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Review

The state of readiness for evidence-based practice among nurses: An integrative review

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ABSTRACT

Objectives: To review factors related to nurses' individual readiness for evidence-based practice and to determine the current state of nurses' evidence-based practice competencies.
Design: An integrative review study.
Data sources: Thirty-seven (37) primary research studies on nurses' readiness for evidence-based practice, of which 30 were descriptive cross-sectional surveys, 5 were pretest-posttest studies, and one study each was an experimental pilot study and a descriptive qualitative study. Included studies were published from the beginning of 2004 through end of January 2015.
Review methods: The integrative review study used thematic synthesis, in which the quantitative studies were analyzed deductively and the qualitative studies inductively. Outcomes related to nurses' readiness for evidence-based practice were grouped according to the four main themes that emerged from the thematic synthesis: (1) nurses' familiarity with evidence-based practice (EBP); (2) nurses' attitudes toward and beliefs about evidence-based practice; (3) nurses' evidence-based practice knowledge and skills; and (4) nurses' use of research in practice. Methodological quality of the included studies was evaluated with Joanna Briggs Institute critical appraisal tools.
Results: Although nurses were familiar with, had positive attitudes toward, and believed in the value of EBP in improving care quality and patient outcomes, they perceived their own evidence-based practice knowledge and skills insufficient for employing evidence-based practice, and did not use best evidence in practice. The vast majority (81%) of included studies were descriptive cross-sectional surveys, 84% used a non-probability sampling method, sample sizes were small, and response rates low. Most included studies were of modest quality.
Conclusions: More robust, theoretically-based and psychometrically sound nursing research studies are needed to test and evaluate the effectiveness of interventions designed to advance nurses' evidence-based practice competencies, especially teaching them how to integrate evidence-based practice into clinical decision-making. All efforts should be focused on systematically using knowledge transformation strategies shown to be effective in rigorous studies, to translate best evidence into practice-friendly, readily usable forms that are easily accessible to nurses to integrate into their clinical practice.

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What is already known about the topic?

- Integration of best evidence into clinical care delivery is essential for improving quality of care and patient outcomes. However, nurses' integration of best evidence into clinical practice is hindered by a multitude of complex factors, particularly the lack of nurses' individual and organizational readiness for EBP.
- The emphasis on published nursing studies on nurses' individual readiness for EBP has to date been on descriptive, cross-sectional surveys, primarily exploring nurses' information literacy skills.

What this paper adds

- This review demonstrates that although most nurses worldwide state they are familiar with, have positive attitudes toward, and believe in the value of EBP in improving care quality and patient outcomes, nurses perceive their own EBP knowledge and skills insufficient for employing EBP, and do not use best evidence in practice.
- The vast majority (81%) of included studies were descriptive cross-sectional surveys, 84% used a non-probability sampling method, sample sizes were small, and response rates were low or not reported at all. Most included studies were of modest methodological quality.
- More robust, theoretically-based and psychometrically sound nursing research studies are needed to test and evaluate the effectiveness of interventions designed to advance nurses' EBP competencies in clinical decision-making. Efforts should be focused on systematically using knowledge transformation strategies shown to be effective in rigorous studies, to translate best evidence into practice-friendly, readily usable forms that nurses actually can use in clinical care delivery.

1. Introduction

Improving patient outcomes and quality and consistency of care through integration of evidence-based practice (EBP) into daily care delivery is a priority for healthcare organizations globally (McGinty and Anderson, 2008; Melnyk et al., 2010; Wallen et al., 2010). Systematic implementation of EBP is essential to improving the effectiveness and cost-efficiency of care (Grol and Grimshaw, 2003; Hart et al., 2008; Melnyk et al., 2012; Pravikoff et al., 2005). However, it is hampered by a multitude of reasons (Gifford et al., 2007; Wallen et al., 2010; Wilkinson et al., 2011), particularly lack of nurses' individual and organizational readiness for EBP, which is further complicated by lack of best evidence in a form that is useful for and easily translated and integrated into practice (Hallberg, 2006; Harrison and Graham, 2012). As a result, contrary to the expectation that implementation of EBP should be the norm in daily practice, the majority of nurses and other clinicians do not consistently engage in EBP (Bennett et al., 2003; Fink et al., 2005; Meline and Paradiso, 2003; Melnyk et al., 2012; Wallen et al., 2010).

Although reviews have been previously conducted on the strategies of EBP implementation using action research (Munten et al., 2010), the role of nursing leadership in the EBP implementation process (Sandström et al., 2011), and the instruments used for evaluating education in EBP (Shaneyfelt et al., 2006) and for assessing nurses' EBP implementation (Leung et al., 2014), they fail to elucidate the individual determinants of nurses' readiness for EBP, i.e., nurses' EBP competencies. Nurses' readiness for EBP encompasses the factors related to nurses' capabilities to engage in EBP and integrate best evidence into daily practice, such as nurses' familiarity with, attitudes toward, and beliefs about EBP, as well as their EBP knowledge and skills. Although the body of knowledge on nurses' readiness for EBP has been steadily growing in countries with a relatively long tradition for conducting EBP research (Beke-Harrigan et al., 2008; Pravikoff et al., 2005; Ross, 2010; Thiel and Ghosh, 2008; Waters et al., 2009), less is known about nurses' readiness for EBP in countries that have joined the global EBP movement more recently. Reviews of primary research studies comprise cross-cultural comparisons of study findings from different countries which enlarge and enrich the growing international body of knowledge on nurses' readiness for EBP, and thus, contribute to building a more comprehensive, global understanding of the type of competences that nurses require to effectively integrate best evidence into daily healthcare delivery. The purpose of this paper was to review the individual or personal factors related to nurses' readiness for EBP. Studies included in the review were published from the beginning of 2004 through January 2015. No such reviews on the topic could be found at a time of this study.

1.1. Evidence-based practice and the EBP process

Melnyk et al. (2012) defined EBP as an approach to problem-solving in clinical decision-making which integrates best evidence from robust studies with clinicians' expertise (including external evidence from patient assessments and practice data) and patients' values and preferences. This definition was selected to define EBP in nursing for this review.

Research utilization (RU), or the retrieval, critique, and use of the research results from a single primary study, has been called the "old" paradigm, prior to the "new" paradigm of EBP, which is commonly considered to be a much broader concept including RU and the integration of summarized and translated best evidence from several well-defined studies into clinical practice (Melnyk and Fineout-Overholt, 2011). Taylor (2007) also described RU as a process of critiquing, implementing, and evaluating research findings. Stevens et al. (2012) agreed with the importance of integrating already critically appraised, summarized and translated best evidence into clinical decision-making as part of EBP in nursing, instead of each practicing nurse having to personally critically appraise, summarize, and translate best evidence into usable and relevant format for clinical practice. Melnyk and Fineout-Overholt (2011) thus described RU as one component of EBP, whereas

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Polit and Beck (2004) contended that the difference between RU and EBP lay in their starting points, with RU beginning with research itself, whereas EBP begins with formulating a searchable question. Leung et al. (2014) considered RU to be equivalent to the step of applying research in practice, out of the five A's or steps of implementing EBP (Ask, Access, Appraise, Apply, and Assess) described by Straus et al. (2011). However, DiCenso et al. contended already in 1998 (p.38) that advocating the idea of EBP, i.e., that nursing practice should be based on best possible information, "is not new," but had for the past 20 years primarily been focusing on identifying barriers to EBP and on strategies to overcome them, rather than on EBP implementation and how to make it happen.

However, the process of EBP implementation consists of more than integrating the best available evidence, clinician's own expertise, and patient preferences into daily clinical decision-making, it also involves completion of several clearly defined steps outlined in Table 1.

Due to the complex nature of the multi-step process of EBP implementation and the multitude of factors influencing it which are internal and external to nurses, assessment of nurses' uptake and integration of EBP into daily practice has been challenging (Harrison and Graham, 2012; Matthew-Maich et al., 2013; Saunders, 2015; Wallen et al., 2010). These internal and external factors have been referred to as nurses' individual and organizational readiness for EBP. Nurses' individual readiness for EBP includes such factors as nurses' familiarity with, attitudes toward, beliefs about, and knowledge and skills related to EBP. Organizational readiness for EBP includes such factors as an organizational culture supportive of EBP, an EBP-infused professional practice environment, and availability of EBP mentors and nurse leaders within the organization who are actively supportive of EBP. There is a need to summarize and synthesize the current research literature examining the individual or personal factors related to nurses' readiness for EBP.

Table 1
Steps of the combined EBP/KT process and the preferred nursing role to perform each step of the collaborative EBP process based on EBP competencies.

Steps of the EBP process	Nursing role
Recognizing evidence needs and defining a researchable clinical question	The clinical/ frontline nurse
2. Searching for, selecting, and retrieving best evidence	The EBP mentor[a]
3. Critically appraising and synthesizing best evidence	The EBP mentor[a]
4. Translating best evidence into clinically relevant and usable form in the local setting	The EBP mentor[a]
5. Integrating best evidence with clinician's expertise, patient preferences and values in clinical decision-making	The clinical/ frontline nurse
6. Evaluating the outcomes of practice change	The EBP mentor[a]
7. Disseminating the results of practice change	The EBP mentor[a]

[a] The EBP mentor = an Advanced Practice Nurse (APN) or other nurse with expert-level EBP competencies.

2. Aim

The aim of this integrative review was to summarize and synthesize the current research literature examining the individual or personal factors related to nurses' readiness for EBP, i.e., the EBP knowledge, skills, attitudes, and beliefs of RNs needed to employ EBP in clinical practice. It addresses the following research question: What is the state of the science on practicing nurses' readiness for EBP implementation at healthcare organizations?

3. Design

An integrative review of published research on nurses' readiness for EBP, i.e., nurses' EBP knowledge, skills, attitudes, and beliefs needed for nurses to integrate best evidence into in clinical practice was conducted. The approach used to summarize and synthesize the current research literature in this review was previously described by Thomas and Harden (2008). The review process is presented according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement or guideline for reporting study methods and results (Moher et al., 2009). Synthesis of the results focused on evaluating the methodological quality of the studies using the quality appraisal instruments developed by the Joanna Briggs Institute (JBI) for descriptive, experimental, and qualitative research studies.

4. Methods

4.1. Literature search

Literature search methods (Torraco, 2005) were used to conduct searches from May through July 2014 which were further updated through additional searches during January–February 2015. The electronic databases PubMed/MEDLINE (Ovid), CINAHL, Scopus, ProQuest Dissertations and Theses, and the Electronic Theses and Dissertations System were searched for primary empirical studies published between the beginning of January 2004–January 31, 2015 without any language restrictions. The following keywords and terms were used: 'evidence-based', 'nurs*', 'readiness', 'preparedness', 'implement*', 'experienc*', 'role*', 'attitud*', 'belief*', 'skill*', 'view*', and 'perception*'. With the expert assistance of a university librarian, these terms were first searched independently and then in combination. The search term 'research utilization' was not used in this review as the aim was to focus on nurses' EBP knowledge, skills, attitudes, and beliefs. In addition to the searched databases, reference chasing of the primary research studies included in the integrative review and hand-searching the lists of contents of the following peer-reviewed journals was conducted between the years of 2004–2014: Worldviews on Evidence-Based Nursing, Journal of Advanced Nursing, BMC Health Services Research, Journal of Nursing Management, and Journal of Nursing Administration. These journals were selected for hand-searching because they had published the majority of the primary studies focusing

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on the topic of nurses' readiness for EBP yielded by the systematic literature searches conducted for this review.

4.2. Inclusion and exclusion criteria

The inclusion and exclusion criteria for the integrative review are listed in Table 2. Published primary empirical studies related to evaluating the impact of various interventions designed to promote practicing nurses' readiness for EBP were included in the review, because in addition to evaluating the impact of the intervention in question, they included a baseline or pre-intervention assessment of nurses' readiness for EBP. Studies reporting on nurses' sources of information and barriers to and facilitators of EBP were excluded because the primary focus of this review was on the state of EBP knowledge, attitudes, beliefs, and skills of nurses that enable them to be ready to engage in EBP implementation in daily practice. Before undertaking this integrative review, the Cochrane Library, the Joanna Briggs Institute Library of Systematic Reviews, and CINAHL were searched. No published or in-progress systematic reviews on this topic were found.

4.3. Search results and data evaluation

The database searches identified a total of 430 publications. First, titles were screened and those not clearly indicating a focus on the factors of nurses' individual readiness for EBP were excluded. Second, all remaining abstracts ($N = 98$) were screened against the purpose and inclusion criteria before being selected for further appraisal. After eliminating a total of 60 records that did not meet one or more inclusion criteria, the second screening resulted in 38 papers. Six (6) papers were added through reference-chasing and hand-searching tables of content of selected peer-reviewed journals, resulting in a total of 44 papers, from which data were extracted and independently evaluated by two researchers. The stages of searching and the inclusion or exclusion of studies are depicted in Fig. 1.

4.4. Data extraction and assessment of methodological quality

The following data were extracted: purpose of study, research design, participants, sample, setting, outcome measures with reliability and validity, main findings, and author's conclusions, which were extracted for each of the 44 papers and organized in a data matrix. Due to their length, the full tables containing all the extracted data are published as supporting information for review and online publication only (please see Table S1 entitled 'Studies included in the review for online content,' available with the online version of this article). The process used for data extraction and evaluation was duplicate, i.e., the data were independently extracted and evaluated by two reviewers for inclusion or exclusion. Any differences between the appraisals were discussed among the two researchers until a mutual agreement was formed. After achieving consensus, 4 full-text articles were excluded from the review, thus resulting in a total of 40 papers eligible for the critical appraisal of methodological quality, the main purpose of which was to ensure that the included studies conformed to usual research norms. The criteria used by the two independent reviewers for appraising the methodological quality were those in the quality appraisal instruments of the JBI for descriptive, experimental, and qualitative research studies. The benchmark for the studies to be included in this integrative review was set at a total minimum score of at least 5 out of a total of 9 (descriptive cross-sectional studies) or out of 10 (experimental or qualitative studies) points on the respective JBI methodological quality appraisal tool used for each study design, indicating acceptable scientific rigor. As a result of the critical appraisal process, another 3 studies were excluded, as they did not reach the minimum standard set for methodological quality of the included studies.

4.5. Synthesis and analysis

The synthesis approach used in this review was previously described by Thomas and Harden (2008). To answer the primary research question, a total of 37 primary research studies were analyzed. The quantitative studies were analyzed deductively, examining the individual factors related to nurses' readiness for EBP, and the qualitative studies were analyzed inductively, exploring different aspects of nurses' EBP experiences. After synthesizing the results from all 37 studies, four main themes emerged: (a) nurses' familiarity with EBP; (b) nurses' attitudes toward and beliefs about EBP; (c) nurses' EBP

Table 2
Study inclusion and exclusion criteria for the integrative review ($N = 37$).

Study inclusion criteria	Study exclusion criteria
Studies whose participants are practicing nurses	Studies reporting on EBP model, theory, or framework development or on questionnaire development, testing, or validation
Studies measuring practicing nurses' readiness for EBP, i.e., their knowledge, attitudes, beliefs, and skills, including information literacy and other EBP–related skills	Studies focusing on the organizational readiness for EBP
Studies published in scientific peer-reviewed journals reporting on primary empirical studies of any design	Studies not reporting on primary empirical research studies
Studies related to evaluating the impact of various interventions designed to promote practicing nurses' readiness for EBP	Studies whose data was not collected during January 1, 2004–January 31, 2015
Studies utilizing samples which consisted primarily (>50%) of practicing nurses	Studies reporting an extremely low response rate <5%
Studies that explored the personal or individual factors of nurses' readiness for EBP implementation	Studies focusing on nurses' sources of information or on barriers to and facilitators of EBP

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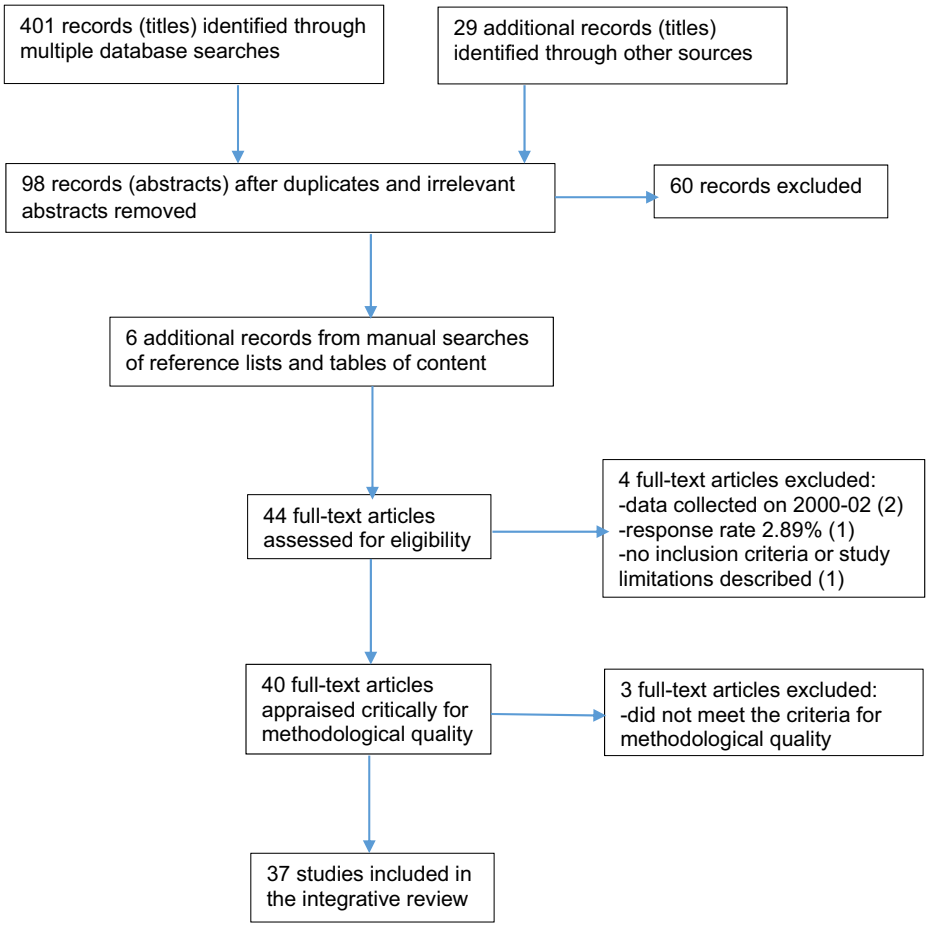

Fig. 1. Flowchart presenting an overview of the systematic search and review process.

knowledge and skills; and d) nurses' EBP implementation or use of research in practice.

5. Study characteristics

Of the 37 primary studies included in this review, 30 (81%) used a descriptive cross-sectional survey design, 5 used a pretest-posttest study design, and one study each used an experimental (pilot) study design (randomised controlled trial, RCT) and a descriptive qualitative study design. Approximately one-half ($N = 18$, 49%) of the included studies originated from the United States. The sample sizes of the included studies ranged from $N = 21$ to $N = 3411$ with six of the 37 included studies using a sample size of under $N = 100$. Twenty-one (21) of the included studies used a convenience sample, 7 studies used a population sample, 5 studies used a random sample, 3 studies used a purposive sample, and 1 study used a both a convenience and random sample. Response rates of the quantitative studies varied from 5% to 88%, with 13 studies reporting response rates of under 50%. In addition, 8 of the quantitative studies did not report a published response rate at all, and in 2 studies the authors were unable to calculate a response rate. Both published and unpublished instruments were used, and instruments developed by the authors of the published report to be used in their own primary study were used in 18 included studies. Factors related to nurses' readiness for EBP were measured using both general instruments related to nurses' EBP competencies, such as the EBP Questionnaire (Upton and Upton, 2005), as well as instruments measuring one specific aspect of nurses' readiness for EBP, such as the EBP Beliefs Scale (Melnyk, 2007). Selected characteristics of the included studies ($N = 37$) are presented in Table 3.

6. Findings

6.1. Participants and practice settings

A total of 18,355 nurses participated in the 37 included studies. The nurse participants in the included studies were described in a multitude of ways, as depicted in Table 3. Studies from metropolitan, urban, and rural settings from 21 different countries were included in this review. Eleven (11) of the included studies were conducted in a single hospital setting. The hospital study settings included acute care hospitals ($N = 14$), academic medical centers or university hospitals ($N = 4$), community hospitals ($N = 2$),

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Table 3
Characteristics of the primary studies included in the integrative review ($N = 37$).

Characteristics	*N* (%)
Country	
USA	18 (49)
Europe	13 (35)
Australia	3 (8)
Israel	1 (3)
Iran	1 (3)
Singapore	1 (3)
Number of participants	
<100	6 (16)
100–499	20 (54)
500–999	8 (22)
>1000	3 (8)
Study design	
Descriptive cross-sectional survey	30 (81)
Quasi-experimental (pre-post)	5 (13)
Experimental (RCT[a])	1 (3)
Qualitative	1 (3)
Response rate	
≤50%	13 (35)
≥51%	14 (38)
Not reported	8 (22)
Unable to calculate	2 (5)
Sampling method	
Probability	5 (13)
Non-probability	31 (84)
Both	1 (3)
Outcomes measured[b]	
Familiarity with EBP	12
Attitudes toward EBP	18
Beliefs about EBP	22
EBP knowledge and skills	28
EBP implementation or use of research in practice	25
Practice settings[c]	
Hospital care	27
Primary care	7
Schools/colleges/universities	4
Community care	3
Other	3
EBP conferences or workshops	1
National meetings of Prof. organizations	1
Unspecified	1

[a] RCT = randomized controlled trial.
[b] Number of studies; multiple outcomes related to nurses' readiness for EBP measured in most of the primary studies included.
[c] Multiple practice settings per study possible.

acute care teaching hospitals ($N = 2$), health service districts ($N = 2$), tertiary care medical centers ($N = 1$), National Health Service Trusts ($N = 1$), and day hospitals ($N = 1$). Primary care settings included primary care community health centers ($N = 2$), ambulatory care clinics ($N = 1$), physician practice groups and outpatient services ($N = 1$), multipurpose health centers ($N = 1$), and unspecified primary care settings ($N = 2$). Community care included community or home health ($N = 2$), psychiatric care ($N = 1$), and elder care ($N = 1$). In addition, study settings included schools ($N = 1$) and universities and nursing colleges ($N = 3$), and other study settings ($N = 3$).

6.2. Interventions and comparisons

Of the six included studies employing an intervention, five used a one-group quasi-experimental (i.e., non-randomized) pre-post-intervention survey design. Only one study used an experimental design, i.e., used a second group for comparison, although it was a randomized controlled pilot trial. The pilot study utilized an attention control group which received an educational intervention on adult physical assessment, while the experimental group received an educational intervention on EBP and a mentoring intervention. However, the outcomes of the RCT were measured over 11 months using repeated measures, while in the other studies, the post-intervention outcomes were measured immediately after the intervention. Four (4) of the studies employing an intervention evaluated the effectiveness of an educational program on: RNs' attitudes toward and implementation of EBP (Varnell et al., 2008), RNs' attitudes and perceptions of knowledge and skills toward EBP (Sherriff et al., 2007), nurses' perceptions of knowledge, attitude and skill level related to EBP (Hart et al., 2008), and RNs' EBP beliefs, EBP implementation, group cohesion, job satisfaction, attrition/turnover rates and productivity (Levin et al., 2011). Other interventions tested for effectiveness included a structured multifaceted mentorship program to implement EBP (Wallen et al., 2010) and an EBP strategic plan on RNs' beliefs of the importance of EBP, frequency of using EBP in daily practice, and the perception of organizational readiness for EBP (Hauck et al., 2012). It is important to keep in mind, however, that just because nurses may have gained EBP knowledge and skills as a result of educational interventions, that does not necessarily equate to their integrating best evidence into their practice (Dalheim et al., 2012).

6.3. Outcomes measured

Outcomes related to nurses' readiness for EBP were measured by using self-report survey measures in 36 of the 37 studies included in this review. In addition, focus groups (Rolfe et al., 2008; Wallen et al., 2010) and interviews (Adib-Hajbaghery, 2009; Rolfe et al., 2008) were used in three of the included studies. Outcomes were grouped according to the following four main themes that emerged from the studies included in this review: Nurses' familiarity with EBP ($N = 12$), nurses' attitudes toward ($N = 18$) and beliefs about EBP ($N = 22$), nurses' EBP knowledge and skills ($N = 28$), and nurses' EBP implementation or use of research in practice ($N = 25$).

6.3.1. Nurses' familiarity with EBP

The findings of the review indicate that nurses were familiar with the concepts of EBP and EBN regardless of professional role, practice environment, or nationality (Adams and Barron, 2009; Adib-Hajbaghery, 2009; Alanen et al., 2009; Egerod and Hansen, 2005; Filippini et al., 2011; Pravikoff et al., 2005; Rolfe et al., 2008; Ross, 2010; Thiel and Ghosh, 2008; Thorsteinsson and Sveinsdottir, 2014; Thorsteinsson, 2012; Varnell et al., 2008). In the included studies, nurses' familiarity with EBP ranged from 84% (Ross, 2010) to 42% (Thorsteinsson, 2012). Familiarity with EBP was associated with nurses' use of evidence in practice (Thorsteinsson, 2012) and primary role, as head nurses, administrative nurses, and educators were reported to be more familiar with EBP than clinical nurses (Egerod and Hansen, 2005; Thorsteinsson, 2012), while unfamiliarity

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with EBP was associated with level of education (Varnell et al., 2008). Familiarity with EBP was also associated with positive attitudes toward and stronger beliefs about EBP (Alanen et al., 2009; Thorsteinsson, 2012; Varnell et al., 2008), and was found to predict use of research in practice (Thorsteinsson and Sveinsdottir, 2014). At the same time, however, the findings indicated that there is widespread confusion among nurses about the meanings of these concepts, in that nurses have many different interpretations and divergent understandings of what constitutes EBP, which often differ from common definitions of EBP (Breimaier et al., 2011; Egerod and Hansen, 2005; Rolfe et al., 2008). Adib-Hajbaghery (2009) asserted that surveyed Iranian nurses viewed their practice as evidence-based when their care delivery was in fact based on traditions, routines, their own experiences, and their view of patients' needs, with little attention paid to patients' own values and preferences. Adams and Barron (2009) reported that although 77% of the surveyed U.S. school nurses were aware of EBP, only 50% understood it well enough to explain it to a peer. Rolfe et al. (2008) contended that surveyed UK nurses considered care delivery based on reflection and intuition a form of EBP, as nurses practiced based "largely on what feels to be the right thing at the time" (Rolfe et al., 2008, p. 450).

6.3.2. Nurses' attitudes toward and beliefs about EBP

The findings indicated that nurses consistently reported favorable attitudes toward and beliefs about EBP, which they value for improving quality of care and patient outcomes (Alanen et al., 2009; Cadmus et al., 2008; Filippini et al., 2011; Hart et al., 2008; Levin et al., 2011; Melnyk et al., 2004, 2010, 2012; Sherriff et al., 2007; Thorsteinsson and Sveinsdottir, 2014; Thorsteinsson, 2012; Veeramah, 2004; Waters et al., 2009). Nurses' beliefs in the value of EBP as an important means for improving healthcare quality and outcomes were positively associated with knowledge of EBP (Thiel and Ghosh, 2008), higher educational level (Koehn and Lehman, 2008; Thiel and Ghosh, 2008), and EBP experience (Alanen et al., 2009). Nurses' positive attitudes toward EBP were associated with their EBP knowledge (Veeramah, 2004), age (Thiel and Ghosh, 2008), higher educational level (Bonner and Sando, 2007; Koehn and Lehman, 2008; Thiel and Ghosh, 2008; Varnell et al., 2008), years in nursing (Thiel and Ghosh, 2008), and use of research in practice (Alanen et al., 2009; Veeramah, 2004). However, nurses' attitudes were more positive than their EBP knowledge (Brown et al., 2008; Waters et al., 2009), EBP skills (Waters et al., 2009), and implementation of EBP (Brown et al., 2008). Nurse managers and leaders had a more positive attitude toward EBP than clinical nurses (Gonzales-Torrente et al., 2012) or nurses in other positions (Bonner and Sando, 2007). A graduate degree, RN status, and attendance at a formal EBP class, predicted positive attitudes toward EBP (Mollon et al., 2012). However, it is important to keep in mind that positive attitudes toward research do not necessarily translate into practice based on best evidence (Veeramah, 2004); in fact, despite familiarity with and positive attitudes toward EBP, nurses seldom participated in EBP activities (Thorsteinsson and Sveinsdottir, 2014).

At least two exceptions to these international trends of nurses' positive attitudes toward and beliefs about EBP can be found: Pravikoff et al. (2005) asserted that U.S. nurses do not value or understand research, while Breimaier et al. (2011) reported an overall negative trend in attitudes toward EBP among Austrian nurses. Nurses believed that the majority of clinical practice (Melnyk et al., 2004; Rolfe et al., 2008; Waters et al., 2009) was based on evidence and also believed that their colleagues consistently implemented EBP (Melnyk et al., 2012), but their belief in their own practice being evidence-based was not as strong (Melnyk et al., 2004). However, nurses do believe that research has shown EBP to be the best, most effective way to practice (Rolfe et al., 2008) and that EBP promotes the nursing profession (Egerod and Hansen, 2005; Eizenberg, 2011), helps nurses in clinical decision-making (Hart et al., 2008), and is relevant for other nurses and for them personally (Adams and Barron, 2009; Breimaier et al., 2011; Egerod and Hansen, 2005). The extent to which nurses believed their practice to be evidence-based was associated with the strength of their EBP beliefs (Melnyk et al., 2004). EBP beliefs were positively associated with familiarity with EBP (Varnell et al., 2008), younger age (Alanen et al., 2009), shorter nursing experience (Alanen et al., 2009), higher educational level (Varnell et al., 2008), indirect care and director/leader nurse role (Hauck et al., 2012), greater EBP implementation (Melnyk et al., 2004, 2010; Thorsteinsson, 2012; Thorsteinsson and Sveinsdottir, 2014; Wallen et al., 2010), fewer perceived barriers to EBP (Melnyk et al., 2004), and stronger perceived organizational culture for EBP (Melnyk et al., 2010). However, nurses' EBP beliefs were higher than their EBP knowledge level (Melnyk et al., 2004) and their implementation of EBP (Melnyk et al., 2010). In addition, the EBP skills of searching for and retrieving information from electronic databases and discussions about EBP in the clinical setting were found to predict positive EBP beliefs (Thorsteinsson and Sveinsdottir, 2014).

6.3.3. Nurses' perceived EBP knowledge and skills

The findings revealed that although nurses' rated their EBP knowledge and skills of their peers and colleagues relatively high (Gerrish et al., 2008; Thorsteinsson, 2012), their confidence in their own EBP knowledge and skills was less favorable (Cadmus et al., 2008; Egerod and Hansen, 2005; Koehn and Lehman, 2008; Pravikoff et al., 2005; Sherriff et al., 2007; Thiel and Ghosh, 2008). However, studies showed that nurses' levels of EBP knowledge and skills varied somewhat from country to country: Nurses' perceived EBP skills were 'modest' (Boström et al., 2009), 'complete beginner or novice' (Dalheim et al., 2012),' low to moderate' (Waters et al., 2009), 'moderate' (Koehn and Lehman, 2008; Majid et al., 2011), or 'competent' (Mollon et al., 2012). While Adib-Hajbaghery (2009) concluded that Iranian nurses had little EBP knowledge and skills, Mollon et al. (2012) found that U.S. nurses' EBP skills were 'competent' for performing most of the steps of the EBP process. Similarly, there was some variability by country in nurses' EBP knowledge level, which was assessed as 'low to

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moderate' (Waters et al., 2009), or 'moderate' (Koehn and Lehman, 2008; Thiel and Ghosh, 2008). However, nurses' levels of EBP knowledge and skills were found to be lower than their EBP beliefs (Melnyk et al., 2004; Thorsteinsson, 2012), and lower than their practice and attitudes (Koehn and Lehman, 2008). Accordingly, several studies concluded that nurses' levels of EBP knowledge and skills were not sufficient for them to engage in implementing EBP (Egerod and Hansen, 2005; Hart et al., 2008; Thiel and Ghosh, 2008; Waters et al., 2009) and to change practice (Sherriff et al., 2007).

However, the findings also indicated that nurses do realize the gaps in their readiness for EBP, and want to gain more EBP knowledge and skills in order to deliver evidence-based care (Melnyk et al., 2012). The extent to which nurses' practice was evidence-based was positively correlated with higher EBP knowledge (Brown et al., 2008; Melnyk et al., 2004; Veeramah, 2004) and better EBP skills (Brown et al., 2008; Dalheim et al., 2012; Thorsteinsson and Sveinsdottir, 2014). Higher education level was positively associated with greater EBP knowledge (Melnyk et al., 2012), greater EBP skills (Cadmus et al., 2008; Majid et al., 2011), and more EBP implementation (Dalheim et al., 2012; Melnyk et al., 2012). Nurses' EBP skills were positively associated with senior nurse role (Gerrish et al., 2008) and negatively associated with nurses' age (Cadmus et al., 2008), years in nursing (Gonzales-Torrente et al., 2012), years since earning a nursing degree (Thorsteinsson, 2012), and barriers to EBP (Dalheim et al., 2012). Nurses' age and years in nursing were also negatively associated with barriers to changing practice to EBP (Dalheim et al., 2012). Senior nurse managers and other nurse leaders were found to have higher EBP knowledge than nurses in other positions (Bonner and Sando, 2007), and also used research in practice more (Bonner and Sando, 2007). In addition, nurses' having a mentor was positively associated with greater knowledge of EBP (Melnyk et al., 2004).

6.3.4. Nurses' perceived information literacy skills related to EBP

More than one-half ($N = 19$) of the 37 included studies focused on assessing nurses' 'technical' research skills related to EBP, i.e., their information literacy and computer skills and their research appraisal and interpretation skills. The findings indicated that approximately during 2004–2008, nurses' workplace online access to the Internet and electronic databases rapidly improved and became at least adequate because of increased availability of computers due to technological advances. Nurses' computer skills had also improved, as lack of computer skills were shown not to be an issue (Adams and Barron, 2009; Beke-Harrigan et al., 2008), although nurses' higher-level computer skills were still found to be somewhat lacking (Cadmus et al., 2008; Thiel and Ghosh, 2008). However, online access alone to best evidence, or even coupled with adequate computer skills, does not necessarily mean that nurses will retrieve and use best evidence in practice (Beke-Harrigan et al., 2008), for irrespective of nationality, nurses consistently perceived that they lacked sufficient skills to search for, retrieve, critically appraise, understand, and summarize evidence for use in daily practice (Beke-Harrigan et al., 2008; Boström et al., 2009; Brown et al., 2008; Cadmus et al., 2008; Dalheim et al., 2012; Gerrish et al., 2008; Hart et al., 2008; Koehn and Lehman, 2008; Pravikoff et al., 2005; Ross, 2010; Sherriff et al., 2007; Thorsteinsson and Sveinsdottir, 2014; Thorsteinsson, 2012; Veeramah, 2004; Waters et al., 2009).

The greatest gaps in 'technical' skills related to EBP were associated with nurses' primary role: Clinical nurses perceived having most learning needs related to the EBP skills of identifying research needs and formulating a researchable question (Boström et al., 2009; Brown et al., 2008; Cadmus et al., 2008; Koehn and Lehman, 2008; Majid et al., 2011; Ross, 2010; Thorsteinsson, 2012), searching for and retrieving research reports (Beke-Harrigan et al., 2008; Boström et al., 2009; Brown et al., 2008; Dalheim et al., 2012; Hart et al., 2008; Ross, 2010; Thorsteinsson and Sveinsdottir, 2014; Thorsteinsson, 2012) critically appraising research reports (Boström et al., 2009; Brown et al., 2008; Cadmus et al., 2008; Dalheim et al., 2012; Gerrish et al., 2008; Koehn and Lehman, 2008; Mollon et al., 2012; Ross, 2010; Sherriff et al., 2007; Thorsteinsson, 2012; Veeramah, 2004; Waters et al., 2009), synthesizing evidence (Mollon et al., 2012; Ross, 2010; Thorsteinsson, 2012), integrating best evidence into practice (Cadmus et al., 2008; Hart et al., 2008; Ross, 2010; Thorsteinsson, 2012; Veeramah, 2004) and evaluating the effect of EBP on clinical care (Adams and Barron, 2009; Boström et al., 2009), while APNs had learning needs in the EBP skills of undertaking research and clinical benchmarking (Gerrish et al., 2011). Also notable was the low participation of nurses in research (Bonner and Sando, 2007; Cadmus et al., 2008; Ross, 2010; Thorsteinsson, 2012), as it is an important avenue for learning the 'technical' research skills related to the steps of the EBP process. In addition, willingness to undertake research was linked to increased use of research in practice (Bonner and Sando, 2007). In addition, several included studies found that nurses' participation in changing practice based on best evidence was an even greater learning need than the 'technical' research skills related to the EBP process, as the studies showed that nurses not only lacked confidence in their ability to change practice, they also perceived themselves as lacking the autonomy, authority and support from their managers, peers, and other colleagues to change practice (Dalheim et al., 2012; Gerrish et al., 2008; Melnyk et al., 2010; Veeramah, 2004).

6.3.5. Nurses' EBP implementation and use of research in practice

Simply because nurses have positive attitudes toward and believe in EBP improving clinical practice and patient outcomes, however, it should not be assumed that they automatically possess the skills or know how to use evidence in practice (Cadmus et al., 2008; Waters et al., 2009), especially when skills only tend to develop through repeated practice of EBP (Mollon et al., 2012). In fact, the findings indicated that irrespective of nationality, nurses' implementation of EBP, i.e., integration of best evidence into daily care delivery, remained 'largely undeveloped' (Waters et al., 2009), 'low' (Cadmus et al., 2008; Filippini

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et al., 2011; Hauck et al., 2012; Melnyk et al., 2010; Thorsteinsson, 2012), or was at a 'moderate level' at best (Koehn and Lehman, 2008). Nurses at Magnet institutions reported more consistent implementation of EBP than those working at non-Magnet institutions (Melnyk et al., 2012). EBP knowledge (Brown et al., 2008; Melnyk et al., 2004), EBP attitudes and beliefs (Alanen et al., 2009; Levin et al., 2011; Melnyk et al., 2004, 2010; Thorsteinsson and Sveinsdottir, 2014; Wallen et al., 2010), an organizational culture perceived to be supportive of EBP (Melnyk et al., 2010; Wallen et al., 2010), and having an EBP mentor (Melnyk et al., 2004; Levin et al., 2011; Wallen et al., 2010) were positively associated with the extent to which nurses engaged in EBP. A greater proportion of nurses working in elder care facilities reported implementing EBP than nurses at hospitals, psychiatric care, or primary care settings (Boström et al., 2009). Nurses with a graduate degree (Bonner and Sando, 2007; Melnyk et al., 2012; Mollon et al., 2012; Varnell et al., 2008), a preceptor, higher clinical grade, advanced practice, indirect care, or nurse leadership role (Bonner and Sando, 2007; Hauck et al., 2012; Varnell et al., 2008; Veeramah, 2004), longer nursing experience (Majid et al., 2011), attendance at a formal EBP class (Majid et al., 2011; Mollon et al., 2012), and familiarity with EBP (Thorsteinsson and Sveinsdottir, 2014) were more likely to report implementing EBP, or these factors predicted nurses' use of research in practice.

7. Discussion

Synthesizing the extracted data for this review and examining the results of the critical appraisal of methodological quality of the included studies revealed that a preponderance of studies of modest quality was present among the included primary studies related to nurses' readiness for EBP. The vast majority of the included studies were descriptive cross-sectional surveys and used a non-probability sampling method, sample sizes were relatively small, and response rates of many of the included studies were low. In addition, a large proportion of the research instruments used in the included studies were not published, not theoretically based, and not psychometrically tested in the studies. Moreover, many assertions were made in the published research reports related to nurses' readiness for EBP, but few were backed up by actual data presented in the reports. Further, the critical appraisal of methodological quality revealed that none of the included studies received full points and a large proportion of the descriptive cross-sectional studies ($N = 10$, 29%) barely reached the total minimum threshold value of 5 out of 9 points chosen to indicate adequate scientific rigor in this review.

Despite the modest quality and substantial variation among the included studies in terms of nurses' primary role, practice setting, and nationality, certain patterns did emerge from the synthesis. Of particular concern was that in several of the included studies, the majority of nurses surveyed never used research findings to inform their practice (Breimaier et al., 2011; Ross, 2010), never searched electronic databases such as CINAHL, Medline, and Cochrane, although they had access to them (Mollon et al., 2012; Rolfe et al., 2008; Ross, 2010; Thorsteinsson, 2012), never participated in research (Thorsteinsson, 2012), and never used on-site libraries or asked a librarian for assistance, although they had access to them (Beke-Harrigan et al., 2008; Mollon et al., 2012; Ross, 2010; Thorsteinsson and Sveinsdottir, 2014). In addition, nurses rated research findings from randomized controlled trails (RCTs) and other quantitative research as the *least* important sources of information (Rolfe et al., 2008), and a large proportion of nurses felt that they seldom needed best evidence to support their nursing practice (Beke-Harrigan et al., 2008; Thorsteinsson, 2012). However, the possible link between nurses' participation in research and EBP activities, and their development of readiness for EBP, i.e., EBP competencies (Bonner and Sando, 2007; Mollon et al., 2012; Ross, 2010; Thorsteinsson and Sveinsdottir, 2014), although encouraging, still requires further investigation.

Conducting the review revealed that use of the constructs of RU & EBP has been evolving in the international nursing literature over the last two decades. From the mid-1990s until approximately 2003, RU was the construct most often used in primary research studies related to nurses' readiness for EBP; from 2004 to 2007 both RU and EBP were being used; and from approximately 2007–2008, EBP has clearly been the construct that was used most often in primary nursing research studies. This reflects a transition from the 'old' paradigm of RU to the 'new' paradigm of EBP; however, the transition has happened in terminology only, as both nurses' use of evidence and teaching of EBP to nursing students still primarily focus on searching for, retrieving, and critically appraising *single* primary research studies, i.e., on the 'old' paradigm of RU, instead of emphasizing the use of already summarized and critically appraised best evidence, such as evidence-based CPGs (Melnyk et al., 2008) and care bundles translated to the local context (Saunders, 2015). Even in recent primary nursing research studies (Breimaier et al., 2011; Florin et al., 2012; Wallin et al., 2012), it is not uncommon for RU and EBP to be used interchangeably as if they were synonyms, although they are not (Estabrooks, 1999), which further adds to the confusion and lack of construct clarity about RU and EBP in the literature. Authors of future research studies should therefore clearly indicate whether they are focusing on examining nurses' competencies for RU or EBP.

Although most authors have transitioned from RU to EBP, the results of this review show that there is a lack of progress in how to make EBP happen, i.e., how to advance nurses' implementation of EBP in daily care delivery. The findings indicate that although nurses perceive that they still do not have the necessary EBP competencies to integrate EBP into clinical care, they are now more familiar with, have positive attitudes toward, and believe in the value of EBP in improving clinical practice and patient outcomes. In other words, nurses are now more aware of and open to the idea of EBP and the importance of its' implementation in daily practice. However, as DiCenso et al. (1998, p. 38) indicated, the "recognition of the importance of evidence-based practice is not new." Nurses want to deliver care based on best evidence, but they find

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that the best evidence is still not easily accessible or available in form that is usable in clinical practice. It is therefore crucially important that nurse leaders and educators ensure that frontline nurses have unencumbered access to critically appraised and translated best evidence in a form that is relevant, practical, and adapted to the local clinical setting, such as evidence-based CPGs and care bundles.

This review answered the research question about the state of the science on practicing nurses' readiness for EBP implementation, and made a contribution to knowledge by summarizing and synthesizing the current research literature examining nurses' individual readiness for EBP. It also contributed to practice by presenting a more collaborative approach to EBP implementation and raising the question of whether we should be focusing on teaching nurses 'technical' research skills or how to integrate critically appraised and translated best evidence into their daily practice.

8. Limitations and strengths

This integrative review has some potential limitations. First, as in any review, it is possible that some relevant studies were not identified. However, we systematically searched multiple electronic databases in collaboration with a university librarian, reference-chased the primary research articles included in this review, and hand-searched the tables of contents of the peer-reviewed scientific journals in which the majority of the primary studies focusing on the topic of nurses' readiness for EBP were published that the systematic literature searches yielded for this review. As hand-searching the tables of contents did not result in additional searches, we believe that our search strategy would effectively capture most of the relevant primary research studies on this topic. Second, all the included studies, originating from 14 different countries worldwide, had passed an international peer review and had been published in high-quality scientific journals. Although the majority of the included studies originated from English-speaking countries,12 of the 37 included studies were from non-English-speaking countries and thus, publication and language biases, although possible, are unlikely. In addition, two reviewers independently extracted and evaluated the data for inclusion or exclusion, and independently appraised the methodological quality of the included studies, with any differences were discussed to form a mutual agreement, all of which increased the reliability of the data. Third, the search term 'research utilization' was not used for our review as the aim was to focus on EBP knowledge, skills, attitudes, and beliefs that practicing nurses need to employ EBP in clinical practice. However, we acknowledge that it is not uncommon for RU to be discussed in primary nursing research studies as if it were an alternative term for EBP, and therefore, we are aware that some primary studies on the topic at hand may have been missed by our search. Fourth, the modest methodological quality of the identified studies and the relatively low quality of reporting of the results may have affected the results of this review. Finally, effect sizes were not reported, but were likely to be small, which in turn may have led to an underpowered approach for detecting the effects of the interventions for those quasi-experimental studies that used a pre-post intervention design. Therefore, generalizability is limited, and the results should be extrapolated with caution.

9. Implications for practice and research

Conducting the review revealed that the majority of included studies focused on assessing nurses' 'technical' research skills related to EBP. It also revealed that few nurse scientists to date (Gerrish et al., 2008; Melnyk et al., 2008; Rolfe et al., 2008) have asserted that there should be careful consideration on whether the emphasis in advancing nurses' EBP skills should be on equipping each clinical nurse with the 'technical' research skills of searching for, accessing, critically appraising, summarizing, and interpreting research findings, or on teaching them how to integrate into their daily practice the already critically appraised and translated best evidence in the form of CPGs and care bundles adapted to the local context. The key question holds, do clinical nurses really need to *personally* possess all these 'technical' research skills in their primary role as direct care professionals in order to be able to implement EBP, i.e., to employ best evidence in their daily practice with patients? This also highlights the importance of reflecting on the broader issue of what is the perspective from which nurses' EBP competencies should be advanced, i.e., should frontline nurses be prepared as competent *users* of evidence in clinical practice (i.e., employing EBP), instead of masters of research skills and generators of research (i.e., engaging in RU)?

The use of a more collaborative approach to EBP implementation where the tasks related to the steps of the EBP process are divided between clinical nurses and EBP mentors based on their EBP competencies, will make clinical nurses' use and integration of best evidence into daily practice easier and more feasible to achieve at hectic practice settings. It will also have direct implications on what nurse leaders, including Advanced Practice Nurses (APNs) and other EBP mentors, should concentrate on when aiming to strengthen nurses' readiness for EBP, i.e., their EBP competencies. It is essential that nurse leaders focus on ensuring the required 'role-mix' for EBP in their local care settings so that those steps of the collaborative EBP implementation process requiring knowledge translation and 'technical' research skills can be performed by nurses with expert-level EBP competencies, such as APNs and other EBP mentors, as displayed in Table 1. As a result, clinical nurses will only need to focus on the two steps of the EBP process that most concretely meet the needs of clinicians directly caring for patients: (1) identifying the real-world clinical problems and questions arising from patient care; and (2) integrating best evidence into their daily practice with patients, through accessing the already critically appraised and translated best evidence in most usable form in the local context and using it as basis for their daily clinical decision-making. This type of active

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collaboration between EBP mentors and clinical nurses forms a more pragmatic approach to EBP implementation in clinical practice in an environment of limited resources, yet provides the support clinical nurses need as they strive to integrate the translated best evidence into their daily practice. It also makes healthcare delivery more effective and cost-efficient, because nurses will be freed to focus on their primary roles and job functions (e.g., clinical nurses may focus on direct patient care delivery) and because all nurses will not be required to spend time and resources to attend courses on how to personally master all the tasks related to each step of the EBP implementation process.

Further research is needed to perform cross-cultural comparisons of RNs' readiness for EBP, to test the effectiveness of educational interventions for advancing RNs' EBP competencies, and to evaluate the effectiveness of the collaborative approach to the EBP implementation process in achieving integration of best evidence into clinical practice.

10. Conclusions

The findings of this review suggest that irrespective of primary role, practice setting, or nationality, most nurses are not ready for EBP. Although nurses are familiar with the concept of EBP, have positive attitudes toward EBP, and believe in the value of EBP in improving care quality and patient outcomes, nurses perceive their own EBP knowledge and skills to be insufficient for employing EBP, i.e., for using best available evidence as the basis for clinical decision-making in daily practice. The findings also indicate that irrespective of nationality, large proportions of nurses do not use research or integrate best evidence into their daily practice. As nurses are the largest group of healthcare professionals working in healthcare organizations globally, it is likely that the anticipated outcome of EBP to provide best possible care at the lowest possible cost in an environment of limited resources (Closs and Cheater, 1999) is seldom realized in nursing care. This is likely to have serious implications on the quality of care, patient outcomes, and patient safety at healthcare organizations worldwide.

Given the IOM's (2011) goal that by 2020, 90% of all clinical decisions should be evidence-based, there is an urgent need for healthcare leaders to collaborate in designing and implementing effective strategies that promote the integration of best evidence into daily care delivery of the nursing workforce. In particular, all efforts should be focused on systematically using strategies that have been shown effective in rigorous studies, to translate best evidence into practice-friendly forms that nurses actually can use in daily care delivery, i.e., forms that are relevant in the local context and readily usable in clinical practice, such as evidence-based CPGs and care bundles. Lastly, the selected strategies need to include using effective interventions to strengthen nurses' readiness for EBP, in order to progress from opinion-based toward evidence-based practice in patient care.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.ijnurstu.2015.10.018.

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