

DISCUSSION PAPER

Evidence-based practice models for organizational change: overview and practical applications

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Abstract

Aim. To provide an overview, summary of key features and evaluation of usefulness of six evidence-based practice models frequently discussed in the literature.

Background. The variety of evidence-based practice models and frameworks, complex terminology and organizational culture challenges nurses in selecting the model that best fits their practice setting.

Data sources. The authors: (1) initially identified models described in a predominant nursing text; (2) searched the literature through CINAHL from 1998 to current year, using combinations of 'evidence', 'evidence-based practice', 'models', 'nursing' and 'research'; (3) refined the list of selected models based on the initial literature review; and (4) conducted a second search of the literature on the selected models for all available years to locate both historical and recent articles on their use in nursing practice.

Discussion. Authors described model key features and provided an evaluation of model usefulness based on specific criteria, which focused on facilitating the evidence-based practice process and guiding practice change.

Implications for nursing. The evaluation of model usefulness can be used to determine the best fit of the models to the practice setting.

Conclusion. The Johns Hopkins Model and the Academic Center for Evidence-Based Practice Star Model emphasize the processes of finding and evaluating evidence that is likely to appeal to nursing educators. Organizations may prefer the Promoting Action on Research Implementation in Health Services Framework, Advancing Research and Clinical Practice Through Close Collaboration, or Iowa models for their emphasis on team decision-making. An evidence-based practice model that is clear to the clinician and fits the organization will guide a systematic approach to evidence review and practice change.

Keywords: evidence-based practice, nursing education, nursing models, research in practice

Introduction

In recent years, nursing scholars have developed a variety of evidence-based practice (EBP) models to facilitate the implementation of research findings into nursing practice (van Achterberg *et al.* 2008, Mitchell *et al.* 2010, Rycroft-Malone & Bucknall 2010, Wilson *et al.* 2010, Melnyk & Fineout-Overholt 2011). Application of EBP models is intended to break down the complexity of the challenge of translating evidence into clinical practice. Effective models to guide translation of research into practice are needed to avoid failure accompanied by a costly investment of time and resources. However, enthusiastic efforts by clinicians and educators to use EBP are often dampened by a confusing array of terms, a plethora of models and a growing variety of approaches to implementation of EBP.

To help the practitioner decide which EBP model is most appropriate for a clinical or educational setting, an overview of commonly used nursing models is needed to assist the clinician in comparing, contrasting, and eventually selecting the model best-fit for their organization and a specific clinical problem. This article provides definitions of common EBP-related terms, a description of major EBP models with examples of use in practice and an evaluation of each model.

Background

Clarification of terms

It is important to begin with a clarification of related terms. The first term, EBP, has been defined a variety of ways. However, Melnyk and Fineout-Overholt's (2011) definition captures the essence:

Evidence-based practice is a paradigm and life-long problem solving approach to clinical decision-making that involves the conscientious use of the best available evidence (including a systematic search for and critical appraisal of the most relevant evidence to answer a clinical question) with one's own clinical expertise and patient values and preferences to improve outcomes for individuals, groups, communities and systems (Melnyk & Fineout-Overholt 2011, p. 575).

A similar definition is provided by Ciliska and colleagues, who described EBP as integration of the best available research evidence with information about patient preferences, clinical skill level and available resources to make decisions about care (Ciliska *et al.* 2001).

Table 1 provides definitions for terms commonly used in EBP discussions. 'Research utilization', an older term, is

Table 1 Definitions of key terms.

Term	Definition
Evidence-based practice (EBP)	'...a paradigm and life-long problem solving approach to clinical decision-making that involves the conscientious use of the best available evidence (including a systematic search for and critical appraisal of the most relevant evidence to answer a clinical question) with one's own clinical expertise and patient values and preferences to improve outcomes for individuals, groups, communities and systems' (Melnyk & Fineout-Overholt 2011, p. 575) Integrating best available research evidence with information about patient preferences, clinical skill level and available resources to make decisions about care (Ciliska <i>et al.</i> 2001)
Research utilization	Use of research findings in clinical practice, often based on a single study (Melnyk & Fineout-Overholt 2011) [Note: Research utilization is a sub-set of EBP]
Adoption	A continuum of the rate and amount of practice change, starting with a decision of a practice change, moving to implementation and sustained, routine use in practice (Titler <i>et al.</i> 2007)
Translation research	'...the study of how to promote adoption of evidence in health care' (Titler 2011, p. 1)
Implementation science	'...scientific study of methods to promote the uptake of research findings into routine healthcare in both clinical and policy contexts' (Implementation Science 2012)

now recognized as just one piece of the broader concept of EBP. EBP theories have undergone a change in focus over the past two decades, which is reflected in use of terms. Straus and Haynes (2009) delineated this process into 'knowledge creation' achieved through research, 'knowledge distillation' through systematic reviews and construction of guidelines and 'knowledge dissemination' through journal articles and presentations. Attempts have been made in EBP and change theory literature to distinguish between definitions of diffusion and dissemination. Diffusion is considered a natural and passive process, while dissemination is an active and planned persuasion and spread of knowledge. Straus and Haynes stated that these process components are not adequate for knowledge use in clinical decision-making and what is needed is 'knowledge translation'.

Thus, the current EBP focus has shifted to the process of moving existing knowledge into the daily routines of practice. 'EBP is the process of integrating evidence into

healthcare delivery, whereas, translation science is the study of how to promote adoption of evidence into health care' (Titler 2011, p. 291). It is important to note that the term 'adoption' has been used differently by scholars as if on a continuum. At the beginning of the continuum, adoption is described as a simple decision to accept a practice change (Greenhalgh *et al.* 2004, van Achterberg *et al.* 2008, Gale & Schaffer 2009). At the other end of the continuum, adoption has been described as a more complete incorporation of the practice change to the extent that it has become routine (Mitchell *et al.* 2010). Titler's model for translation research uses the terms 'rate' and 'extent of adoption', suggesting a potential continuum of adoption starting with a decision of a practice change, moving to implementation and sustained, routine use in practice (Titler *et al.* 2007).

The terms 'translation research' and 'implementation science' include a growing body of study – that of how to effectively facilitate full adoption of best practice into an organization. These terms have been used synonymously; it may be helpful to point out that usage of terms has been somewhat dependent on geographical region. The term research translation has been more prevalent in the U.S. (National Institutes of Health 2012). Since 2006, the NIH has prioritized translational research, creating centres for translational research at its institutes. The term implementation science has been used more in the UK and may become more commonly used due to 'Implementation Science', an open-access journal from the UK; implementation science is defined as the 'scientific study of methods to promote the uptake of research findings into routine healthcare in both clinical and policy contexts' (Implementation Science 2012).

Aim

The EBP models can support an organized approach to implementation of EBP, prevent incomplete implementation, improve use of resources, and facilitate evaluation of outcomes (Gawlinski & Rutledge 2008). However, clinicians find there is not one model that meets the needs of all the settings where nurses provide care.

The purpose of this discussion is to present a succinct overview of selected EBP models that can be applied to nursing practice and to evaluate their usefulness in clinical and educational settings. It is beyond the scope of this paper to present an in-depth analysis of each EBP model for nursing practice. Rather, this review provides a concise description and evaluation of selected models that occur most frequently in the literature and are used in practice. In addition, this paper may serve as a guide to the

evidence-based nursing practice of staff nurses, educators, and healthcare organizations.

Data sources

Selection of data sources to identify relevant EBP models involved four steps. First, Melnyk and Fineout-Overholt's text on EBP provided an initial list of models to consider for application to nursing EBP projects (Melnyk & Fineout-Overholt 2011). They described seven models that 'have been created to facilitate change to EBP' (Ciliska *et al.* 2011, p. 245). This approach was selected because the authors of the text have considerable expertise in application of models and frameworks for EBP.

Second, to gain a broad perspective on EBP models used in nursing, CINAHL was searched using various combinations of terms: 'evidence', 'evidence-based practice', 'models', 'nursing' and 'research'. Articles that described EBP models used in only one setting or were infrequently used in EBP projects were excluded.

Third, following the initial review of the literature, two models described in the Melnyk and Fineout-Overholt text (Ciliska *et al.* 2011) were excluded and one other model was added. An EBP change model, originally developed by Rosswurm and Larrabee (1999), was excluded because it was not predominant in current literature. Also, the Clinical Scholar Model (Schultz 2005) was excluded because it focused on strategies for preparing nurses to conduct and use research. The ACE Star Model, which was included in Melnyk and Fineout-Overholt's chapter on teaching EBP in academic settings (Melnyk & Fineout-Overholt 2011), but not in their chapter on EBP models, was added to the finalized list of EBP models because it was featured in several articles found in the literature.

Fourth, once models were selected, specific names of models were used in the search process. The final list selected for inclusion were: (1) the ACE Star Model of Knowledge Transformation; (2) Advancing Research and Clinical Practice Through Close Collaboration (ARCC); (3) the Iowa Model; (4) the Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP); (5) Promoting Action on Research Implementation in Health Services Framework (PARIHS); and (6) the Stetler Model. Literature was searched in CINAHL to understand the history of model development from 1998 to the current year.

Discussion

The following concise overview presents six major EBP models that can be used by staff nurses, educators, and

healthcare organizations to guide evidence-based nursing practice. Readers should note that although 'model' is the term used in this paper and was also used in the Melynk and Fineout-Overholt text, different terminology such as framework (PARIHS) or guidelines may be more appropriate. Table 2 includes a description of model steps and key features; abbreviated summaries of each model are provided, allowing for a general overview useful for comparing model features. The last column in Table 2 provides a simple classification of each model according to its original design for use. For example, some are designed for individual use, while others place more emphasis on organizational processes.

Table 3 provides a brief evaluation of each EBP model using the four criteria for selecting an EBP model identified by Newhouse and Johnson (2009). Although other criteria exist for evaluation of model selection, the following criteria are particularly relevant to the needs of nurses in practice. The EBP model should: (1) facilitate the work required for completing an EBP project; (2) have educational components that help nurses to critique and assess the strength and quality of the evidence; (3) guide the process of implementing practice changes; and (4) potentially be implemented across specialty practice areas (Table 3). In addition, an implementation or application example is provided for each model.

Overview and evaluation of evidence-based practice models

ACE Star Model of Knowledge Transformation

The Academic Center for Evidence-Based Practice (ACE) developed the ACE Star Model as an interdisciplinary strategy for transferring knowledge into nursing and healthcare practice to meet the goal of quality improvement (Stevens 2004). This model addresses both translation and implementation aspects of the EBP process. The five model steps are: (1) discovery of new knowledge; (2) summary of the evidence following a rigorous review process; (3) translation of the evidence for clinical practice; (4) integration of the recommended change into practice; and (5) evaluation of the impact of the practice change for its contribution to quality improvement in health care. The model emphasizes applying evidence to bedside nursing practice and considers factors that determine likelihood of adoption of evidence into practice.

The Ace Star Model has been used in both educational and clinical practice. In an educational example, the University of Wisconsin-Eau Claire used the ACE Star Model to design an evidence-based approach to promote student

success on the NCLEX-RN[®] exam. Authors reviewed trends in exam pass rates, conducted a review of the literature on student success strategies, made recommendations to improve student performance, implemented the strategies, and achieved a statistically significant increase in student pass rate (Bonis *et al.* 2007). Other educational projects that have applied the ACE Star Model include identification of EBP competencies for clinical nurse specialists (Kring 2008) and use of the ACE Star Model as an organizing framework for teaching EBP concepts to undergraduates (Heye & Stevens 2009). Clinically, practitioners have used the model to guide development of a clinical practice guideline for ventilator-associated pneumonia (Abbot *et al.* 2006) and apply knowledge on social support and positive health practices to working with adolescents in community and school settings (Mahon *et al.* 2007).

The ACE Star Model can be used by both individual practitioners and organizations to guide practice change in a variety of settings. The model has been used as a guide to incorporate EBP into nursing curriculum and is also easily understood by staff nurses, in part due to similarity to the nursing process. The emphasis on knowledge transformation contributes to validating the contribution of nursing interventions to quality improvement. Additionally, the translation stage includes clinician expertise and has potential to discuss patient expertise, but is not addressed in the model. Strategies for successful implementation of a practice change are less well defined, such as the organizational culture and context that influence adoption of a practice change.

Advancing Research and Clinical Practice through Close Collaboration

The ARCC model focuses on EBP implementation and promotes sustainability at a system wide level (Melynk & Fineout-Overholt 2002, Melynk *et al.* 2010, Levin *et al.* 2011). The model has five steps: (1) assessment of organizational culture and readiness for implementation in the healthcare system; (2) identification of strengths and barriers of the EBP process in the organization; (3) identification of EBP mentors; (4) implementation of the evidence into organizational practice; and (5) evaluation of the outcomes resulting from the practice change (Ciliska *et al.* 2011). The key feature is the use of an EBP mentor to facilitate nurses' development of skills and knowledge to implement EBP projects effectively. In addition, scales have been developed based on the model for assessment of the organizational culture and measurement of effectiveness of EBP in practice.

Levin *et al.* (2011) piloted the implementation of the ARCC model with nurses working in a community health

Table 2 Evidence-based practice models for guiding change.

Model/EBP steps	Key features	Model classification
<p>ACE Star Model of Knowledge Transformation (Stevens 2004, Kring 2008)</p> <ol style="list-style-type: none"> 1. Discovery – search for new knowledge through traditional research 2. Evidence Summary – a rigorous systematic review process of multiple studies to formulate a statement of evidence 3. Translation – creation of a practice document or tool that guides practice, such as a clinical practice guideline 4. Integration – change in practice; supports EBP through influencing individual and organizational change 5. Evaluation – consider impact of EBP practice change on quality improvement in health care 	<p>Focuses on finding nursing evidence for bedside nursing practice, including qualitative evidence</p> <p>Addresses factors that influence adoption of innovation</p> <p>Major focus is knowledge transformation</p>	Organizational or individual use
<p>Advancing Research and Clinical Practice Through Close Collaboration (ARCC) (Ciliska <i>et al.</i> 2011)</p> <ol style="list-style-type: none"> 1. Assess organizational culture and readiness for system-wide implementation 2. Identify organizational strengths and barriers to EBP 3. Identify EBP mentors within the organization to mentor direct care staff on clinical units 4. Implement evidence into practice 5. Evaluate outcomes 	<p>Cognitive Behavioural Theory guides clinicians to change behaviour towards adopting EBP</p> <p>Organizational and Readiness Scale for EBP for assessment of organizational culture</p> <p>Evidence-Based Implementation Scale for measurement of EBP in practice</p>	Emphasis on organizational use
<p>Iowa Model (Titler <i>et al.</i> 2001)</p> <ol style="list-style-type: none"> 1. Identify practice questions (problem-focused or knowledge-focused ‘triggers’) 2. Determine whether or not the topic is an organizational priority 3. Form a team to search, critique, and synthesize available evidence 4. Determine the sufficiency of the evidence (if insufficient, conduct research) 5. If evidence base is sufficient and the change appropriate, pilot the recommended practice change 6. Evaluate pilot success and if successful, disseminate results and implement into practice 	<p>Flowchart used to guide decision-making</p> <p>Uses problem-solving steps</p> <p>Uses feedback loops to guide change process (e.g. lack of evidence leads to conducting research)</p> <p>Includes a trial of the practice change before implementation occurs across the system</p> <p>Designed as an interdisciplinary approach</p>	Emphasis on organizational use
<p>Johns Hopkins Nursing Evidence-Based Practice Model (JHNEBP) (Newhouse <i>et al.</i> 2007)</p> <ol style="list-style-type: none"> 1. Practice Question – identify the EBP question using a team approach 2. Evidence – search, critique, summarize, rate evidence strength, and develop recommendations for change based on evidence strength 3. Translation – determine feasibility, create an action plan, implement change, evaluate, and communicate findings 	<p>A practical guide for the bedside nurse to use the best evidence for care decisions</p> <p>Provides tools for process and critique, including question development, evidence rating scale, and research and non-research evidence appraisal</p> <p>Applicable to a variety of healthcare settings</p>	Emphasis on individual use

Table 2 (Continued).

Model/EBP steps	Key features	Model classification
<p>Promoting Action on Research Implementation in Health Services Framework (PARIHS) (Rycroft-Malone 2004)</p> <p>Successful implementation of a practice change is based on the following interacting elements:</p> <ol style="list-style-type: none"> 1. Evidence – search for evidence from research, clinical experience, patient experience, and local data and information 2. Context– adoption of an innovation is influenced by the organizational culture, leadership support, and evaluation practices 3. Facilitation – individuals in the organization use their knowledge and skills to assist with implementation of the practice change 	<p>Can use framework to evaluate progress in implementing practice change</p> <p>For each element, model provides sub-elements or factors that predict the likelihood of success (high to low continuum)</p>	<p>Emphasis on organizational use</p>
<p>Stetler Model (Stetler 2001, Ciliska <i>et al.</i> 2011)</p> <ol style="list-style-type: none"> 1. Preparation – define priority need and initiate a search for evidence 2. Validation – systematically critique and summarize evidence 3. Comparative Evaluation and Decision-Making – make a decision about what evidence to use to respond to the identified need 4. Translation and Application – plan change and implement evidence-based change plan 5. Evaluation – determine whether goals for using the evidence were accomplished 	<p>Focuses on critical thinking and use of evidence by individual clinician</p> <p>Categorizes evidence as external (from research) and internal (systematic locally obtained evidence, such as outcome data, consensus opinion, experiential information)</p>	<p>Emphasis on individual nurse as critical thinker, but may include groups of clinicians</p>

home care setting. The researchers randomized a convenience sample of 46 nurses to experimental and control groups. The experimental group received didactic content on EBP, an EBP toolkit, posters on EBP, and an available EBP mentor, while nurses in the control group were given didactic content on physical assessment. The EBP mentored group had a significant improvement in EBP beliefs, demonstrated increased implementation of EBP, and had nearly a 50% reduction in the group turnover rate during the study time period.

The ARCC model has been used in hospital and community practice settings and has been tested as a strategy for improving practice outcomes. The emphasis on identifying organizational strengths and barriers to EBP and identifying mentors to work with direct care staff contributes to an organizational culture that supports EBP. As the ARCC model emphasizes organizational environment and factors that support EBP, there is less emphasis in the model on evaluating evidence. The model's authors caution that while the model emphasizes organizational processes to advance EBP in care delivery, it is important to note that decision-making at the point of care includes clinician expertise and patient preference (Melnik & Fineout-Overholt 2011).

Iowa Model

The Iowa Model, originally developed as a research utilization model at the University of Iowa Hospitals and Clinics, has been revised to focus on implementation of EBP at the organizational level (Titler *et al.* 2001). The model is represented as an algorithm with defined decision points and feedback loops. The first decision is whether the problem or knowledge-focused trigger is a priority for the organization. An affirmative decision leads to formation of a team which searches, critiques, and synthesizes the literature. The second decision point considers the adequacy of evidence to change practice. Inadequate evidence leads the practitioner to a choice between conduction of research or utilization of alternative types of evidence (i.e. case reports and expert opinion). When adequate evidence is found, a pilot of the change is conducted. Evaluation of the pilot leads to the third decision point – whether to adopt the change in practice. Ongoing evaluation of the change and dissemination of results are further components of the Iowa Model.

There are numerous examples of application of the Iowa Model to organizational practice change. A New York hospital applied the Iowa Model to the implementation of a critical care pain observation tool for pain assessment of

Table 3 Application of criteria* for selecting an EBP Model.

EBP Model	Facilitates completion of an EBP Project	Educational components to guide evaluation of the evidence	Guidance for practice change	Applicable across specialty areas
ACE Star Model	Rigorous systematic review process Addresses translation and implementation	Not emphasized	Creates a tool for guiding practice (practice guideline)	Examples include acute care and school health
ARRC Model	Takes into account organizational culture and readiness Primarily addresses implementation	Available on CD-ROM with Melnyk and Fineout-Overholt (2011) text	Offers tools to assess organizational feasibility and evaluate EBP outcomes	Used for hospital and community practice; best fit is for large organizations
Iowa Model	Decision points and feedback loops throughout process Addresses translation and implementation	Not emphasized	Pilot of the change and evaluation are essential components	Useful in a wide variety of specialty areas, most notably acute care; best fit is for large organizations
Johns Hopkins EBP Model	Detailed attention to identifying practice questions and evaluating evidence Greater emphasis on translation – creation of an action plan	Offers tools for question development, rating the evidence, and appraising research and non-research evidence; text by Newhouse <i>et al.</i> (2007) provides a simplified, clear description of the EBP process	Includes an action plan with implementation, evaluation and dissemination steps; less emphasis on organizational culture and change	Potential usefulness in a variety of settings; useful for teaching the EBP process to nursing students
PARIHS Framework	Highlights the often under-recognized effect of the 'context' (e.g. leader support) as one influence impacting success of EBP implementation Addresses translation and implementation	Newly published guide available online, along with tools such as the successful implementation tool (Stetler <i>et al.</i> 2011)	Three elements (evidence, context, and facilitation) provide a process for practice change	Has been retrospectively applied in a variety of settings; may be good strategy for teaching doctoral students to test a developing model; look for connections to complementary models
Stetler Model	Comprehensive guide for implementation which includes practitioner expertise, context and evidence Addresses translation and implementation	Evaluation tools for critiquing literature for potential use in guideline development available in Stetler <i>et al.</i> (1998)	Contains detailed guidance for practice change including operational definitions and evidence-based dissemination and change strategies	Provides valuable guidance for the experienced EBP practitioner in any setting

*Criteria selected from Newhouse and Johnson (2009).

non-verbal patients in an intensive care unit (Kowal 2010). Nurses identified the problem trigger as a lack of an accurate pain assessment tool to rate pain levels in non-verbal patients. The unit governance committee from the surgical intensive care unit collaborated with a clinical nurse specialist to develop the question focus and search for evidence. After a thorough review of the literature, a decision was made to pilot a specific pain assessment tool. The group concluded that use of the measure resulted in improved patient outcomes and the use of the pain assessment tool was approved. A search of the literature demonstrated a wide variety of applications for the Iowa Model

(Madsen *et al.* 2005, Gordon *et al.* 2008, Farrington *et al.* 2009, 2010, Hermes & Lee 2009, Missal *et al.* 2010).

Multiple reports by researchers have demonstrated successful use of the Iowa Model in a variety of settings to guide decisions and implementation for practice change. Practitioners, regardless of prior EBP experience, find the Iowa Model algorithm helpful. The model considers input from the entire organizational system, including the patient, providers, and organizational infrastructure, and involves nurses in each of the steps (Kowal 2010). An additional strength is the inclusion of a trial of the practice change before making the decision about implementation. Although

implied, the model does not specifically address the process of making staff aware of the practice change (Kowal 2010).

Johns Hopkins Nursing Evidence-Based Practice Model

The Johns Hopkins Nursing EBP Model resulted from the collaborative work of leaders in nursing education and practice at Johns Hopkins Hospital and the Johns Hopkins University School of Nursing (Newhouse *et al.* 2007). The major focus of the model is translation of best evidence for nurses at the bedside to use in care decisions. The model provides three major steps with subcategories in each of the steps: (1) identification of the practice question, using a team approach; (2) collection of the evidence, which involves searching, critiquing, summarizing, determining strength of evidence, and making recommendations; and (3) translation of the evidence for use in practice, which includes determining feasibility of adopting the change and creating an action plan for implementation. The model includes tools for assisting the user: a question development tool, an evidence rating scale, and appraisal criteria for research and non-research evidence.

The clear, concise text (Newhouse *et al.* 2007) describing the Johns Hopkins model has been adopted in a university setting for use among baccalaureate and graduate students as a method for searching and appraising the literature. University professors and hospital nurse researchers describe collaboration between the university and the research councils of two hospitals on EBP projects (Missal *et al.* 2010). Clinical nursing leaders identified 'burning' clinical practice questions offered by staff nurses for which the university master's students performed critical appraisals of the literature and made practice recommendations using the model. Examples of practice changes included venous thromboembolism prevention for same-day postoperative surgery patients, RN interventions to prevent readmission of adults related to health literacy, and EBP protocols for opiate drug withdrawal of chemically dependent adult patients (M. A. Schaffer, personal communication, 10 June 2011).

The Johns Hopkins EBP Model is comprehensive, addressing all important components of the EBP process. Specific steps are provided for identifying the practice question and leadership responsibility, evaluating the evidence and developing recommendations and translating evidence for practice change. This model includes a rating scale for strength of evidence and quality for both research and non-research evidence. Practitioner expertise and patient experience are included in the rating scale. The critical appraisal tools provide a helpful guide for educators teaching the process of review of evidence to students. However, there is

a lack of literature on the use of the JHNEBP Model in a variety of clinical settings and the model has less emphasis on organizational culture and change.

Promoting Action on Research Implementation in Health Services Framework

Readers new to the PARIHS framework may find early studies describing retrospective application of the framework confusing unless they understand that the framework was developed over several years by a variety of authors with practice improvement and guideline implementation experience. The authors refer to their work as a framework, rather than a model, which is perhaps most appropriate as a model is expected to have undergone more rigorous explanation and testable hypotheses (Titler *et al.* 2007). The PARIHS framework's three key elements mutually influence one another during a successful implementation of EBP (Stetler *et al.* 2011). The first element, evidence, is described as sources of knowledge as perceived by multiple stakeholders. The second element, context, describes the quality of the environment where the research is being conducted. The third element, facilitation, is a technique to support people to change (i.e. attitude and skills). A prediction for degree of success in EBP implementation is based on the strength and appropriateness of the three elements.

In a critical synthesis of the literature on the PARIHS framework, Helfrich *et al.* (2010) identified six overview articles presenting core concepts in the new framework, along with 18 empirical articles from 2001–2008 where the framework was applied. With the exception of the survey development studies, studies reviewed by Helfrich and colleagues were retrospective in their application of the PARIHS framework. However, authors demonstrated that the framework could be used to guide an analysis of evidence and the context for dissemination.

Recently, a group of researchers applied the PARIHS framework to prospectively guide an implementation study on the use of consultation recording in oncology so patients could access the digital recording later to review what was said during the consult (Hack *et al.* 2011). In planning the study, researchers considered the interrelationship of evidence, context and facilitation aspects through analysis of the pre-implementation, implementation, and postimplementation phases. Investigators in New Zealand used the PARIHS framework to interpret focus groups of nurses, physicians, and managers to explore a nation-wide cardiovascular risk factors guidelines implementation in a primary healthcare setting, and concluded that the study supported the validity and applicability of the PARIHS framework (McKillop *et al.* 2011).

The PARIHS framework has been used to facilitate the work required for completing an EBP project. Indeed, one of the strengths of this framework is its emphasis on contextual application (i.e. consideration of the leader's willingness to support activities and a proposed practice change). The framework allows for a complex process of EBP implementation that recognizes unpredictable and changing factors and includes evidence from patients and practitioners. In terms of educational components, the framework initially appeared more theoretical than practical and earlier publications often focused on framework refinement and development rather than prospective clinical application. Recently, attempts have been made to clarify and strengthen the framework. A revision (Stetler *et al.* 2011) offers users online tools with a User Guide. In terms of a process guide to implement practice change, the PARIHS framework has great applicability for engaging stakeholders across healthcare disciplines; collaboration is needed for making financial, quality, and administrative decisions that lead to successful implementation.

Stetler Model

The Stetler Model, which in its original development focused on research utilization, has been updated and refined to fit in the EBP paradigm. The model emphasizes the critical thinking process and although practitioner-oriented, is also used by groups for implementing formal organizational change (Stetler 2001). An important assumption for the model revision is that internal factors such as the characteristics of individual EBP users and organizational practices influence implementation of evidence along with external factors that include formal research and organizational standards and protocols. The Stetler Model consists of five phases. Phase I, preparation, includes definition of the purpose, contextual assessment and search for sources of evidence. Phase II is validation of the evidence found. Phase III is comparative evaluation/decision-making, where the evidence found is critiqued, synthesized, and a decision for use is made with consideration of external and internal factors. Phase IV refinements provide implementation/translation guidance for change in practice. Finally, Phase V is evaluation, which includes outcomes met and the degree to which the practice change was implemented (Ciliska *et al.* 2011).

Romp and Kiehl (2009) used the Stetler Model to guide the redesign of a preceptor program with the goal of improving satisfaction levels of new nurses and reducing the turnover rate. They described how each of the five steps or phases of the Stetler Model led to program redesign. After reviewing literature on preceptor education, decision

makers disseminated recommendations to administrators, managers, and preceptors through committee meetings, individual meetings, or direct mailings. New nurse satisfaction with their preceptors showed a significant improvement and the turnover rate decreased by 3.9%. Additional application examples of the Stetler Model include analysis of evidence for using humour with cancer patients, evaluation of evidence on a screening tool for anxiety in patients with Parkinson's disease, and development of a screening tool for postpartum depression (Christie & Moore 2005, Bishop 2007, Snyder *et al.* 2011).

The Stetler Model, although oriented to the individual practitioner, can also be used by a team that is making a practice change decision. The model takes into account characteristics of the individual EBP user. The Stetler Model uses critical thinking and a logical process that emphasizes evaluation of the evidence. In the model, evidence includes quality improvement data, operational and evaluation data, and consensus of experts. Authors caution that experiential information from individual professionals should receive critical reflection before use as evidence (Stetler 2001, Melnyk & Fineout-Overholt 2011).

An updated diagram of the model is used to convey the key points and relationships of the model. However, readers may be confused by the details and complexity. The comprehensive approach of the Stetler Model makes it best suited for practitioners with skills in EBP (Stetler 2010).

The intersection of quality improvement and EBP

Nursing administrators and staff nurses should consider how the selection of a specific EBP model fits with the concept of quality improvement. While the concept of continuous quality improvement (CQI) has been used for decades, it is most appropriate to include it under the larger umbrella of EBP. CQI and EBP work in tandem; CQI may trigger a review of EBP. Conversely, a review of evidence can lead to new CQI initiatives. Thus, it is more vital now than ever before for administrators, clinicians, and researchers to work together, using EBP models to evaluate need for practice change, feasibility, context, barriers, facilitators, cost and benefit, and most importantly, patient outcomes.

Implications for nursing

The six models discussed all contribute in unique ways to the realization of EBP in everyday practice. Two models in particular may be attractive to nurse educators. The Johns Hopkins EBP Model offers evidence rating scales and

What is already known about this topic

- Evidence-based practice promotes using best evidence to make decisions to improve health outcomes for individuals, groups, communities, and systems.
- Evidence includes research, clinical expertise, and patient values and preferences.
- Many models have been developed for guiding implementation of evidence into nursing practice.
- Translation of evidence is a critical step for implementing practice change.

What this paper adds

- This review provides an overview and summary of key features and usefulness of six evidence-based practice models frequently discussed in the literature.
- Each model is analysed based on specific criteria for selecting an evidence-based practice model, including applicability to academic and practice settings.

Implications for practice and/or policy

- This summary of evidence-based practice models will inform nursing and healthcare organizational decisions about applicability to their setting and potential model application.
- Model features should be considered when selecting a model to provide the best fit for clinical and educational settings.
- Healthcare organizations can support nurses in implementing evidence-based practice by selecting a model that provides clear guidance for critiquing, selecting, and implementing best evidence.

critical appraisal forms that are helpful in assisting baccalaureate and master's students to understand the EBP critique process. The ACE Star Model can be readily understood by undergraduate students due to its similarity to the nursing process.

Individual clinicians may find both the Johns Hopkins and Stetler models helpful because of their emphasis on critical thinking and a logical decision-making process. Organizations may find a best-fit with the PARIHS, ARCC, and Iowa models because of the emphasis on team decision-making processes. The Iowa model is prominent in the literature for organizational decisions about adoption of specific clinical practice guidelines. The PARIHS and ARCC models stress the practical and contextual application of evidence, including sustainability.

The PARIHS model considers factors that contribute to likelihood of success for the practice change and, with further refinement in clarity and succinct presentation, has potential for judging the merit of cost and time expenditures.

In addition to considering the setting for the best-fit EBP model, the reader may wish to consider the degree of guidance for reviewing and critiquing evidence. In this regard, only the Johns Hopkins and ARCC models provided clear criteria to rate level and quality of evidence. While all six models mentioned patient experience and clinician expertise, there was variation on the emphasis and process for appraising these experiences.

Future scholars should focus not on development of new EBP models but rather on the review, testing, and refinement of existing models. Consistent use of terminology will help counteract the challenge of navigating the array of terms and models faced by educators and clinicians. Finally, clinicians need to consider EBP recommendations in light of patients' unique characteristics and values. Baumann (2010) cautions, 'nurses need to recognize that the generalizations of EBP findings must always be checked by listening to and respecting the views and choices of each individual' (p. 229).

Limitations

The process used to identify EBP models for discussion, although systematic, may have resulted in overlooking models with potential for application to practice. It should also be pointed out that the article featuring the four criteria used to evaluate the selected EBP models in Table 3 is co-authored by Newhouse who has also been instrumental in development of the Johns Hopkins Nursing Evidence-Based Practice Model. This discussion of EBP models and application in practice is not exhaustive; more in-depth discussion is provided by others (Gawlinski & Rutledge 2008, Rycroft-Malone & Bucknall 2010).

Conclusion

This discussion, which has provided an overview of EBP models in practical use, application examples, and an evaluation of model usefulness, will facilitate the reader in identifying the model that best fits the clinician, organization, and the desired goal. Consideration of how the model facilitates EBP projects, provides guidelines for evidence critique, guides the process for implementing practice change, and can be used across practice areas will assist clinicians in selecting a model that is understood, used, and leads to improved practice.

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