to EBP implementation identified were registered nurse authority to change practice, registered nurse awareness of research, and time on the job to read research. While all 29 barriers listed on the scale showed improvement pre- to post-survey, the barriers noted to have statistically significant improvement included: registered nurse authority to change practice ($P < 0.01$), registered nurse awareness of research ($P < 0.01$), administration will not allow implementation ($P < 0.01$), nurse isolation from knowledgeable colleagues to discuss research ($P < 0.01$), research reports/articles not readily available ($P < 0.05$), and time on the job to read research ($P = 0.056$). Kim et al. (2013) also noted a statistically significant reduction in all BARRIERS subscale scores with the greatest reduction noted in the communication subscale.

Fink et al. (2005) also utilized the RFQ instrument and reported statistically significant improvement ($P < 0.001$) in organizational climate and individual innovativeness, two of the three RFQ subscales. The third subscale, communication channel influences, did show improvement from pre- to post-survey but without statistical significance. Additional qualitative data obtained by Fink et al. (2005) were grouped into four areas for analysis. Scores for two of the qualitative groupings, difficulty in changing practice and lack of administrative support and mentoring, decreased pre- to post-survey 40% to 29% and 33% to 28% respectively. Scores for

the remaining two groupings, insufficient time and lack of education on the research process, increased 16% to 21% and 11% to 21% respectively. While difficulty in changing practice and lack of administrative support and mentoring improved post implementation of EBP educational strategies was anticipated the increase in insufficient time and lack of education in research utilization was not anticipated but suggested possibly a better participant understanding of requirements of EBP implementation.

Using the Evidence-Based Nursing Questionnaire developed by Nagey et al., Hart et al. (2008) reported statistically significant differences in perceptions of knowledge ($P = .022$), attitude ($P < .001$), skill level ($P < .001$), and beliefs about organizational readiness ($P < .001$) between pre-test and post-test scores following participant completion of three computer-based learning modules regarding EBP. Sherriff et al. (2007), also using Nagey et al.'s instrument, reported a statistically significant improvement in skill level ($P < .0001$) and availability of organizational support ($P = .006$). However, improvement in perception and knowledge scores by Sherriff et al. (2007) did not have statistical significance. Lastly, Linton & Prasun (2013) measured nurse practice, attitudes, knowledge/skill immediately upon participant completion of a formal education program without obtaining pre-intervention data for comparison.

Of the nine studies identified here, great variation exists including research design, use of theoretical framework, participant type, data collection tool(s) utilized, educational intervention(s) implemented, and research findings. In summary, there are only a few studies published that have directly addressed the effects of educational programs on nurses' attitudes, beliefs, and knowledge/skill of EBP, thus creating a great need for future studies in the area and replication of existing studies.

Methods

Project Design

A quasi-experimental pretest-posttest design was used to examine the effect of an online educational intervention on nurses' practice, attitudes, and knowledge/skills of EBP. Participants were randomly assigned to one of three groups including an experimental group assigned to complete and EBP educational module, a control group assigned to complete an alternate educational module, and a control group in which an educational intervention was not assigned. Participants were surveyed prior to and upon completion of the educational intervention.

Participants

A convenience sample of registered nurses (RNs) with bedside care responsibilities from a population of 667 RNs at a large regional hospital were recruited for the study. Educational preparation in nursing for this population included 64% (427) with an associate degree, 31% (210) with a baccalaureate degree, and 5% (37) with a master's degree in nursing. Participation was voluntary and RNs in administrative roles without direct patient care responsibilities were excluded from the study. As an incentive for participation, each participant completing the study was entered into a raffle for one of ten $25 gift cards provided by the researcher. In addition to the gift cards, the healthcare facility provided a hospital cafeteria meal ticket to all participants completing the study.

Setting

A large regional hospital serving the medical needs of nine counties in western Kentucky and two counties in southern Indiana was the setting for the study. The nine county area has an estimated population of 300,000 and the regional hospital is licensed to operate 477 patient beds (Kentucky Hospital Association, n.d.). While the hospital's administration is aware of the

advantages of EBP, they have not directly implemented any actions towards implementation of EBP within the facility. Facility administrators' do have a future desire to obtain Magnet status but are currently working on increasing the number of baccalaureate prepared nurses on staff before initiating its journey towards Magnet status. This hospital was selected by the researcher because it did not have any type of research committee or activities in place, the high percentage of associate degree nurses on staff, the absence of a formal or informal education programs in regards to EBP, and nurse administrators had expressed interest in the researcher's proposal at a Western Kentucky University (WKU) DNP Advisory Committee meeting.

Data Collection Tools

With author permission (Appendix A), the Evidence Based Practice Questionnaire (EBPQ) developed by Upton and Upton (2006) (Appendix B) was used to measure registered nurse practice, attitude, and knowledge/skills of EBP before and after an online educational intervention. The EBPQ is a self-report measure of practice, attitude, and knowledge/skills of EBP containing 24 Likert type items organized into three subscales: practice of EBP (6 items), attitude toward EBP (4 items), and knowledge/skills associated with EBP (14 items). Each question is scored 1 – 7 with higher scores indicating more use of EBP, a more positive attitude regarding EBP, and more knowledge/skills related to EBP. The EBPQ authors and other researchers have demonstrated reliability and validity of the EBPQ (Kim et al. 2013; Koehn & Lehman, 2008; 2012; Mollon et al., 2012; Upton & Upton, 2006). Upton and Upton (2006) reported a principal component analysis with an oblique rotation method was utilized to determine construct validity during tool development. Internal consistencies were determined using item-total correlations and Cronbach's α. Cronbach's α of 0.87 for the entire questionnaire and Cronbach's alphas for the subscales were 0.85, 0.79, and 0.91 respectively. Construct

validity was assessed using Pearson's product-moment correlation with correlation coefficients ranging from 0.3 – 0.4 ($P < 0.001$) and discriminative validity assessed comparing subscale scores of persons with knowledge and those without knowledge using an independent samples *t*-test (Upton & Upton, 2006). Studies by Kim et al. (2013), Koehn & Lehman (2008), and Mollon et al. (2012) all reported similar Cronbach's α scores for each of the three subscales. The three studies reported Cronbach's α scores of 0.87 to 0.94 for the practice subscale, 0.68 to 0.78 for attitude, and 0.95 to 0.96 for the knowledge/skills subscale. In addition to the EBPQ, demographic information and questions related to the unrelated educational intervention were included on the survey. Demographic data included number of years work experience as a registered nurse and educational background.

Intervention and Data Collection

Two weeks prior to project implementation, participants were recruited through unit staff meeting announcements, posted flyers, and facility approved e-mailed announcements announcing dates and times of study related informational sessions (Appendix C). Twenty-five 30-minute informational sessions were conducted at various hours on three days including nights and a weekend shift in effort to increase participation and to promote inclusion of all nursing shifts. Informational sessions were conducted in a centrally located furnished meeting room. Throughout the time period the researcher was on site to conduct the informational sessions/pre-test, facility administration made additional announcements to staff in effort to increase staff participation. Using a script (Appendix D), the researcher briefly described the study's purpose, time requirements, and participant anonymity. A consent form (Appendix E) and the pretest Evidence-Based Practice Questionnaire (Appendix F) were distributed to each registered nurse attending an informational session. Registered nurses who elected to participate in the study

printed their name on a provided slip of paper for raffle entry and completed the pretest survey. Participants submitted both the name slip and the completed pretest survey to separate marked collection boxes to maintain anonymity. However, after completion of the information sessions, only 41 RNs had participated.

With such a low participation rate, the researcher after consultation with hospital administration and her faculty advisor, submitted an IRB revision form requesting permission to administer both the pre-test and post-test electronically using the healthcare facility's email and web-based educational systems. Upon IRB approval (Appendix G), a researcher provided email (Appendix H) was sent to the facility's registered nurses by the facility's Human Resources department. The email sent to registered nurses contained the approved informed consent document as an attachment, scripted information that was provided verbally to participants who attended an informational session with the text of the email, and an electronic survey link. At completion of the survey, an additional link was provided for participant name input to be used for participant randomization, verification of study completion, and eligibility for incentives.

Participant names were randomly assigned by the researcher into one of three groups. Participants were assigned a number of 1, 2, or 3 in sequence as they completed the online pretest. The three groups included: group 1, an experimental group who received the EBP educational intervention; group 2, a control group who received the pain management educational intervention; and group 3, a control group who did not receive any type of educational intervention. The researcher provided a list of names to the facility's Human Resource specialist who then generated a blinded email group for each of the three groups.

Within one week of the completing the pre-test, participants were sent an email using the facility's email system with directions and link to access their assigned online educational

module (Appendix I). The email to participants in the experimental group (Group 1) had directions and web link needed to complete the online EBP educational intervention. Control Group 2's email had directions and web link to complete the pain management educational intervention and Control Group 3's email stated that no learning activity was required at the time. Both the EBP educational intervention and the pain management educational interventions were delivered to participants through the facility's online educational system.

An online researcher developed educational intervention was created on the topic of EBP. The online EBP learning module (Appendix J) was reviewed by both an experienced doctorally prepared nurse educator and a practice expert to ensure content validity prior to project implementation. The project's experimental group was asked to complete the researcher developed computer-based learning module regarding EBP. The EBP learning module content defined EBP, stated relevance of EBP, explained the steps of EBP, and identified resources available to facility nursing staff for use when implementing EBP. A second computer-based learning module regarding pain management in acute care settings was used as the educational intervention for one of the two control groups. The pain management educational intervention was selected from a commercial nursing education product that the facility had purchased for staff continuing education. The pain management related educational intervention was similar in delivery format and time requirement as the EBP educational intervention but completely unrelated in content.

Participants were given three weeks to complete the assigned learning modules. During this time, the facility's online learning system sent weekly reminders to participants who had not yet completed their assigned learning module. Next, participants who had completed their assigned learning module or were assigned to Group 3 were sent an email (Appendix K) with

directions on how to complete the follow-up survey (Appendix L). Participants were given two weeks to complete the follow-up survey with an email reminder (Appendix M) sent midway.

Project costs included extensive researcher time, printing costs associated with the pretest and posttest surveys, and use of gift cards/lunch tickets as participation incentives. Permission to use the survey instrument was received from the authors at no cost. University resources available to the researcher at no cost included services of a statistician and statistical analysis software. Direct costs to the healthcare facility were that of registered nurses' time to attend informational sessions, complete consent form and initial survey, complete online educational intervention, and completion of posttest survey. Additional direct costs for the healthcare facility included the services it offered to the researcher including:

- marketing staff to assist with development of materials and announcements for participant recruitment,
- a centrally located and furnished meeting room for the three consecutive days of informational sessions,
- assistance of human resources personnel to upload researcher's EBP educational intervention to the facility's online educational system,
- assistance of human resources personnel to distribute intervention related emails to participants in the experimental and control groups, and
- meal tickets for participants completing the study.

Data Analysis

Statistical analysis was utilized to determine level of achievement in regards to the project's three goals. First, was improvement in registered nurse practice, attitude, and knowledge/skills of EBP achieved in the experimental group greater than that of the control

groups? Second, was the relationship between the online EBP educational intervention and improvement in nurses' practice, attitudes, and knowledge/skills of EBP significant? Finally, what was the relationship between educational preparation and registered nurse practice, attitude, and knowledge/skills of EBP prior to and after an EBP educational intervention significant?

The Statistical Analysis System (SAS) version 9.3 program was used to analyze the data with an established statistical significance level of 0.05. Data collected from each participant included a score for each of the three EBPQ subsets: practice, attitude, and knowledge/skills of EBP. With three groups, one-way analysis of variance (ANOVA) was used to determine the effect of educational preparation and years of experience, the independent variables, on the three dependent variables registered nurse practice, attitude, and knowledge/skills subscale scores obtained from the initial survey. Paired *t*-tests were used to measure variations in registered nurse practice, attitudes, and knowledge/skills of EBP from prior to and after implementation of the educational intervention. The one independent variable was the educational intervention and the dependent variables were the registered nurse practice, attitudes, and knowledge/skills subscale scores in regards to EBP. In addition, ANCOVA was used to statistically control for participant knowledge (pretest scores) when determining the potential effect of educational preparation and years of nursing experience on practice, attitudes, and knowledge/skills after the educational intervention. Finally, descriptive statistics were used to analyze demographic data.

Protection of Human Subjects

WKU Institutional Review Board approval and informed consent from all participants was obtained prior to project implementation. Participation was voluntary and data collection was anonymous. The EBP educational intervention posed no actual harm to the project's participants. With a quasi-experimental design, those participants randomly assigned to either of

the control groups had access to the EBP educational intervention upon project completion so as not to disadvantage participants in the control group. Confidentiality of participants was maintained by using a coded identification technique which allowed for individual pretest-posttest analysis while maintaining anonymity. Each participant's unique identification code was created using the participant's alphanumerical answers to two questions on each survey. In addition, data collected was maintained in a secure location within the WKU School of Nursing office accessible only to the researcher and the researcher's academic advisor.

Results

Sample Characteristics

Of the 197 RNs that completed the pre-test, 134 completed the post-test. However after removing participants that did not provide a unique identifier and duplicate unique identifiers, only 110 post-tests were utilized. Of the 110 post-tests, only 77 unique identifiers could be matched to pre-test participant unique identifiers. The 77 matched pretest-posttest surveys included 17 participants from Group 1 (the experimental group), 24 participants from Group 2 (control group with pain management learning module), and 36 participants from Group 3 (control group without assigned learning module). Educational preparation of participants was similar to state and national demographics in that less than half of the participating RNs had a baccalaureate or higher degree in nursing. In addition, years of experience varied greatly from less than one year to 40 years. Table 5 shows the educational demographics and years of RN experience of the participants from the pretest.

Table 5

Pre-Test Demographics (N = 197)

	Number	Percentage	Mean Experience (years)
Educational Preparation			
ADN/Diploma	118	60%	15.4
BSN	68	35%	15.9
MSN/Doctorate	10	5%	25.7
Missing Data	1		
Total	197		16.2

Nurses' Perceptions of EBP Practice, Attitude, and Knowledge/skills

The three EBPQ subscales are practice, attitude, and knowledge/skills of EBP. A total Cronbach's α of 0.93 was obtained for the entire EBPQ questionnaire and Cronbach's alphas for the subscales were 0.83 for practice, 0.73 for attitude, and 0.95 for knowledge/skills of EBP. These findings were consistent to Cronbach's α reported by the EBPQ authors and other similar studies (Kim et al. 2013; Koehn & Lehman, 2008; and Mollon et al., 2012). Table 6 lists the mean scores and standard deviation for each subscale item individually and each subscale collectively. Nurses rated themselves moderate in attitude (mean = 5.28, SD = 1.02) and lowest in practice (mean = 4.80, SD = 1.23) and knowledge/skills (mean = 4.83, SD = 0.99). While individual item mean scores across the subscales showed little variation, lower mean scores on individual items could be utilized when developing future EBP educational programs and/or addressing barriers to EBP implementation. For example the lowest item mean score for

practice was “Critically appraised, against set criteria, any literature you have discovered” (mean = 4.13, SD = 1.57). The lowest mean score for attitude was for “My workload is too great for me to keep up to date with all the new evidence” (mean = 4.30, SD 1.39) and “Converting your information needs into a research question” (mean = 4.10, SD = 1.30) for the knowledge/skills subscale. In addition 13-16% of participants did not submit answers for the EBPQ items suggesting a lack of general knowledge in EBP or in understanding the questions asked.

Table 6

Pre-Test EBPQ Subscale Scores (Range of 1 to 7)

	N	Mean	SD
Practice	**168**	**4.80**	**1.23**
Formulates a clearly answerable question as the beginning…	150	4.87	1.53
Tracks down relevant evidence after formulating question	167	5.14	1.48
Critically appraises, against set criteria, any literature…	158	4.13	1.57
Integrates the evidence found with experience	163	5.01	1.55
Evaluates the outcomes of the practice	164	5.05	1.58
Shares the information with colleagues	162	4.99	1.56
Attitude	**172**	**5.28**	**1.02**
My workload is too great….New evidence is so important	161	4.30	1.39
I resent having my practice questioned...I welcome questions	152	5.53	1.32
EBP is a waste of time……EBP is fundamental to practice	159	5.77	1.48
I stick to tried and trusted methods…My practice has changed	143	5.67	1.32
Knowledge/Skills	**167**	**4.83**	**0.99**
Research skills	163	4.55	1.32
IT skills	166	4.84	1.41
Monitoring & review of practice skills	164	5.04	1.12
Converting information needs into research question	163	4.10	1.30
Awareness of major information types & sources	164	4.68	1.28
Ability to identify gaps in professional practice	164	4.85	1.21
Knowledge of how to retrieve evidence	163	4.94	1.33
Ability to analyze critically evidence against standards	162	4.69	1.29
Ability to determine how valid the material is	161	4.72	1.18
Ability to determine how useful the material is	162	5.02	1.19
Ability to supply information to individual cases	166	5.10	1.27
Sharing of ideas and information with colleagues	163	5.24	1.34
Dissemination of new ideas about care to colleagues	162	4.86	1.34
Ability to review your own practice	162	5.24	1.20

Effect of Educational Preparation on Practice, Attitudes, and Knowledge/skills of EBP

As the number of participants with a masters degree was so small (N = 3), statistical analysis using ANOVA was performed using only associate and baccalaureate educational levels. With educational level as the independent variable, no statistical difference in EBPQ subscale scores in regards to educational preparation were noted for practice ($F = 0.24$, $Pr > F = 0.62$), attitude ($F = 0.56$, $Pr > F = 0.45$), or knowledge/skills ($F = 0.85$, $Pr > F = 0.36$). Table 7 shows the mean pretest scores for the practice, attitude, and knowledge/skills subscale scores by educational preparation.

Table 7

Pretest EBPQ Subscales According to Educational Level

	ASN			BSN		
EBP Subscale	N	Mean	SD	N	Mean	SD
Practice	95	4.84	1.22	64	4.74	1.31
Attitude	97	5.26	0.99	65	5.38	0.99
Knowledge/skills	94	4.79	0.98	64	4.94	1.01

Effect of Years of Nursing Experience on Practice, Attitudes, and Knowledge/skills of EBP

As the participants' experience varied greatly between less than one year and 40 years, statistical analysis using the ANOVA method was conducted after grouping years of nursing experience into three groups according to frequency thirds. No statistical difference in EBPQ subscale scores in regards to years of nursing experience were noted for practice ($F = 0.07$, $Pr > F = 0.93$), attitude ($F = 0.52$, $Pr > F = 0.59$), or knowledge/skills ($F = 0.03$, $Pr > F = 0.97$). Table 8 shows the mean scores for the practice, attitude, and knowledge/skills subscale scores by years of nursing experience.

Table 8

Pretest EBPQ Subscales According to Years of Experience

	0-6 years			7-21 years			> 22 years		
EBP Subscales	N	Mean	SD	N	Mean	SD	N	Mean	SD
Practice	45	4.77	1.22	49	4.86	1.29	56	4.80	1.32
Attitude	46	5.36	1.96	52	5.17	0.98	55	5.34	1.03
Knowledge/skills	45	4.85	0.76	51	4.81	0.94	53	4.81	1.20

Effect of Educational Intervention on Practice, Attitudes, and Knowledge/skills of EBP

Participants were randomly assigned to one of three groups. Group 1 was the experimental group who received an EBP educational intervention, Group 2 was a control group who received an alternate educational intervention (pain management), and Group 3 was a control group who did not receive any type of educational intervention (no treatment). Table 9 summarizes group demographics regarding educational preparation and years of nursing experience.

Table 9

Group Demographics

	Group 1 (experimental) N = 17	Group 2 (control - pain intervention) N = 24	Group 3 (control - no treatment) N = 36
Educational Level			
Associate	7 (41%)	17 (71%)	16 (44%)
Baccalaureate	10 (59%)	5 (21%)	19 (53%)
Masters	0 (0%)	2 (8%)	1 (3%)
Years of Nursing Experience			
0 – 6 years	4 (24%)	7 (29%)	13 (33%)
7 – 21 years	7 (41%)	5 (21%)	9 (25%)
> 22 years	6 (35%)	12 (50%)	11 (31%)
Missing Data	0 (0%)	0 (0%)	3 (8%)

Paired T-tests were performed for each group to measure change in any of the three EBPQ subscales from pretest to posttest. While there was a slight decrease in mean score for all subscales for all groups except Group 3's attitude subscale score which was unchanged, no significant differences were noted. Table 10 summarizes the pretest and posttest means scores for each group and EBPQ subscale.

Table 10

Group Comparison of Pre- and Posttest EBPQ Subscale Scores

	Group 1 (experimental)						Group 2 (control – pain)						Group 3 (control - no treatment)					
	Pre			Post			Pre			Post			Pre			Post		
EBP Subscales	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Practice	17	4.89	1.35	16	4.81	1.06	20	4.98	1.11	22	4.65	1.57	33	4.77	1.29	31	4.71	1.24
Attitude	17	5.40	0.92	16	5.30	1.01	21	5.56	0.85	21	5.38	1.08	33	5.22	1.06	31	5.22	1.21
Knowledge/skills	17	4.92	1.04	16	4.78	1.17	21	5.11	0.92	22	4.95	0.92	33	4.96	0.75	31	4.84	0.89

To examine post test scores in regards to years of nursing experience and educational level, an ANCOVA was performed on the posttest scores controlling for the participant's pretest scores. The ANCOVA revealed no statistical differences in pre- to posttest scores in relation to either educational level or years of nursing experience as summarized in Tables 11 and 12.

Table 11

Pre- and Posttest EBPQ Subscale Scores Accounting for Educational Level

	ASN						BSN					
	Pre			Post			Pre			Post		
EBP Subscales	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD
Group 1 (experimental)												
Practice	6	5.39	0.50	6	5.32	0.40	10	4.49	1.61	10	4.51	1.23
Attitude	6	5.39	1.07	6	5.25	0.83	10	5.43	1.02	10	5.24	1.03
Knowledge/skills	6	5.14	0.39	6	5.10	0.13	10	4.72	1.30	10	4.58	1.47
Group 2 (control – pain)												
Practice	15	4.91	1.19	15	5.02	1.11	5	5.20	0.93	5	5.00	1.11
Attitude	15	5.64	0.63	15	5.76	0.74	5	5.10	1.10	5	4.40	1.68
Knowledge/skills	16	4.79	1.00	16	4.93	0.96	5	5.66	0.56	5	5.41	0.54
Group 3 (control – no treatment)												
Practice	13	4.59	1.56	13	4.60	1.32	16	4.80	1.15	16	4.83	1.26
Attitude	13	4.96	1.27	13	4.99	1.17	16	5.48	0.93	16	5.41	1.21
Knowledge/skills	13	5.04	1.04	13	4.77	0.95	16	4.92	0.72	16	4.91	0.91

Table 12

Pre- and Posttest EBPQ Subscale Scores Accounting for Years of Nursing Experience

	0 – 6 years						7 – 21 years						> 22 years					
	Pre			Post			Pre			Post			Pre			Post		
EBP Subscales	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SC
Group 1 (experimental)																		
Practice	4	3.96	2.16	4	3.81	1.04	9	5.47	0.67	9	5.40	0.52	5	4.47	0.93	5	4.83	1.24
Attitude	4	5.04	1.06	4	5.04	1.09	6	5.43	0.80	6	5.40	1.08	5	5.23	1.12	5	5.30	1.08
Knowledge/skills	4	4.29	0.68	4	3.80	1.28	6	5.23	0.52	6	5.56	0.69	5	4.85	1.71	5	4.63	1.19
Group 2 (control - pain)																		
Practice	6	4.02	0.99	6	4.58	0.65	3	5.11	0.42	3	4.89	0.97	9	5.48	1.07	9	5.11	1.35
Attitude	7	5.52	1.02	7	5.57	0.79	3	5.08	0.88	3	5.25	0.75	8	5.72	0.80	8	5.08	1.54
Knowledge/skills	7	4.51	0.79	7	4.51	1.00	3	5.12	0.76	3	5.60	0.53	9	5.12	0.88	9	4.87	0.78
Group 3 (control – no treatment)																		
Practice	9	4.64	0.64	9	4.56	0.95	9	4.20	1.71	9	4.33	1.21	10	5.08	1.39	10	5.08	1.52
Attitude	9	5.18	1.23	9	4.79	0.93	9	5.22	1.06	9	5.42	1.33	10	5.23	0.92	10	5.25	1.38
Knowledge/skills	9	4.29	0.68	4	3.80	1.28	9	4.94	0.78	9	5.00	0.80	10	4.96	0.85	10	4.93	1.11

Discussion and Conclusion

Summary

Pretest findings were similar to other studies in that generally nurses report a favorable attitude towards EBP often scoring attitude higher than both practice and knowledge/skills of EBP (Hart et al., 2008; Koehn & Lehman, 2008; Linton & Prasun, 2013). Healthcare organizations can use positive EBP attitude scores to their advantage when developing strategies to promote EBP implementation. EBPQ practice (Mean = 4.80, SD 1.23) and knowledge/skill (Mean = 4.83, SD 0.99) subscales scores were considerably lower than the EBPQ attitude subscale score (Mean = 5.28, SD 1.02) demonstrating collectively the lack of EBP knowledge and skills needed to implement EBP within the organization. In addition with 47 participants not answering one or more of the EBPQ items, one must again question whether the participants had enough understanding of EBP and/or the EBPQ questions to answer the items correctly. Attention should also be paid to individual items which score lower than others. For example, if "My workload is too great" (Mean = 4.30, SD 1.39) or "Critically appraised, against set criteria, any literature you have discovered" (Mean = 4.13, SD 1.57) is not addressed within the organization's EBP implementation plan, then EBP cannot be successfully implemented within the organization. As these individual items can be affected by many factors and can fluctuate, periodic reevaluation of nurse perceptions of EBP practice, attitude, and knowledge/skills would be beneficial in maintaining a culture of EBP.

In contrast to studies by Koehn and Lehman (2008), Linton and Prasun (2013), and Mollon et al. (2012), this study did not find any statistically significant correlations in EBPQ pretest subscale scores in regards to educational preparation nor years of nursing experience. Mollon et al. (2012) reported a negative correlation with associate degree education and all three

EBPQ subscales. Koehn and Lehman (2008) reported a statistical difference in attitude in regards to educational level with baccalaureate prepared nurses having higher EBP attitude scores but not for EBPQ practice and knowledge/skill subscale scores. Finally, Linton and Prasun (2013) reported a statistically significant difference for both EBPQ attitude and knowledge/skill subscale scores in regards to educational preparation.

In regards to its educational intervention and similar to Mollon et al. (2012), this study's online EBP educational intervention showed to have no statistical significance on any of three EBPQ subscales. Whereas the three computer based EBP educational modules by Hart et al. (2008) did demonstrate statistically significant improvement in participant knowledge, attitude, skill, and belief in organizational readiness in regards to EBP. Other EBP educational programs have shown mixed results such as Hauck et al. (2012) and Kim et al. (2013). Hauck et al (2012) reported a statistically significant increase in EBP belief scores after implementing multiple strategies but their noted increase in EBP practice was not statistically significant. Finally, Kim et al. (2013) reported a statistically significant increase in both EBP practice and knowledge scores after implementation of a fellowship program but not for participant attitude in regards to EBP. Further analysis of post-test data did not indicate any significant difference in post-test EBPQ scores in relation to educational preparation or years of nursing experience after the educational intervention.

This study's findings support previous findings in that much more research is needed in the area of developing EBP knowledge and skills of practicing nurses. Perhaps a multifaceted approach would be most effective in teaching EBP knowledge and skills to practicing nurses rather than a single educational intervention as suggested by Kim et al. (2013). Regardless of type of educational program, time period, measurement instrument utilized, etc., future replicable

research studies are needed on larger scales to accurately measure the effectiveness and generalizability of educational programs on EBP.

Clinical Implications

Although this study did not find statistically significant correlations between its EBP educational intervention and RN practice, attitudes, and knowledge/skills of EBP, valuable information with clinical implications can be extrapolated from its findings. As internationally agreed upon, nurses' attitudes and perceptions of their knowledge and skill in regards to EBP are essential to implementing EBP and delivering high quality healthcare. While nurses report positive attitudes towards EBP as noted in this study, their perceptions of practice and knowledge/skills score much lower. Educational interventions are needed for practicing nurses to overcome this knowledge deficit in order for successful implementation of EBP.

Implementing a culture of EBP into a healthcare organization takes time, administrative support, and continuous resources. As the literature is lacking in identifying which type of educational programs or delivery methods are most effective in teaching and implementing EBP, organizations may benefit from implementing multi-faceted strategies. To be cost effective, organizations should also consider the characteristics and perceptions of its practicing nurses when developing strategies to teach and implement EBP. Finally, implementation of EBP comes through repeated exposure and practice of EBP. Educating practicing nurses in regards to EBP should not occur as a one- time event but rather as a continuous educational modality that promotes nurse confidence in implementing EBP.

Research Implications

While the literature is abundant in some regards to EBP, much work is needed in order to advance educational research in the area of EBP. Studies of higher evidentiary level including

experimental studies are greatly needed. When selecting EBP educational interventions that best meet the needs of an organization, healthcare organizations need evidentiary support identifying which types of EBP educational interventions are the most effective in creating and maintaining a culture of EBP. Thus, future studies are needed to determine which educational programs are most effective in not only teaching EBP knowledge and skills but in getting nurses to implement EBP.

Strengths and Limitations

As the literature is lacking in EBP studies with higher evidentiary design, a strength of this study is its quasi-experimental design using two control groups and the documented reliability of the instrument used. Limitations of the study resulting in limited generalizability of study findings include small sample size, use of a convenience sample from one healthcare facility, and volunteer participation. Another limitation to the study was its lack of knowledge evaluation in relation to its EBP educational intervention. The study only assessed participants' perceptions of EBP and not actual EBP knowledge. Without evaluation of participant EBP knowledge prior to and upon completion of the educational intervention, one cannot be certain that participants actually read or completed the EBP educational intervention.

Conclusions

The results of this study support Roger's Diffusion of Innovations theory in that implementation does not occur without knowledge and persuasion. The lack of improvement in nurses' implementation of EBP was expected as there was no notable increase in participant EBP knowledge. The study's online EBP educational intervention alone was not effective in increasing RN practice, attitudes, and knowledge/skills regarding EBP. While use of computer based learning modules are cost efficient and offer several benefits when educating such a

diverse population as healthcare professionals, use of an online independent learning module as the only strategy may not necessarily be the most effective method for teaching EBP knowledge and skills to nurses. Numerous educational methods have proven effective in educating nurses and other healthcare professionals in regards to EBP. Educational methods such as formal classes, EBP workshops, independent study, journal clubs, research committees, and use of EBP mentors among others have been successful when used alone and/or in various combinations. Healthcare organizations must implement EBP in order to provide the highest quality care possible. As such, organizations must develop educational programs that will enculturate EBP throughout every aspect of the organization. Organizations need to evaluate nurse practice, attitude, and knowledge/skills prior to developing interventions and should consider a multi-faceted approach to EBP implementation as there is not a "one size fits all" approach to EBP implementation.

References

Adams, A. (2004). Pedagogical underpinnings of computer-based learning. *Journal of Advanced Nursing, 46*(1), 5-12. doi:10.1111/j.1365-2648.2003.02960.x

American Nurses Credentialing Center. (2014). *Magnet Recognition Program Model*. Retrieved from http://nursecredentialing.org/Magnet/ProgramOverview/New-Magnet-Model

Bonner, A., & Sando, J. (2008). Examining the knowledge, attitude and use of research by nurses. *Journal of Nursing Management, 16*, 334-343. doi:10.1111/j.1365-2834.2007.00808.x

Brown, C., Wickline, M., Ecoff, L., & Glaser, D. (2009). Nursing practice, knowledge, attitudes and perceived barriers to evidence-based practice at an academic medical center. *Journal of Advanced Nursing, 65*(2), 371-381. doi:10.1111/j.1365-2648.2008.04878.x

Cochrane Collaboration. (2014). *About us.* Retrieved from http://www.cochrane.org/about-us

Curran, J., Grimshaw, J., Hayden, J., & Campbell, B. (2011). Knowledge translation research: The science of moving research into policy and practice. *Journal of Continuing Education in the Health Professions, 31*(3), 174-180. doi: 10.1002/chp.20124

Duffield, C. M., Roche, M. A., Blay, N., & Stasa, H. (2010). Nursing unit managers, staff retention and the work environment. *Journal of Clinical Nursing, 20,* 23-33. doi:10.1111/j.1365-2702.2010.03478.x

Duke University. (2013). *Introduction to Evidence-Based Practice.* Retrieved from http://guides.mclibrary.duke.edu/content.php?pid=431451&sid=3529499

Estrada, N. (2009). Exploring perceptions of a learning organization by RNs and relationship to EBP beliefs and implementation in the acute care setting. *Worldviews on Evidence-Based Nursing. 6*(4), 200-209. doi: 10.1111/j.1741-6787.2009.00161.x

Fineout-Overholt, E., Levin, R., & Melnyk, B. (2004/2005). Strategies for advancing evidence-based practice in clinical settings. *Journal of the New York State Nurses Association. Fall/Winter,* 28-32. Retrieved from http://bmhlibrary.info/15884483.pdf

Fineout-Overholt, E., Melnyk, B., & Schultz, A. (2005). Transforming health care from the inside out: Advancing evidence-based practice in the 21st century. *Journal of Professional Nursing, 21*(6), 335-344. doi: 10.1016/j.profnurs.2005.10.005

Fink, R., Thompson, C., & Bonnes, D. (2005). Overcoming barriers and promoting the use of research in practice. *Journal of Nursing Administration, 35*(3), 121-129. Retrieved from http://ovidsp.tx.ovid.com.libsrv.wku.edu/sp-3.12.0b/ovidweb.cgi

Flinkman, M., Leino-Kelpi, H., & Salantera, S. (2010). Nurse's intention to leave the profession: Integrative review. *Journal of Advanced Nursing, 66*(7), 1422-1434. doi:10.1111/j.1365-2648.2010.05322.x

Gess, E., Manojlovic, M., & Warner, S. (2008). An evidence-based protocol ofr nurse retention. *Journal of Nursing Administration, 38*(10), 441-447. doi:10.1097/01.NNA.0000338152.17977.ca

Hart, P., Eaton, L., Buckner, M., Morrow, B., Barrett, D., Fraser, D., Hooks, D., & Sharrer, R. (2008). Effectiveness of a computer-based educational program on nurses' knowledge, attitude, and skill level related to evidence-based practice. *Worldviews on Evidence-Based Nursing, 5*(2), 75-84. doi: 10.1111/j.1741-6787.2008.00123.x

Hauck, S., Winsett, R., & Kuric, J. (2012). Leadership facilitation strategies to establish evidence-based practice in an acute care hospital. *Journal of Advanced Nursing, 69*(3), 664-674. doi:10.11365-2648.2012.06053.x111/j

Heiwe, S., Johansson, E., Nilsson-Kajermo, K., Saflund, K., & Odlund, A. (2013). Outcomes of a multiprofessional educational intervention in evidence-based practice. *Journal of Research in Interprofessional Practice and Education, 3.2,* 1-11. Retrieved from http://www.jripe.org/jripe/index.php/journal/article/view/107/82

Heiwe, S., Kajermo, K., Tyni-Lenne, R., Guidetti, S., Samuelsson, M., Anderson, I., & Wengstrom, Y. (2011). Evidence-based practice: attitudes, knowledge and behaviour among allied health care professionals. *International Journal for Quality in Health Care, 23*(2), 198-209. doi: 10.1093/intqhc/mzq083

Hudson, K., Duke, G., Haas, B., & Varnell, G. (2008). Navigating the evidence-based practice maze. *Journal of Nursing Management, 16,* 409-416. doi: 10.1111/j.1365-2834.2008.00860.x

Hutchison, A., & Johnston, L. (2006). Beyond the barriers scale: Commonly reported barriers to research use. *The Journal of Nursing Administration, 36*(4), 189-199.

Institute of Medicine. (2001). *Crossing the quality chasm: A new health system for the 21st century.* Retrieved from http://www.iom.edu/Reports/2001/Crossing-the-Quality-Chasm-A-New-Health-System-for-the-21st-Century.aspx

Institute of Medicine (2003). *Health professions education: A bridge to quality*. Retrieved from http://www.iom.edu/Reports/2003/Health-Professions-Education-A-Bridge-to-Quality.aspx

Institute of Medicine (2010). *The future of nursing: Leading change, advancing health*. Retrieved from http://www.iom.edu/Reports/2010/The-Future-of-Nursing-Leading-Change-Advancing-Health.aspx

Joint Commission. (2010). *Robert wood johnson foundation initiative on the future of nursing.* Retrieved from http://www.jointcommission.org/assets/1/18/RWJ_Future_of_Nursing.pdf

Jones, C. (2008). Revisiting nurse turnover costs: adjusting for inflation. *Journal of Nursing Administration, 38*(1), 11-18. doi:10.1097/01.NNA.0000295636.03216.6f

Kajermo, K., Unden, M., Gardulf, A., Eriksson, L., Orton, M., Arnetz, B., & Nordstrom, G. (2008). Predictors of nurses' perceptions of barriers to research utilization. *Journal of Nursing Management, 16*, 305-314. doi: 10.1111/j.1365-2834.2007.00770.x

Kentucky Hospital Association. (n.d.). Retrieved from http://info.kyha.com/KHADBS/Hospitals.asp#O

Kim, S., Brown, C., Ecoff, L., Davidson, J., Gallo, A.-M., Klimpel, K., & Wickline, M. (2013). Regional evidence-based practice fellowship: Impact on evidence-based practice implementation and barriers. *Clinical Nursing Research, 22*(1), 51-69. doi:10.1177/1054773812446063

Kleinman, C. (2004). The relationship between managerial leadershp behaviors and staff nurse retention. *Hospital Topics, 82*(4), 2-9. doi: 10.3200/HTPS.82.4.2-9

Koehn, M., & Lehman, K. (2008). Nurses' perceptions of evidence-based nursing practice. *Journal of Advanced Nursing, 62*(2), 209-215. doi:10.1111/j.1365-2648.2007.04589.x

Levin, R., Fineout-Overholt, E., Melnyk, B., Barnes, M., & Vetter, M. (2011). Fostering evidence-based practice to improve nurse and cost outcomes in a community health system: A pilot test of the advancing research and clinical practice through close collaboration model. *Nursing Administration Quarterly, 35*(1), 21-33. doi:10.1097/NAQ.0b013e31820320ff

Linton, M. & Prasun, M. (2013). Evidence-based practice: Collaboration between education and nursing management. *Journal of Nursing Management, 21,* 5-16. doi: 10.1111/j.1365-2834.2012.01440.x

Melnyk, B. & Fineout-Overholt, E. (2011). Making the case for evidence-based practice and cultivating a spirit of inqiry. *Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice* (p. 3). Philadelphia: Lippincott Williams & Wilkins.

Melnyk, B., Fineout-Overholt, E., Giggleman, M., & Cruz, R. (2010). Correlates among cognitive beliefs, ebp implementation, organizational culture, cohesion and job satisfactions in evidence-based practice mentors from a community hospital system. *Nursing Outlook, 58,* 301-308. doi:10.1016/j.outlook.2010.06.002

Mollon, D., Fields, W., Gallo, A., Wagener, R., Soucy, J., & Gustafson, B., Kim, S. (2012). Staff practice, attitudes, and knowledge/skills regarding evidence-based practice before and after an educational intervention. *The Journal of Continuing Education in Nursing, 43*(9), 411-419. doi:10.3928/00220124-20120716-89

Moseley, A., Jeffers, L., & Patterson, J. (2008). The retention of the older nursing workforce: A literature review exploring factors that influence the retention and turnover of older nurses. *Contemporary Nurse, 30*(1), 46-56. doi: 10.5172/conu.673.30.1.46

Olade, R. (2004). Evidence-based practice and research utilization activities among rural nurses. *Journal of Nursing Scholarship, 36*(3), 220-225. doi. 10.1111/j.1547-5069.2004.04041.x

Pierson, M., & Schuelke, S. (2009). Strengthening the use of evidence-based practice: Development of an independent study packet. *The Journal of Continuing Education, 40*(4), 171-176. doi: 10.3928/00220124-20090401-09

Pravikoff, D., Tanner, A., & Pierce, S. (2005). Readiness of U.S. nurses for evidence-based practice. *American Journal of Nursing, 105*(9), 40-51.

Pullen, D. (2006). An evaluative case study of online learning for healthcare professionals. *The Journal of Continuing Education in Nursing, 37*(5), 225-232.

Rolloff, M. (2010). A constructivist model for teaching evidence-based practice. *Nursing Education Perspectives, 31*(5), 290-293.

Sackett, D., Rosenberg, J. Gray, A. Haynes, B., & Richardson, S. (1996). Evidence based medicine: What it is and what it isn't. *British Medical Journal, 312*(7023), 71-72. Retrieved from http://www.jstor.org.libsrv.wku.edu/stable/pdfplus/29730277.pdf?acceptTC=true

Schmidt, N., & Brown, J. (2007). Use of the innovation-decision process teaching strategy to promote evidence-based practice. *Journal of Professional Nursing, 23*(3), 150-156. doi:10.1016/j.profnurs.2007.01.009

Schmitt, M., Titler, M. Herr, K., & Ardery, G. (2004). Challenges of web-based education in educating nurses about evidence-based acute pain management practices for older adults. *The Journal of Continuing Education. 35*(3), 121-127.

Sherriff, K., Wallis, M., & Chaboyer, W. (2007). Nurses' attitudes to and perceptions of knowledge and skills regarding evidence-based practice. *International Journal of Nursing, 13*, 363-369. doi:10.1111/j.1440-172X.2007.00651.x

Shirey, M. (2006). Evidence-based practice: How nurse leaders can facilitate innovation. *Nursing Administration Quarterly, 30*(3), 252-265.

Upton, D., & Upton, P. (2006). Development of an evidence-based practice questionnaire for

nurses. *Journal of Advanced Nursing, 53*(4), 454-458. doi:10.1111/j.1365-2648.2006.03739.x

U. S. Department of Health and Human Services. (2010). *The Registered Nurse Population.* Health Resources and Services Administration (HRSA). Retrieved from http://bhpr.hrsa.gov/healthworkforce/rnsurveys/rnsurveyfinal.pdf

Varnell, G., Haas, B., Duke, G., & Hudson, K. (2008). Effect of an educational intervention on attitudes toward and implementation of evidence-based practice. *Worldviews on Evidence-Based Nursing, 5*(4), 172-181. doi: 10.1111/j.1741-6787.2008.00124.x

Appendix A

Permission to Use EBPQ Instrument

Moore, Lora

From: Laura Scurlock-Evans <l.scurlock-evans@worc.ac.uk>
Sent: Wednesday, May 01, 2013 9:56 AM
To: Moore, Lora
Subject: RE: EBPQ
Attachments: Evidence Based Practice QUESTIONNAIRE (Upton & Upton 2006).doc; Upton&UptonEBPQ(2006).pdf

Dear Lora,
I am a Psychology Technician and assist with requests for Professor Upton's publications. Professor Upton and Dr. Upton are happy to provide you with a copy of the measure free of charge and grant permission to use it in your project, with the proviso that (as you say) as authors they are acknowledged in any communication, including publication, in which the questionnaire is used.
I have attached a copy of the questionnaire and a paper which contains details of its development and construction (Upton & Upton, 2006). Each item on the questionnaire is scored from 1-7 (i.e. 1=Poor – 7= best) and an average score can then be calculated for each subscale (Practice (1), Attitudes (2) and Knowledge/Skills (3)).

In accordance with UK copyright law we would be grateful if you would refer anyone else interested in using the EBPQ to us, rather than distribute copies of the questionnaires to third parties yourself. This will also help the authors gauge the level of interest in the questionnaire and its application in the clinical/research/educational setting. We would be very interested to hear about your findings, if you would be happy to share them with us?

Many thanks for your interest in the EBPQ and good luck with your project. Please feel free to contact me if you would like any further information.
Best wishes,

Laura.

Laura Scurlock-Evans BSc (Hons), PGD PRM (Open), MBPsS
Psychology Technician, PhD student and sessional lecturer
Room: BB065
Phone: (01905) 85 5190
Email: l.scurlock-evans@worc.ac.uk

Appendix B

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 C

Recruitment Announcement

Attention Registered Nurses!

Participant Recruitment for Research Study

The purpose of this study is to evaluate the effectiveness of online learning modules in nursing.

To qualify for participation in this study, you must be a registered nurse with direct bed-side care responsibilities.

Informational sessions will be scheduled to:

- provide you with information regarding the research project,
- explain requirements for participation,
- provide you information needed for informed consent, and
- allow time for completion of the initial questionnaire.

Informational sessions should take no more than 30 minutes and participant responses will be anonymous.

Schedule:

Sunday, June 29th	**Monday, June 30th**	**Tuesday, July 1st**
	12:00 PM	
	1:00 PM	1:00 PM
	2:00 PM	2:00 PM
3:00 PM	3:00 PM	3:00 PM
4:00 PM	4:00 PM	4:00 PM
5:00 PM		
6:00 PM	6:00 PM	6:00 PM
7:00 PM	7:00 PM	7:00 PM
8:00 PM	8:00 PM	8:00 PM
9:00 PM	9:00 PM	9:00 PM
	10:00 PM	

This study is approved by the Western Kentucky University Institutional Review Board.

Appendix D

Script for Use When Obtaining Informed Consent

Hello, my name is Lora Moore and I am a doctoral nursing student at Western Kentucky University. First, let me thank you for your attendance today and participation in my research study.

The purpose of this meeting is to:

- provide you with information regarding my research project,
- explain requirements of you for participation,
- obtain your informed consent, and
- have you complete the initial survey.

My research study will be looking at online learning modules in nursing.

Each of you will be randomly assigned to one of three groups with each group having a different activity to complete. Your responses will be anonymous and confidentiality maintained by using a unique key code on your surveys.

Within the next week, you will receive an email with directions on how to access your online learning module which will take approximately 45-60 minutes to complete. It is important that you complete your online learning module by August 1st. As a reminder of the completion date, flyers will be posted throughout the facility and an email will be sent to you.

Two weeks after the start of the intervention, you will receive a third email reminding you to complete your assigned intervention and instructions on how to complete the follow-up survey. Time to complete the follow-up survey is minimum and will be similar to the time needed to complete today's survey. It is very important that you complete the follow-up survey so that your participation can be included in the study results.

As an incentive for participation, participants who complete today's survey, the online activity, and the follow-up survey will be entered into a raffle for one of ten $25 gift cards.

At this time I will distribute the informed consent document. You will receive two copies of the informed consent document. One is for you to keep and one is for you to sign and turn in today should you choose to participate in the research study. As I receive your signed consent form, I will then give you the survey to complete. A box has been placed by the door for you to turn in your completed survey as you leave the room.

Please let me know if you have any questions regarding the instructions just provided or the research study itself.

Again, I would like to thank you for your participation and I look forward to sharing my research findings with you and the OHRH organization.

Appendix E

INFORMED CONSENT DOCUMENT

Project Title: Improving Evidence-Based Practice Skills of Practicing Registered Nurses
Investigator: Lora Moore, School of Nursing, 615-476-9161

You are being asked to participate in a project conducted through Western Kentucky University and Owensboro Health Regional Hospital. The University requires that you give your agreement to participate in this project.

The investigator will explain to you in detail the purpose of the project, the procedures to be used, and the potential benefits and possible risks of participation. You may ask any questions you have to help you understand the project. A basic explanation of the project is written below. Please read this explanation and discuss with the researcher any questions you may have. You should keep a copy of this form for your records.

1. **Nature and Purpose of the Project:** The purpose of this project is to evaluate the effect of an online learning module in nursing.

2. **Explanation of Procedures:** You will be asked to complete a 38-item survey today. Then next week you will be sent an email with instructions on how to access and complete an online learning module for registered nurses. Two weeks later you will receive a reminder email regarding completion date for educational intervention and directions on how to complete the follow-up survey.

3. **Discomfort and Risks:** There are no actual or perceived risks with this project. Participant time requirement is approximately 10-15 minutes for initial survey completion, 45-60 minutes for the online learning module, and 10-15 minutes for completion of follow-up survey.

4. **Benefits:** The benefits of this study to you include increased knowledge related to evidence-based nursing practice. Additional potential benefits include improved nurse job satisfaction and improved patient care outcomes.

5. **Confidentiality:** Data will be collected anonymously. Participants will not be asked any identifying information.

6. **Refusal/Withdrawal:** Refusal to participate in this study will have no effect on any future services you may be entitled to from the University. Anyone who agrees to participate in this study is free to withdraw from the study at any time with no penalty.

You understand also that it is not possible to identify all potential risks in an experimental procedure, and you believe that reasonable safeguards have been taken to minimize both the known and potential but unknown risks.

Completion of the survey implies your consent.

THIS PROJECT HAS BEEN REVIEWED AND APPROVED BY
THE WESTERN KENTUCKY UNIVERSITY INSTITUTIONAL REVIEW BOARD
Paul Mooney, Human Protections Administrator
TELEPHONE: (270) 745-2129

Appendix F

Pretest

Evaluating Effectiveness of Online Learning Modules in Nursing

Thank you for participating in my research study which will evaluate the effect on online learning modules in nursing. To allow for comparison with follow-up survey while maintaining your anonymity, you will be asked two basic questions from which your unique code will be developed.

Thank you! You may begin the survey.

Questions to Determine Participant's Unique Code

1. What is the first two letters of your mother's maiden name? _____
2. What is the last three numbers of your social security number? _____

Demographic Questions

1. How many years of experience as a registered nurse do you have? _____
2. What is the highest level of nursing educational preparation you have? (circle answer)
    a. Diploma/Associate
    b. Baccalaureate
    c. Masters/Doctorate
3. In what year did you graduate from your nursing program? (Use highest nursing level if more than one.) _____

Section 1: Survey Questions

1. Acetaminophen intake must be monitored closely because: _____
    a. It is sedating
    b. Toxic doses result in hepatic cell necrosis
    c. This medication is very potent
    d. It inhibits synthesis of serotonin

2. Addiction is defined as: _____
    a. Physical adaptation to a drug
    b. Presence of withdrawal symptoms
    c. Continued use regardless of harm
    d. Recreational use of a drug

3. The World Health Organization (WHO) ladder is intended for management of cancer pain, and is **NEVER** generalized to non-cancer pain (nociceptive pain). _____
    a. True
    b. False

4. Tramadol is a strong opioid but decreases the risk of serotonin syndrome. _____
    a. True
    b. False

Section 2: Survey Questions

Consider 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**

Please indicate (√ 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

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**

Section 3: Survey Questions

1. Fentanyl patches would be appropriate for which of the following patients? _____
    a. Patients already receiving opioid therapy
    b. Opioid-naïve patients
    c. Patients in acute pain from trauma
    d. The first 24 hours after surgery

2. Adverse effects of opioids include rash, nausea, and constipation. _____
    a. True
    b. False

3. Patient selection for treatment with narcotics should include assessment of risk for: _____
    a. Opioid abuse or diversion
    b. Phobias
    c. Biotoxicity
    d. Lack of GP4 enzyme

4. Normal cognitive function is a factor when selecting patients for patient controlled analgesia (PCA).
    a. True
    b. False

Thank you for your participation!

Appendix G

IRB Revision Approval

WESTERN KENTUCKY UNIVERSITY

Institutional Review Board
Continuing Review Report

Name of Project: Improving Evidence-Based Practice Skills of Practicing Registered Nurses
Name of Researcher: Lora Moore
Department: School of Nursing

How many total subjects have participated in the study since its inception? # 13

How many subjects have participated in the project since the last review? # 13

Is your data collection with human subjects complete? ☐ **Yes** ☒ **No**

1. Has there been any change in the level of risks to human subjects? (If "Yes", please explain changes on a separate sheet). ☐ Yes ☒ No

2. Have informed consent procedures changed so as to put subjects above minimal risk? (If "Yes", please describe on a separate sheet). ☐ Yes ☒ No

3. Have any subjects withdrawn from the research due to adverse events or any unanticipated risks/problems? (If "Yes", please describe on a separate sheet). ☐ Yes ☒ No

4. Have there been any changes to the source(s) of subjects and the Selection criteria? (If "Yes", please describe on a separate sheet). ☐ Yes ☒ No

5. Have there been any changes to your research design that were not specified in your application, including the frequency, duration and location of each procedure. (If "Yes", please describe on a separate sheet). ☒ Yes ☐ No

6. Has there been any change to the way in which confidentiality of the Data is maintained? (If "Yes", please describe on a separate sheet). ☐ Yes ☒ No

7. Is there desire to extend the time line of the project? ☐ Yes ☒ No
On what date do you anticipate data collection with human subjects to be completed? _____

At completion of 17 of the 25 scheduled informational sessions, the researcher had only 13 participants. One hundred percent (100%) of registered nurses attending an informational session elected to participate in the study by completing the initial survey. Primary reason thought to hinder registered nurse attendance at informational sessions is lack of time to leave unit during patient care hours.

After discussion with both hospital administration and the researcher's faculty advisor, the researcher would like to add the addition of electronic surveys to the study by using the registered nurses' work email addresses and Qualtrics Survey software. A researcher provided email will be sent to the facility's registered nurses by the Human Resources department of Owensboro Health Regional Hospital. The email sent to registered nurses will contain both the approved informed consent document and scripted information that was provided verbally to participants who attended an informational session.

The initial and follow-up surveys delivered via Qualtrics will be identical to the previously approved paper survey and will not ask for any identifying information. The study will continue as scheduled with the exception of including an electronic survey format for both the initial and follow-up survey.

Appendix H

Email to Participants

Hello, my name is Lora Moore and I am a doctoral nursing student at Western Kentucky University conducting a research study that evaluates the effectiveness of online learning modules in nursing.

Your responses will be anonymous as no identifying information will be obtained. Each of you will be randomly assigned to one of three groups with each group having a different activity to complete.

Within the next week or so, you will receive an email with directions on how to access your online learning module which will take approximately 30 minutes to complete. It is important that you complete your online learning module by August 1st.

A second email will be sent to you as a reminder of the completion date and with follow-up survey instructions. Time to complete the follow-up survey is minimum and will be similar to the time needed to complete today's survey. It is very important that you complete the follow-up survey so that your participation can be included in the study results.

As an incentive for participation, participants who complete this survey, the online activity, and the follow-up survey will be entered into a raffle for one of ten $25 gift cards from the researcher. OHRH will also be providing each participant a gift as a thank you for participation in the study.

At this time you may read over the attached informed consent document and ask any questions you may have. Completion of the survey will imply your consent to participate in the study. **This survey must be completed by Wednesday, July 16, 2014.**

Again, thank you for your participation and I look forward to sharing my research findings with you and the OHRH organization.

Survey Link: **https://wku.co1.qualtrics.com/SE/?SID=SV_erf5SmbcZMOx0fX**

Lora Moore MSN, RN, CNE
DNP Student
School of Nursing
Western Kentucky University

Appendix I

Email to Participants Regarding Assignments

Group 1

Thank you once again for participating in this research study to evaluate the effectiveness of online learning modules in nursing. You have been randomly assigned to one of three groups. Your group has been assigned the ***Introduction to Evidence Based Nursing Practice*** learning module. To access and complete your learning module, log in to HealthStream. The *Introduction to Evidence Based Nursing Practice* learning module must be completed by August 1st.

Lora Moore MSN, RN, CNE
DNP Student
School of Nursing
Western Kentucky University

Group 2

Thank you once again for participating in this research study to evaluate the effectiveness of online learning modules in nursing. You have been randomly assigned to one of three groups. Your group has been assigned the ***Pain Management*** learning module. To access and complete your learning module, log in to HealthStream and select the *Norton University: Instructions and Link to access Swank Education* in the My Learning tab. This course will direct you to the Norton's login page. The *Pain Management* learning module, course number 319012, must be completed by August 1st.

Lora Moore MSN, RN, CNE

DNP Student
School of Nursing
Western Kentucky University

Group 3

Thank you once again for participating in this research study to evaluate the effectiveness of online learning modules in nursing. You have been randomly assigned to one of three groups. At this time your group does not have a learning module to complete. Please check your email frequently for future instructions.

Lora Moore MSN, RN, CNE
DNP Student
School of Nursing
Western Kentucky University

Appendix J

EBP Educational Intervention

Introduction to Evidence-Based Nursing Practice

Lora Moore MSN, RN, CNE

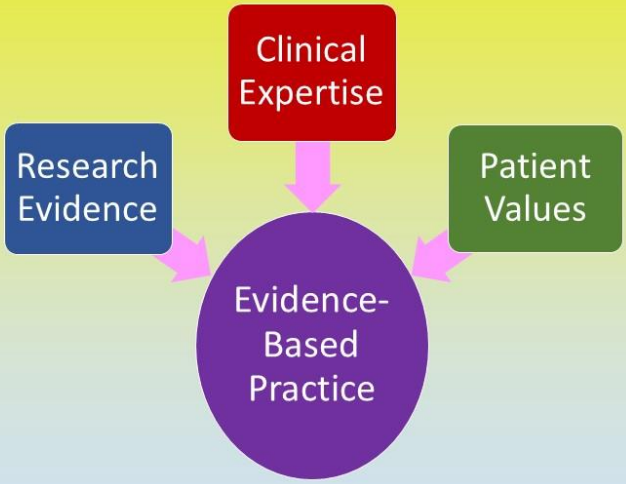
Course Objectives

- Define evidence-based practice (EBP)
- Develop a clinical question
- Describe and use relevant evidence-based resources
- Critically appraise information and apply evidence to practice
- Evaluate the evidence-based change for effectiveness
- Identify EBP resources available at OHRH

What is EBP?

EBP is "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of the individual patient. It means integrating individual clinical expertise with the best available external clinical evidence from systematic research" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996).

It is no longer acceptable to say "that's how I've always done it."



Why EBP Matters?

- American Nurses Association (ANA) Scope & Standards of Practice (ANA, 2004)
  - #7: The RN systematically enhances the quality and effectiveness of nursing practice.
  - #8: The RN attains knowledge and competency that reflects current nursing practice.
  - #13: The RN integrates research findings into practice.
- IOM's Health Professions Education: A Bridge to Quality report
  - EBP is one of five core competencies that all healthcare professionals must develop and maintain proficiency (Kim, Brown, Fields, & Stichler, 2009)
- EBP quality improvement to provide effective, safe, & efficient care (Stevens, 2013)
- Increasing public and professional demand for accountability in safety and quality improvement in health care (Stevens, 2013)

Benefits to Utilizing EBP

- High quality healthcare (Melnyk & Fineout-Overholt, 2011)
- Best patient outcomes (Melnyk & Fineout-Overholt, 2011)
- Improved nurse satisfaction & retention (Levin, Fineout-Overholt, Melnyk, Barnes, & Vetter, 2011)
- Decreased healthcare costs (Melnyk & Fineout-Overholt, 2011)
- Maximizing payment for services provided (Hauck, Winsett, & Kuric, 2012)
- Increased number of customers choosing facility based on publicly available patient outcome data (Pierson & Schuelke, 2009)

EBP Requires a Spirit of Inquiry

A spirit of inquiry is an ongoing curiosity in which one challenges the status quo, questions traditional practices, and seeks new approaches. (National League for Nursing, 2010)

A spirit of inquiry is essential to EBP. (Melnyk, Fineout-Overholt, Stillwell, & Williamson, 2009)

A spirit of inquiry is an essential characteristic for nurses practicing in today's healthcare environment. (National League for Nursing, 2010)

Seven Steps of EBP

Once you have identified your topic of interest through spirit of inquiry, you will follow the 7 steps of EBP.

Step 0: Spirit of Inquiry
Step 1: Ask a clinical question
Step 2: Search for the best evidence
Step 3: Critically appraise the evidence
Step 4: Applying the evidence
Step 5: Evaluate the outcomes
Step 6: Share your outcomes with others

(Ciliska, 2005; Melnyk et al., 2010; Yackel, Short, Lewis, Breckenridge-Sproat, & Turner, 2013)

Step 0: Spirit of Inquiry

Start with a spirit of inquiry by questioning the current process, etc.

What are you interested in knowing?
Is there something that doesn't work well?
How can you change it for the better?
What patient outcome do you want to improve?
Is there a better way to do something?

Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2010). The seven steps of evidence-based practice. *American Journal of Nursing, 110*(1). 51-53.

Step 1: Ask a Clinical Question

The first step of EBP involves taking your topic of interest or identified clinical problem and constructing it in a way that facilitates finding the answer. Using the PICOT format, a clinical question becomes well focused.

P = Patient or problem

I = Intervention

C = Comparison

O = Outcome

T = Time

Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2010). Asking the clinical question: A key step in evidence-based practice. *American Journal of Nursing, 110* (3). 58-61.

PICOT Format

P = How would you describe your patient, group of patients, or clinical problem? What are the most common characteristics of this patient? What is the primary problem? Any other relevant information such as age, gender, race, etc.?

I = What intervention are you considering? What do you want to do for the patient or problem?

C = What is the alternative that you want to compare with the intervention? Are you trying to decide between two options?*

O = What do you hope to achieve or improve? What are you trying to do for the patient? Improve function? Prevent complication, etc.?

T = Time frame to achieve outcome?*

*Time and Comparison are not always appropriate for every clinical question.

Scenario #1

While working in an inner city postpartum clinic, you have noticed an increase in postpartum depression. You wonder not only why there is an increase in postpartum depression within this population but also what can be done to decrease the postpartum depression rate. One intervention you consider is "skin to skin contact". You speak to your nurse manager regarding your recent observations. The nurse manager is open to the idea of implementing a policy change promoting "skin to skin contact" but only after you can provide the evidence showing that "skin to skin contact" does indeed positively effect the identified clinical problem of increased postpartum depression in clinical patients.

Scenario #1 : Develop the PICOT Question

Now that you have read the scenario and have identified a clinical problem, you must now focus your question into a searchable, well focused, PICOT question.

P =

I =

C =

O =

T =

Take a moment to write down your answers on your worksheet.

Scenario #1 : Develop the PICOT Question

P = new mothers

I = skin to skin contact

C = no skin to skin contact

O = effect on postpartum depression

T = first three months

PICOT Question:

In new mothers, does skin to skin contact between mother and newborn versus no skin to skin contact have an effect on maternal postpartum depression during the first three months?

Scenario #2

You work on a surgical floor in which some patients receive orders for Incentive Spirometer (IS) while others do not. You notice that standing orders by general surgeons are mixed with some surgeons ordering IS and others not. You wonder if the use of IS over traditional turn, cough, deep breathe practices is more beneficial to your patients? In addition, you consider costs particularly for those patients who are too confused to properly use the incentive spirometer.

Scenario #2 : Develop the PICOT Question

Now that you have read the scenario and have identified a clinical question, you must now focus your question into a searchable, well focused, PICOT question.

P =

I =

C =

O =

T =

Take a moment to write down your answers on your worksheet.

Scenario #2 : Develop the PICOT Question

P = post-op abdominal surgery

I = use of incentive spirometer

C = turn, cough, deep breathe

O = respiratory complications (pneumonia)

T = first seven days post-op when hospitalized

PICOT Question:

In patients who have had abdominal surgery, how does use of incentive spirometer versus the turn, cough, deep breathe intervention effect incidence of pneumonia during the first seven days post-op while hospitalized?

Scenario #2 : Develop the PICOT Question

PICOT Question:

In patients who have had abdominal surgery, how does use of incentive spirometer versus the turn, cough, deep breathe intervention effect incidence of pneumonia during the first seven days post-op while hospitalized?

As you can see, specifics were needed to make this a searchable question. Such as, patients with abdominal surgery in comparison to all surgical patients. Limiting respiratory complications to pneumonia or other related complication such as infection, fever, etc.

Scenario #1 & #2

Scenarios #1 & #2 are examples of how to develop a PICOT question from a clinical question or problem. A PICOT question is used to guide your search for evidence and can be developed for any topic.

Why do we use this device or that type of mattress? Does this incontinence product do a better job maintaining skin integrity compared to another product? Does this medication work better than that one? How does hypothermic treatment post cardiac arrest affect survival rates? Effect of rapid response teams, IV therapy teams, admission procedures, timing of medications, etc.

A PICOT question is used to guide your search for evidence and can be developed for ANY TOPIC!

Step 2: Search for the Best Evidence

Now that you have a well-built clinical question it is time to search the literature for the best evidence. While there are millions of published articles available, databases such as PubMed provide access to primary health literature. PubMed is an open access database.

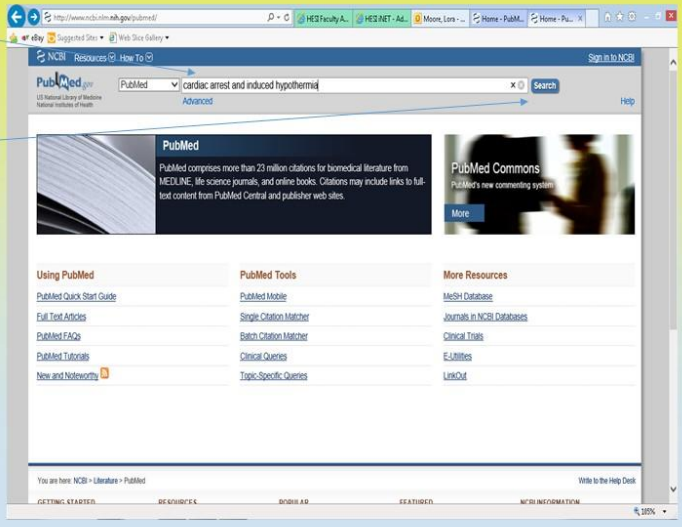
Other databases:

- Cochrane Library
- The Johanna Briggs Institute
- National Guideline Clearinghouse
- Evidence Updates
- CINAHL

Searching PubMed

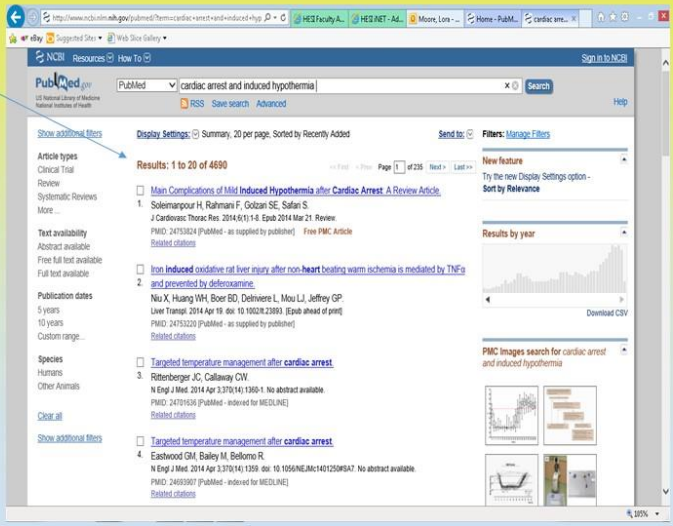
Enter patient problem and intervention

Select "Search"



Searching PubMed

Articles located are listed along with number of articles found

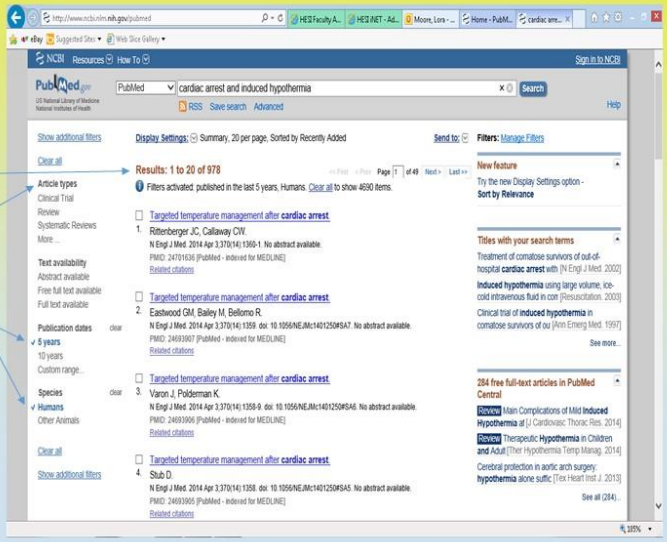


Searching PubMed

Filters may be applied to refine your search

Simply Selecting “Humans” and “5 years” decreased the number of articles from 4,690 to 978

Use other filters to refine your search even further such as article types

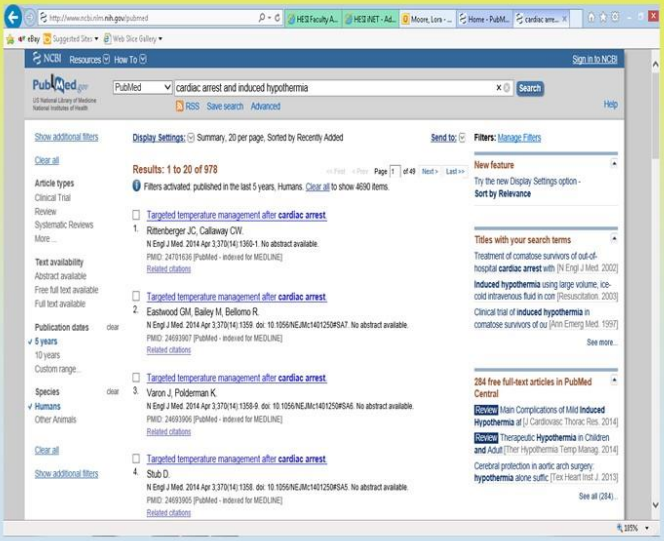


Searching PubMed

Article types is an excellent way to refine your search to include articles with only the highest levels of evidence.

Article types include:
- Systematic Reviews
- Clinical Trials
- Practice Guidelines
- others……

At this time, review the information on the handout titled *EBP Resources.*



Article Types

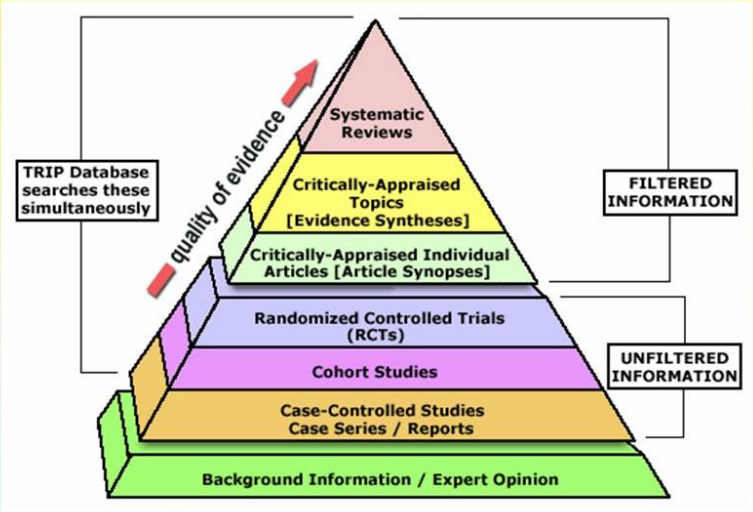
The pyramid depicts hierarchy level among types of articles with Systematic Reviews having the highest level of evidence.

Systematic Reviews summarize numerous studies on same clinical topic, identifying findings from numerous studies in one article.

Randomized control trials are experimental studies that can provide evidence of cause and effect.

Case Studies take a look at what might have been associated with a patient's illness.

Cohort Studies take a group of patients with a common condition/treatment and follow them over time.



PubMed Tutorial

Locating exactly what you are looking for in a database such as PubMed takes a little practice. The PubMed database has an easy to follow tutorial that walks you through how to conduct a search using numerous search filters.

http://www.nlm.nih.gov/bsd/disted/pubmedtutorial/cover.html

In addition to database tutorials, your medical librarian can be of assistance to you when conducting literature searches.

Step 3: Critically Appraise the Evidence

When appraising a study, you want to know if the study was well designed, what were the study's results, and is the information relevant to your patients.

Filtered resources are generally pre-appraised prior to publication.

Are the results of the study valid? Is the information provided truthful?

Step 3: Critically Appraise the Evidence

Evidence that supports validity of a study is primarily in the design of the study also known as study methodology.

Key issues include:

- potential for bias
- randomization
- blinding
- follow-up

Step 3: Critically Appraise the Evidence

Bias – conscious or unconscious influence affecting study results

Randomization – patients should be selected to study groups randomly so that the study is a true representation of the larger population

Allocation concealed – clinicians should not know who is assigned to which treatment group to prevent potential bias

Blinded - patients or participants should not know what treatment or intervention group to which they are assigned

Follow-up – the number of patients that started the study compared to the number that finished the study, should be ≥ 80%. Should also include why participants did not complete study.

Step 3: Critically Appraise the Evidence

What were the results?

Was the improvement statistically significant?

- P < 0.05 means there is less than a 5% chance that the outcome achieved was not related to the intervention.
- The smaller the P value the higher the significance.

Was the improvement clinically significant?

- This is more so a use of judgment than statistics
- Is the difference between groups large enough to be worthwhile?

Step 4: Applying the Evidence

How can I apply the results to patient care?

Do my patients match the study inclusion criteria?

Were all clinical outcomes considered?

Clinical significance of the results?

Are treatment/intervention benefits worth the potential harm?

Are treatment/intervention benefits worth the cost?

Patient preferences?

Step 5: Evaluate the Outcomes

Once you have implemented changes to practice based on evidence, you must evaluate effectiveness of the new change in practice.

- Was the treatment/intervention successful?
- Is there more up-to-date evidence on this topic?
- Are additional revisions to practice/policy needed?
- What information should be considered next time?

Step 6: Share Your Findings/Outcomes

Once you have implemented a change and evaluated its effectiveness, you must share your findings with others so that "the wheel is not reinvented over and over".

Definitely share your findings with other units within your facility, partnering facilities, etc.

Consider working with an academic nursing unit to formally publish findings.

When findings are publicly available, others can build upon that knowledge without starting from "scratch" each time.

Additional EBP Resources

- The first four articles of an eleven article series from Arizona State University College of Nursing and Health Innovation's Center for the Advancement of Evidence-Based Practice
  - Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2009). Igniting a spirit of inquiry: An essential foundation for evidence-based practice. *American Journal of Nursing*, *109*(11), 49-52.
  - Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2010). The seven steps of evidence-based practice. *American Journal of Nursing*, *110*(1), 51-53.
  - Stillwell, S., Fineout-Overholt, E., Melnyk, B., & Williamson, K. (2010). Asking the clinical question: A key step in evidence-based practice. *American Journal of Nursing*, *110*(3), 58-61.
  - Stillwell, S., Fineout-Overholt, E., Melnyk, B., & Williamson, K. (2010). Searching for the evidence. *American Journal of Nursing*, *110*(5), 41-47.

You Can Implement EBP – Give It A Try!

- Now that you have the knowledge to implement the steps of EBP
  - Develop a question.
  - Look for the evidence.
  - Consider how you could use this information to change practice in your area.
- You do not have to do this alone. Work with other staff.
- Creating an organizational culture that supports & practices EBP takes time and participation by everyone.
- So over the next 2 weeks do you part and give EBP a try!

OHRH Medical Library

Virginia Marx, Medical Librarian/CME Coordinator

virginia.marx@owensborohealth.org

270-417-6864

Library Hours: Monday-Friday 8:00-4:30

References

- American Nurses Association [ANA]. (2004). Scope & Standards of Practice. Silver Spring, MD: Nursebooks.org
- Ciliska, D. (2005). Educating for evidence-based practice. *Journal Of Professional Nursing*, *21*(6), 345-350.
- Kim, S., Brown, C., Fields, W., & Stichler, J. (2009). Evidence-based practice-focused interactive teaching strategy: A controlled study. *Journal Of Advanced Nursing*, *65*(6), 1218-1227. doi:10.1111/j.1365-2648.2009.04975.x
- Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2009). Igniting a spirit of inquiry: An essential foundation for evidence-based practice. *American Journal of Nursing*, *109*(11), 49-52.
- Melnyk, B., Fineout-Overholt, E., Stillwell, S., & Williamson, K. (2010). The seven steps of evidence-based practice. *American Journal of Nursing*, *110*(1), 51-53.
- Melnyk, B. & Fineout-Overholt, E. (2011). Making the case for evidence-based practice and cultivating a spirit of inqiry. *Evidence-Based Practice in Nursing & Healthcare: A Guide to Best Practice* (p. 3). Philadelphia: Lippincott Williams & Wilkins.

References

- National League for Nursing. (2010). Outcomes and competencies for graduates of practical/vocational, diploma, associate degree, baccalaureate, master's, practice doctorate, and research doctorate programs in nursing. New York, NY: NLN
- Sackett, D., Rosenberg, W., Gray, J., Haynes, R., & Richardson, W. (1996). Evidence based medicine: What it is and what it isn't. *BMJ: British Medical Journal (International Edition)*, *312*(7023), 71-72. doi:10.1136/bmj.312.7023.71
- Stevens, K. R. (2013). The impact of evidence-based practice in nursing and the next big ideas. *Online Journal of Issues In Nursing*, *18*(2), 1. doi:10.3912/OJIN.Vol18No02Man04
- Stillwell, S., Fineout-Overholt, E., Melnyk, B., & Williamson, K. (2010). Asking the clinical question: A key step in evidence-based practice. *American Journal of Nursing*, *110*(3), 58-61.
- Stillwell, S., Fineout-Overholt, E., Melnyk, B., & Williamson, K. (2010). Searching for the evidence. *American Journal of Nursing*, *110*(5), 41-47.
- Yackel, E., Short, N., Lewis, P., Breckenridge-Sproat, S., & Turner, B. (2013). Improving the adoption of evidence-based practice among nurses in army outpatient medical treatment facilities. *Military Medicine*, *178*(9), 1002-1009. doi:10.7205/MILMED-D-13-00191

Evidence Based Practice Worksheet

The first step of EBP involves taking your topic of interest or identified clinical problem and constructing it in a way that facilitates finding the answer. Using the PICOT format, a clinical question becomes well focused.

P = How would you describe your patient, group of patients, or clinical problem? What are the most common characteristics of this patient? What is the primary problem? Any other relevant information such as age, gender, race, etc.?

I = What intervention are you considering? What do you want to do for the patient or problem?

C = What is the alternative that you want to compare with the intervention? Are you trying to decide between two options?*

O = What do you hope to achieve or improve? What are you trying to do for the patient? Improve function? Prevent complication, etc.?

T = Time frame to achieve outcome?*

*Remember time and comparison are not always appropriate for every clinical question.

Scenario #1

P =

I =

C =

O =

T =

Scenario #2

P =

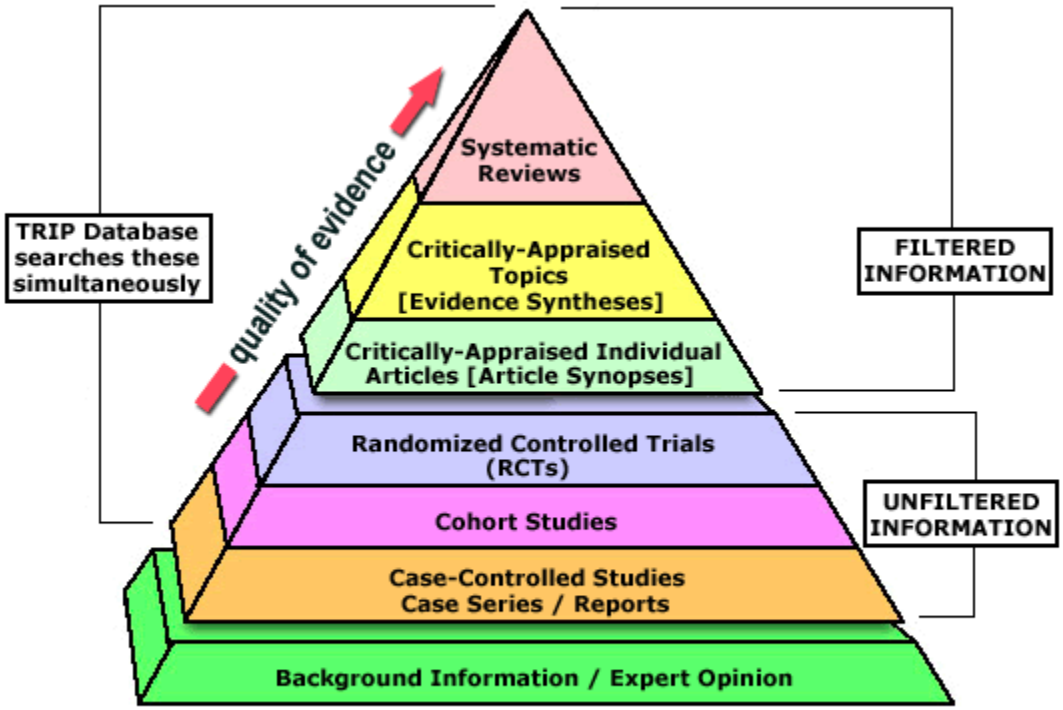
I =

C =

O =

T =

Evidence-Based Practice Resources



Filtered Resources

Filtered resources appraise the quality of studies and often make recommendations for practice.

Systematic Reviews / Meta-Analyses

Authors of a **systematic review** ask a specific clinical question, perform a comprehensive literature search, eliminate the poorly done studies and attempt to make practice recommendations based on the well-done studies. A **meta-analysis** is a systematic review that combines all the results of all the studies into a single statistical analysis of results.

The Cochrane Database of Systematic Reviews

Consists of detailed, structured topic reviews of hundreds of articles. Teams of experts complete comprehensive literature reviews, evaluate the literature, and present summaries of the findings of the best studies. Published by the International Cochrane Collaboration.
The Cochrane Library contains the Cochrane Systematic Reviews, the Database of Abstracts of Reviews of Effect (DARE), the Central Register of Clinical Trials (CENTRAL), the Methodology Register, the Health Technology Assessment Database, and the NHS Economic Evaluation Database.

The Database of Abstracts of Reviews of Effect (DARE)

Full-text database containing structured abstracts of systematic reviews from a variety of medical journals. DARE is produced by the National Health Services' Centre for Reviews and

Dissemination (NHS CRD) at the University of York. DARE records cover topics such as diagnosis, prevention, rehabilitation, screening, and treatment.

Systematic Reviews are also searchable in MEDLINE:

- **Ovid MEDLINE:** Enter your search query. Click on the "Limits" icon; select "Systematic Reviews" under "Subject Subsets."
- **PubMed:** Click on "Clinical Queries" on the left side of the screen; select "Find Systematic Reviews" and enter your search query.

Critically-Appraised Topics
Authors of **critically-appraised topics** evaluate and synthesize multiple research studies.

Clinical Evidence
Summarizes the current state of knowledge about the prevention and treatment of clinical conditions, based on thorough searches and appraisal of the literature. It describes the best available evidence from systematic reviews, RCTs, and observational studies where appropriate, and if there is no good evidence it says so.

National Guideline Clearinghouse
A comprehensive database of evidence-based clinical practice guidelines and related documents produced by the Agency for Health Care Research and Quality, in partnership with the American Medical Association and the American Association of Health Plans. Updated weekly.
Note: Guideline evidence varies from expert opinion to high levels of evidence.

PIER
Evidence-based clinical guidance designed for rapid access to clinical information at the point of care. PIER is peer-reviewed, updated continually and includes recommendations based on all levels of medical evidence. Recommendations also include strength-of-recommendation ratings based on the quality of the underlying evidence. From the American College of Physicians. There is a PDA version of this product.

Critically-Appraised Individual Articles
Authors of **critically-appraised individual articles** evaluate and synopsize individual research studies.

The ACP Journal Club
The editors of this journal screen the top 100+ clinical journals and identify studies that are methodologically sound and clinically relevant. An enhanced abstract, with conclusions clearly stated, and a commentary are provided for each selected article. Published by the American College of Physicians-American Society of Internal Medicine.
Check ejournals list for multiple subscriptions.

Bandolier
Bandolier is an independent journal about evidence-based healthcare published in the UK. It includes "information about evidence of effectiveness (or lack of it), and put[s] the results

forward as simple bullet points of those things that worked and those that did not: a bandolier with bullets. Information comes from systematic reviews, meta-analyses, randomised trials, and from high quality observational studies."

"Evidence-Based…" Journal series

(e.g., Evidence-Based Medicine, Evidence-Based Mental Health, Evidence-Based Nursing)
Primary research articles within the discipline are selected for quality and clinical relevance. A structured abstract and expert commentary are provided for each study.
Check ejournals list for multiple subscriptions.

Unfiltered Resources

Evidence is not always available via filtered resources. Searching the primary literature may be required. It is possible to use specific search strategies in MEDLINE and other databases to achieve the highest possible level of evidence.

PubMed

To limit your PubMed search to the best evidence-producing studies: Click on "clinical queries" (on the left side of the screen). This specialized search is intended for clinicians and has built-in search "filters." Four study categories--therapy, diagnosis, etiology, prognosis--are provided, and you may indicate whether you wish your search to be more sensitive (i.e., include most relevant articles but probably including some less relevant ones) or more specific (i.e., including mostly relevant articles but probably omit a few).

Ovid Medline

To limit your Ovid MEDLINE search to the best evidence-producing studies: Clinical Queries (See PubMed) is searchable in Ovid; click on the "Limits" icon.

PsycINFO

International coverage of the professional and academic literature in psychology, medicine, psychiatry, nursing, sociology, education, pharmacology, physiology, linguistics, and other areas.
To limit your PsycINFO search to the best evidence-producing studies: Click on the 'Limits' icon to use 'Clinical Queries' or limit to 'methodology' types.

CINAHL

Cumulative Index to Nursing and Allied Health Literature
To limit your CINAHL search to the best evidence-producing studies: Click on the 'Limits' icon to use 'Clinical Queries' or limit to 'Research' or other 'publication' types (i.e., systematic review).

Scopus

Scopus is the largest abstract and citation database of research literature and quality web sources. Includes the EMBASE data. Updated daily.

Background Information/Expert Opinion

Note: Evidence in these resources may vary from expert opinion to high levels of evidence.

UpToDate
A clinical information resource, which offers up-to-date, fully referenced expert answers to patient-care, diagnosis, and treatment questions. Topic reviews are written by recognized authorities who review the topic, synthesize the evidence, summarize key findings, and provide specific recommendations.

eMedicine
Physician authors and editors contribute to the eMedicine Clinical Knowledge Base, which contains articles on 7,000 diseases and disorders. The evidence-based content provides the latest practice guidelines in 62 medical specialties. eMedicine's professional content undergoes multiple levels of physician peer review.

eBooks
Full-text electronic books.

Harrison's Online
Searchable and continually updated version of Harrison's Principles of Internal Medicine.

Appendix K

Email Sent to Participants Regarding Completion of Follow-up Survey

Thank you for your participation thus far in my research study. As your last assignment, you are to complete the follow-up survey by Friday, August 22nd, using the link below. In doing so your name will then be entered into a raffle for one of ten $25 gift cards. OHRH will also be providing each participant, who completes all phases of the study, a gift as an additional thank you for participation in the study. To be eligible for the gifts you must follow the directions at the end of the survey. The directions will ask that you click on a second unrelated link in which you will enter your name as entry for the incentives.

https://wku.co1.qualtrics.com/SE/?SID=SV_5nCIBLXRKL4IaJD

Thank you once again!

Lora Moore MSN, RN, CNE
DNP Student
School of Nursing
Western Kentucky University

Appendix L

Follow-Up Survey

Evaluating Effectiveness of Online Learning Modules in Nursing

Thank you for participating in my research study which will evaluate the effect on online learning modules in nursing. To allow for comparison with follow-up survey while maintaining your anonymity, you will be asked two basic questions from which your unique code will be developed.

Thank you! You may begin the survey.

Questions to Determine Participant's Unique Code

1. What is the first two letters of your mother's maiden name? _____

2. What is the last three numbers of your social security number? _____

Demographic Questions

3. How many years of experience as a registered nurse do you have? _____

4. What is the highest level of nursing educational preparation you have?

a. Diploma/Associate
b. Baccalaureate
c. Masters/Doctorate

5. In what year did you graduate from your nursing program? (Use highest nursing level if more than one.) _____

6. Which of the following learning modules were you asked to complete?

a. Pain Management
b. Evidence Based Practice
c. I was not assigned a learning module to complete

Section 1: Survey Questions

7. Acetaminophen intake must be monitored closely because: _____

a. It is sedating
b. Toxic doses result in hepatic cell necrosis
c. This medication is very potent
d. It inhibits synthesis of serotonin

8. Addiction is defined as: _____

a. Physical adaptation to a drug
b. Presence of withdrawal symptoms
c. Continued use regardless of harm
d. Recreational use of a drug

9. The World Health Organization (WHO) ladder is intended for management of cancer pain, and is **NEVER** generalized to non-cancer pain (nociceptive pain). _____

a. True
b. False

10. Tramadol is a strong opioid but decreases the risk of serotonin syndrome. _____

a. True
b. False

Section 2: Survey Questions

Consider 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

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

Please indicate (√ 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 ☐ ☐ ☐ ☐ ☐ ☐ ☐ My practice has changed because of evidence I have found

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**

Section 3: Survey Questions

1. Fentanyl patches would be appropriate for which of the following patients? _____
    a. Patients already receiving opioid therapy
    b. Opioid-naïve patients
    c. Patients in acute pain from trauma
    d. The first 24 hours after surgery

2. Adverse effects of opioids include rash, nausea, and constipation. _____
    a. True
    b. False

3. Patient selection for treatment with narcotics should include assessment of risk for: _____
    a. Opioid abuse or diversion
    b. Phobias
    c. Biotoxicity
    d. Lack of GP4 enzyme

4. Normal cognitive function is a factor when selecting patients for patient controlled analgesia (PCA).
    a. True
    b. False

Thank you for your participation!

Appendix M

Second Email Sent to Participants Regarding Completion of Follow-up Survey

It's not too late to complete your participation requirements for the research study. If you have not already done so, please complete the follow-up survey using the link below by Friday, August 29th. The survey may seem similar to the initial survey but there are minor differences that are important to the research findings so completion is important. Once you have completed the survey be sure to use the link on the last page of the survey to register your participation for the gift cards raffle and other incentives.

https://wku.co1.qualtrics.com/SE/?SID=SV_5nCIBLXRKL4IaJD

If you have already completed the follow-up survey but do not remember submitting your name using the link on the end page of the survey, you may still register your participation using the following link.

https://wku.co1.qualtrics.com/SE/?SID=SV_4IbyOa2WUnnDRkN

Thank you once again!

Lora Moore MSN, RN, CNE
DNP Student
School of Nursing
Western Kentucky University