DISSERTATION

THE ICER MODEL© MEASURE OF AN EVIDENCE-BASED NURSING CULTURE

Submitted by

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ABSTRACT

THE ICER MODEL© MEASURE OF AN EVIDENCE-BASED NURSING CULTURE

Evidence-based practice (EBP) is defined as the use of current best evidence in making decisions about the care of individual patients. The magnitude of emphasis on EBP within the healthcare industry is articulated in the Institute of Medicine's (IOM) agenda that by 2020, 90% of clinical decisions will be supported by accurate and up-to-date clinical information that reflects the best available evidence. In contrast, medical practice based on best evidence may be as low as 25-50% and even lower within the nursing profession. The importance of objective measures toward fully achieving an evidence-based culture is supported in the IOM's call for the development of measures to "track and stimulate progress" of the EBP quest and in the Magnet Recognition Program® inclusion of empirical outcomes as the foundation of their model for exemplary nursing practice. Yet, no sufficiently comprehensive scales for measuring an evidence-based healthcare or nursing culture are available.

Hence, the objective of this study was to develop a reliable and valid measure of the intrapersonal, interpersonal, and organizational predictors (i.e., attitudes, knowledge, social norms, and organizational controls) of the behaviors necessary for achieving an evidence-based nursing culture (EBNC). Using a modified version of the Theory of Planned Behavior, survey statements were developed to represent the predictors associated with each of four essential behaviors embedded within the ICER Model for Achieving an Evidence-Based Healthcare Culture©. Following pilot testing at a medical center, the survey was disseminated electronically to approximately 1500 nurses working at a larger health system. Structural equation modeling analyses conducted on survey responses from 559 nurse participants were used to establish a scale with acceptable internal structure and psychometric properties. This measure offers a diverse range of applications that includes evaluating the progress toward achieving, and the accuracy and efficiency of interventions designed for promoting, an EBNC.

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DEDICATION

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ICER Model©

Theory of Planned Behavior

Evidence-based healthcare

Nursing

Healthcare culture

CHAPTER 1

INTRODUCTION

Evidence-based practice (EBP) is defined as "the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients" (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996, p. 71). The EBP movement began with UK scholar and physician Archie Cochran's stinging critique during the 1970's of the effectiveness, efficiency, and equality of treatment within the medical profession (Hill, 2000). Cochran's appeal for best evidence as the basis for practice and procedures (McKenna, H., Ashton, & Keeney, 2004) has spread into a global, interdisciplinary healthcare movement (Cochrane Collaboration, *n.d.*; Turkel, Reidinger, Ferket, & Reno, 2005) to integrate the best evidence available into the delivery of care to patients (Sackett & Rosenberg, 1995). The goal of integrating evidence into practice has extended beyond the healthcare professions to other domains, including business management (Pfeffer & Sutton, 2006) and the behavioral sciences (Pagoto et al., 2007) in general, including, more specifically, school (Hoagwood & Johnson, 2003) and clinical (Spring, 2007) psychology.

The magnitude of emphasis on EBP within the healthcare industry is articulated in the Institute of Medicine's (2008) agenda that "by 2020, ninety percent of clinical decisions will be supported by accurate, timely, and up-to-date clinical information, and will reflect the best available evidence" (p. iv). In contrast, medical practice based on the best evidence may be as low as 25-50% (McGlynn et al., 2003), and potentially even lower in nursing practice (Oman, Duran, & Fink, 2008). Indeed, the transformation from an experience-based discipline to one that is founded on evidence poses a significant challenge for the health professions. In fact, many healthcare organizations do not have a comprehensive plan for achieving an evidence-based culture (Rycroft-Malone, Harvey, Seers, Kitson, McCormack, & Titchen, 2004).

I herein review the literature describing evidence and practice associated with evidence-based practice, including a narrower focus on the nursing profession's EBP quest. A critical appraisal of this literature reveals suppositions that have engendered confusion and inefficiency in the EBP quest. In response, I propose the ICER Model for Achieving an Interdisciplinary Evidence-Based Healthcare Culture©. This framework is built on four essential steps – ***I****dentify* best practice recommendations, ***C****ommunicate* best practice recommendations, ***E****mbrace* best practice recommendations, and ***R****eview* outcomes associated with recommended practice – which are importantly influenced by the quality and efficiency of collaboration among the disciplines engaged in planning, funding, delivering, and evaluating interventions and outcomes within the organization. Further, and in accordance with the Institute of Medicine's (2008) EBP charge that measures be "developed to track and stimulate progress" (p. iv) in achieving their EBP goal, this research study will develop a scale for measuring an evidence-based nursing culture. Using a modified version of Ajzen and Fishbein's Theory of Planned Behavior (Ajzen & Manstead, 2007), attitudes, knowledge, social norms, and organizational controls are used to predict behavioral intention and/or behaviors associated with each of the ICER Model© steps.

Evidence-Based Practice

Evidence

Evidence categories. The range of evidence upon which practice is founded is diverse, and typically presented as a hierarchy of evidence quality. Hierarchy levels and their associated definitions are varied, but a representative model used in guidelines published on their National Guideline Clearinghouse website (*n.d.*) of the US Department of Health and Human Services' Agency for Healthcare Research and Quality consists of: Level 1a, meta-analysis of randomized controlled trials; Level 1b, at least one randomized controlled trial; Level IIa, at least one well-designed controlled study without randomization, including cohort studies; Level IIb, at least one other type of well-designed quasi-experimental study, including case control studies; Level III, well-designed nonexperimental descriptive studies, such as comparative studies,

correlation studies, and case studies; and Level IV, expert committee reports or opinions and/or clinical experience of respected authorities.

Evidence category controversies. Randomized controlled trials (RCTs), studies that rely on randomized assignment to groups, are widely purported to be the gold standard of evidence quality (e.g., Concato, Shah, & Horwitz, 2000; Sackett, Straus, Richardson, Rosenberg, & Haynes, 2000). However, Abel and Koch (1999) contested the classic arguments favoring the use of RCTs by identifying their inherent weaknesses, and concluded that well-designed observational studies also offer credible support to the body of evidence upon which practice is based. Addressing the proposition that observational studies are less valid than RCTs, Concato et al. (2000) conducted summary estimates and 95% confidence intervals of five sets of meta-analyses from RCTs and compared them to meta-analyses from observational studies evaluating the same intervention. They concluded that well-designed observational studies do not systematically overestimate the magnitude of treatment effects when compared to RCTs.

The inclusion of qualitative evidence or its location in an evidence hierarchy has also been controversial (Closs & Cheater, 1999). Some have proposed that meta-syntheses of qualitative studies should reside at the top of a qualitative hierarchy, akin to randomized controlled trials at the top of quantitative hierarchies (Panniers, 2006; Sandelowski & Barroso, 2003). Others have suggested that EBP may be useful in treating conditions with a biological cause, but may be less useful for conditions with social, psychological, or spiritual origins (Nolan & Bradley, 2008). Mantzoukas (2008) asserted, contrary to the consensual opinion of other commentators, that locating randomized controlled trials at the top of the hierarchy of evidence impedes evidence-based practice, and that *reflection* on practice should serve as its appropriate substitute.

Debate about the inclusion of expert opinion, practitioners' skills (Closs & Cheater, 1999), and patient preferences (McKibben & Walker, 1994) in the evidence hierarchy (Kendall,

1997) generated confusion in the 1990's. Several researchers addressed the dispute by categorizing evidence into four sources of knowledge: research; clinical experience; patients, clients, and caregivers; and local context and environment (Rycroft-Malone, Seers, Titchen, Harvey, Kitson, & McCormack, 2004). Regarding patients, clients, and caregivers, they pointed out "that 'good practice' cannot be separated from the unpredictable ways in which individuals and their families respond to concepts of health and illness" (p. 85). An update to the Promoting Action on Research Implementation in Health Services (PARIHS) framework addressed the circumstances under which clinical experience is classified as evidence, clarifying that "it is essential that clinical experience or tacit knowledge is made explicit in order for it to be disseminated, critiqued and developed" (Rycroft-Malone et al., 2002; p. 64). Others have argued that broadening the definition of evidence to include clinical experience and expertise violates the principal emphasis on research findings or knowledge (Scott-Findlay & Pollock, 2004). Yet, Melnyk and Fineout-Overholt's (Arizona State University College of Nursing & Healthcare Innovation, *n.d.*) EBP model, for example, denotes the merging of science and art in specifying the influence of research findings and theory, clinical expertise, and patient preferences and values on clinical decision-making. Levin and Feldman (2006) also purported that a patient's values and preferences must be incorporated at the point of treatment decision. Indeed, uncertainty continues regarding the role that nonresearch evidence plays within the evidence-based movement. The process of crafting evidence-based recommendations is distinctly unique from the process of reviewing the range of best practice recommendations with patients and their families in order to develop a plan of care that is endorsed by the patient – a point that will be integrated into the forthcoming presentation of the ICER Model©.

Synthesizing evidence into practice recommendations. The health disciplines use a *systematic review* process to locate, retrieve, review, and summarize the research evidence associated with a practice topic. PubMed, a search engine and database of citations of the biomedical literature serviced by the U.S. National Library of Medicine and the National

Institutes of Health, is one of many resources available for identifying and retrieving published evidence. Evidence synthesized into practice recommendations that address a specific healthcare issue or diagnosis is called a *guideline*. The Cochrane Collaboration (*n.d.*), for example, produces and reports systematic reviews and guidelines of healthcare interventions for medical practitioners with the agenda of improving healthcare decision-making globally. *Clinical pathways* offer an efficient mechanism to convert practice guidelines into sequential or timed interventions for a defined group of patients within a specific period of time (De Bleser et al., 2006; Dykes, Currie, & Cimino, 2003). These interdisciplinary recommendations and order sets offer important potential for clinicians to employ the full spectrum of best-practice strategies without suffering the limitations of human cognition as they establish a plan of care or deliver care at the bedside (Stead, 2007).

Although Cochrane guidelines are typically founded on evidence from RCTs, the quality of evidence upon which some other guidelines have been founded has been contentious. Evaluating 279 guidelines published in the peer-reviewed medical literature from 1985 through 1997, Shaneyfelt, Mayo-Smith, and Rothwangl (1999) found that most of them did not adhere well to the methodological standards formulated by the American Medical Association, the Institute of Medicine, and the Canadian Medical Association. More recently, Sanghavi (2008) investigated the origins of specific guidelines disseminated by well-respected professional organizations, and asserted that they had been founded on “expert opinion” rather than objective data. He further cautioned that author conflict of interests have generated rogue guidelines. Indeed, Sackett’s editorials exposing the “sins of expertness and a proposal for redemption” (Sackett, 2000, p. 1283) and calling for the compulsory retirement of “experts” (Sackett, 1983), exemplify the challenges posed by the healthcare culture’s overriding deference to expert opinion.

Further, crafting succinctly stated recommendations from conflicting study conclusions is a complex and difficult task. Although “systematic review is typically viewed in the health

sciences as the most objective—that is, rigorous, transparent, and reproducible—method for summarizing the results of research . . . recent scholarship has shown systematic review to involve feats of interpretation producing less certain, albeit valuable, results" (Sandelowski, Voils, Barroso, & Lee, 2008, p. 454). In fact, a Committee on Standards for Developing Trustworthy Clinical Practice Guidelines was recently developed by the Institute of Medicine (Institute of Medicine of the National Academies, 2009) to address these challenges.

On the other hand, a variety of innovative strategies exist for identifying and communicating best practice recommendations to clinicians (Resources for evidence-based practice, 2008). Toolkits guide clinicians in evidence review processes (e.g., Ryton, Grant, Little, & Gilsenan, 2007). Detailed information on statistical strategies and procedures is widely available in EBP textbooks (e.g., Newhouse, Dearholt, Poe, Pugh, & White, 2007; Straus, Richardson, Glasziou, & Haynes, 2005; Fink, 2000) and professional journals. For example, the *Effective Clinical Practice* journal presented a "Primer on 95% CIs for the number needed to treat" (Editorial, 1999). Meta-analytic techniques are available not only for quantitative research studies, but for qualitative studies as well (Panniers, 2006; Sandelowski & Barroso, 2003). Resources for evaluating the integrity of evidence upon which practice recommendations are founded include a step-by-step instrument from the AGREE Collaboration© (2001). The SQUIRE (Standards for QUality Improvement Reporting Excellence) project (Davidoff, Batalden, Stevens, Ogrinc, & Mooney, 2008) offers detailed advice to researchers submitting an article for publication. Membership in professional organizations such as the Joanna Briggs Institute enable access to specific practice recommendations that cite the levels of evidence upon which they are founded, and tools for embedding appraised and rated evidence into organizational documents (The Joanna Briggs Institute, *n.d.*b).

EBP recommendations are disseminated in a variety of other ways, including electronic newsletters such as Proquest Nursing and Allied Health Source (*n.d.*) and Medscape Nurses (*n.d.*) from WebMED. Business vendors such as Zynx Health (*n.d.*) create evidence-based

recommendations that can be integrated into order sets and interdisciplinary plans of care, and linked to electronic alerts and reminders sent to clinicians. Straus et al. (2005) emphasized the integration of electronic technology in their "4S" approach to developing an evidence-based plan of care for individual patients. The resources they identified included, in ascending order of usefulness: (a) studies, or original published articles in journals; (b) syntheses, such as Cochrane Collaboration (*n.d.*); (c) synopses, e.g., evidence-based journal abstracts; and (d) systems, e.g., computerized decision support systems. They suggested that "a perfect evidence-based clinical information *system* would integrate and concisely summarize all relevant and important research evidence about a clinical problem and would automatically link, through an electronic medical record, a specific patient's circumstances to the relevant information" (p. 34). Straus et al. accentuated that information systems do not instruct clinicians about what to do, but identify the most current cumulative evidence available regarding the patient's condition and its treatment.

Practice

As technological advances enable clinicians to access evidence and best practice recommendations, the challenge that surfaces is their incorporation into practice. In fact, clinically relevant research findings have taken up to two decades to make their way into clinical practice (Balas & Boren, 2000; Sussman, Valente, Rohrbach, Skara, & Pentz, 2006). Some clinicians have scorned guideline-based clinical pathways as cookbook medicine; i.e., "too simple to treat the heterogeneity of the patients' conditions" (Panella, Marchisio, & Di Stanislao, 2003, p. 512; see also To, McLimont, Wang, Cicutto, 2009).

So, how would clinicians determine if, or to what degree, their practice is based on the best evidence available? What proportion of one's practice would need to rely on research findings to be considered evidence-based? What level of evidence would need to be embraced for it to be labeled research utilization? Is there a cut-off value for the strength of evidence needed for it to quality for integration into a healthcare policy or procedure? How frequently

would clinicians need to update their command of the literature for their practice to remain evidence-based (e.g., Barroso, Sandelowski, & Voils, 2006)? By what criteria would an organization meter its success in achieving an EBP culture? What percentage of its policies and procedures would need to be based on a review of the evidence (Oman et al., 2008)? These questions exemplify the complexity of defining and measuring an evidence-based culture.

Measuring practice based on evidence. Several studies have attempted to quantify the use of evidence in practice. Ellis, Mulligan, Rowe, and Sackett (1995) reviewed physicians' perceptions of the proportion of their practice that was based on evidence. They found that 83 percent of physician interventions at Oxford's main teaching hospital were evidence-based. Using reports from 17 healthcare organizations with publication dates as recent as 2000, another study found that practice based on Level I evidence from randomized-controlled trials ranged from 11% to 70% and averaged 38%, use of nonexperimental evidence ranged from 4% to 71% and averaged 41%, and practice not based on evidence ranged from 3% to 58% and averaged 23% across the 17 organizations (Booth, n.d.). McGlynn et al. (2003) examined the proportion of diagnosis-specific recommendations that were actually administered to patients. By evaluating the medical records of approximately 6,000 United States citizens, they found that these participants received only half of the preventive and therapeutic care recommended for their health histories, which included healthy, chronic, and acute conditions. Depending on the condition being evaluated, the variability was substantial. For example, "only 24 percent of participants in our study who had diabetes received three or more glycosylated hemoglobin [i.e., hemoglobin A_{1C}] tests over a two-year period" (p. 2642) compared to the recommended 2-4 times per year (American Diabetes Association, 2009). McGlynn et al. pointed out that their results paralleled those of Saaddine et al. (2002) who found that only 29% of adults with diabetes who participated in a representative surveillance system reported having their hemoglobin A_{1C} tested during the preceding year.

Variability in implementing clinical guidelines is influenced by the differences in barriers between settings and disciplines (Cabana et al., 1999). Confusion about the benefits of EBP and discouragement over inconsistency in the quality of guidelines are among a host of variables suggested to cause individual medical practitioners to ignore guidelines (Sanghavi, 2008). Kivlighan (2008) compared the EBP struggle within the group psychology domain to a "resistant client . . . bogging down" in the process, resulting from not understanding the required tasks or having the skills to perform these tasks. Indeed, the struggle that nursing has experienced to base its practice on evidence is a circumstance not unlike those experienced by other professions (Scott & McSherry, 2009).

Implementation research. The historic focus of EBP training programs on achieving best practice (Farquahar, Stryer, & Slutsky, 2002) is consistent with the recent profusion of implementation research in the professional literature. Eccles and Mittman (2006) defined implementation research as the "scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice, and, hence, to improve the quality and effectiveness of health services. It includes the study of influences on healthcare professional and organisational behaviour" (p. 1).

The science of implementation research within healthcare is still in its early stages (Titler, Everett, & Adams, 2007). Interventions designed to enhance the translation of evidence into practice have been criticized for being insufficiently guided by theory or empirical findings (Hedges, 2006; Hopp 2006; Improved Clinical Effectiveness through Behavioural Research Group [ICEBeRG], 2006). Generating randomized controlled trials and other empirical research void of theoretical foundations has been declared "an expensive version of trial-and-error, with no a priori reason to expect success or to have confidence of being able to replicate success if it is achieved" (Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005, p. 108). Correspondingly, researchers are responding to the call for greater use of theory and influence from the multidisciplinary literature to guide the knowledge translation research specifically as it applies

to the nursing profession (Estabrooks, 2007a; Estabrooks, Thompson, Lovely, & Hofmeyer, 2006; Rycroft-Malone, 2007). For example, a recent article listed theories that might be paired with implementation strategies (van Achterberg, Schoonhoven, & Grol, 2008). Another exemplar compared a variety of strategies for integrating research recommendations into practice, and reported that the median improvement in performance associated with the use of reminders was 14.1%, compared with an improvement of only 8.1% after disseminating educational materials (Grimshaw et al., 2004). Further, researchers and practitioners must collaborate to enable the measurement of interventions designed to increase knowledge translation (Baumbush et al., 2008).

The professional literature uses a wide range of terms associated with the process of converting knowledge into action, including knowledge translation, knowledge transfer, knowledge exchange, research utilization, implementation, diffusion, dissemination, continuing education, and continuing professional development (Graham et al., 2006). The interchangeable use of these terms and lack of definitional clarity or agreement is problematic (Rycroft-Malone, 2007). For example, the distinction between research utilization, defined as the processes involved in using research knowledge to inform clinical decisions (Cummings, Estabrooks, Midodzi, Wallin, & Hayduk, 2007), and knowledge translation, described as the "synthesis, dissemination, exchange and ethically-sound application of knowledge to improve … health" (Canadian Institutes of Health Research, 2009, May 8), led Rycroft-Malone (2007) to assert that knowledge translation is a more expansive construct than research utilization. Indeed, such lexical ambiguity has generated confusion and misunderstanding (Graham et al., 2006; Graham & Tetroe, 2007). Hence, Graham et al. (2006) proposed a conceptual framework for the process of translating knowledge into action, and integrated the roles of *knowledge creation* and *knowledge application* into their model. Their work creates an important distinction between the cognitive and the behavioral aspects of an EBP, and highlights the multidimensional nature of achieving an EBP culture.

Evidence-Based Nursing Practice

Although the evidence-based movement originated within medicine, its agenda has been embraced broadly within health care. Physicians play an integral role in developing the plan of care for patients, yet a broad range of healthcare professions develop their own standards and plans for implementing that care. In the hospital setting, nurses generally have more direct contact with patients and their families than any other group of health professions, documenting the importance of nursing's commitment to the evidence-based agenda (Turkel et al., 2005).

Nursing evidence. Although widespread consensus exists within the nursing profession that practice must be founded on the best available evidence (Levin, 2008; Messmer, Jones, & Rossilo, 2002), the paucity of research upon which practice recommendations can be established is problematic. Academicians have conventionally advanced theories and research that did not represent priorities in the clinical arena (Chulay, 2006; Goode, 2000). Others have attributed the dearth of high-quality research findings relevant for the primary care setting to lack of financial support (McKenna, H. P., Ashton, & Keeney, 2004). Funding limitations and logistical challenges have frustrated the conduct of clinical research, particularly the use of randomized study designs. Or, conversely, nursing studies frequently use designs that fail to test theory or establish causal inference (Estabrooks, 2004, 2007b; Watson, Walker, Grimshaw, & Bond, 2006), which may have exacerbated the funding limitations experienced by the profession. Further, the challenges of obtaining data upon which to craft practice recommendations have also been addressed in the literature. One response strategy is for researchers to share data among themselves, or to develop data repositories (Estabrooks & Romyn, 1995). Clancy and Cronin (2005) expanded this concept to propose the development of data sources among regional health information organizations, with the caveat that confidentiality and informed consent issues would need to be resolved. They also pointed out that large sample size data sets would help to address the issue of achieving a representative sample. The number of guidelines and research studies being streamed into the public domain

is increasing, but it remains sparse relative to the number of practices in which nurses engage as they deliver care to patients.

Thus, decisions about the extent of commitment for engaging in the synthesis of practice recommendations from existing evidence or in the conduct of research compel introspection by healthcare organizations. Allocating organizational resources for these activities is problematic (Alexander, Hearld, Jiang, & Fraser, 2007). Even determining which topics merit response, and the order in which they are prioritized, can be complicated. One priority scale, for example, assigns a weight ranging from -1 to 2 or from 0 to 2 for each of six categories of evaluation: physiological outcomes, costs associated with changing practice, customer satisfaction, complications and safety, disorganized practice, and number of customer affected; the sum of these categorical weights for each topic creates a score that can be used to rank-order the priority with which clinical questions or topics will be reviewed (Craighead, 2006).

Nursing practice: Utilization of research evidence. Sorting evidence into research and nonresearch categories highlights that an EBP agenda is distinctly broader than one focused on research utilization (Estabrooks, 1998; Titler et al., 2001). Indeed, the vast majority of nursing procedures and protocols at most healthcare organizations are not based on research evidence (Oman et al., 2008). Upon what, then, is current practice based? It seems that much of nursing practice is founded on an assumption or informal observation that past practices have achieved acceptable outcomes, or at least have been associated with no apparent harm. That is, the "evidence" upon which much of current practice is based is apparently little more substantial than recent experience.

Significant effort has been allocated to understanding nurses' engagement with the EPB agenda by identifying the determinants of research utilization in nursing practice. Champion and Leach (1986) reported one of the first EBP measures in the nursing literature. They described their use of three predictors – support from peers and administrators, availability of research findings, and attitudes – and one criterion, research utilization, in a letter to the editor.

Although they did not specify the number of items they used in their questionnaire, they reported Cronbach's alpha for each of the three constructs predicting research use as .57, .75, and .94, respectively. Only 58 nurses working in a large university hospital completed their survey. Three years later, they distributed a 46-item scale to 150 nurses at a community hospital, and, using the responses from 59 nurses, were able to account for 42% of the variance in research use by using the same three predictors (Champion & Leach, 1989). Soon thereafter, Funk, Champagne, Wiese, and Tornquist (1991a) developed the BARRIERS to Research Utilization Scale, which is still being used extensively in the United States (Funk, *n.d.*). The BARRIERS scale was constructed using an exploratory approach, and identified four factors predicting the use of research: characteristics of the adopter, characteristics of the organization, characteristics of the innovation, and characteristics of the communication. A factor analysis of the BARRIERS scores from more than 2,000 British nurses 10 years later identified four different factors than those established by Funk et al.: benefits, quality, accessibility, and resources (Griffiths et al., 2001).

Nevertheless, the findings of these early studies are not dissimilar to more recent research evaluating the predictors of an evidence-based culture (e.g., van Achterberg et al., 2008). Upton and Upton (2006) developed an evidence-based practice questionnaire for nurses and, using principal components analysis, identified three factors: evidence-based practice/behaviors, attitudes, and knowledge/skills. A multilevel analysis of data from over 4,000 RNs in Canada identified three levels for predicting research use in nursing organizations: the individual nurse, the specialty, and the hospital (Estabrooks, Midodzi, Cummings, & Wallin, 2007). Individual differences accounted for most of the variation in research utilization; although organizational predictors were statistically significant when analyzed alone, they accounted for relatively little predictive value compared to individual determinants. Further, Estabrooks et al. (2007b) evaluated five hospital-level factors that included innovative organization, responsive

administration, staff development, staffing and support, and size, but only hospital size was significant.

Knowledge, attitudes, and behaviors have also been used to evaluate the effectiveness of EBP training programs. One questionnaire designed to evaluate the effectiveness of EBP education with undergraduate medical students assessed knowledge, attitudes, personal application, personal use, and future use (Johnston, Leung, Fielding, Tin, & Ho, 2003). Shaneyfelt et al. (2006) identified 104 instruments that evaluated EBP skills. Most of these measures assessed medical students' and postgraduate trainees' skills for *acquiring* and *appraising* evidence; some of the measures assessed the behaviors of *asking* answerable questions and *applying* evidence to individual patients; and a few of the scales assessed clinical interventions or patient outcomes. One-fourth of these instruments evaluated EBP attitudes, although less than five percent of the instruments were from the nursing domain. Another review documented that while stand-alone teaching was associated with improvements in EBP knowledge, integrated teaching (i.e., identifying and critically appraising EBP recommendations on the clinical unit or during patient encounters) generated improvements in EBP skills, attitudes, and behaviors (Coomarasamy & Khan, 2004). Craighead, Rohman, Dawson, and Hopkins (2007) evaluated the effectiveness of a teaching intervention designed to promote EBP cognitions and behaviors. They found that educational interventions were associated with improvements in EBP cognitions that were sustained for at least 10 weeks, and proposed that their modest but sustained improvements in behaviors following education, although statistically nonsignificant, merited additional longitudinal evaluation.

In presenting a more extensive summary of the predictors of research utilization, I build on Graham et al.'s (2006) framework and reorganized Upton and Upton's (2006) constructs to structure research utilization behaviors as an outcome, and to organize predictor variables into three general categories: (a) intrapersonal constructs, including attitudes and knowledge, (b)

interpersonal constructs, including peer and managerial relationships, and (c) organizational controls, consisting primarily of resource adequacy and innovation.

Intrapersonal determinants. Two broad constructs, knowledge and attitudes, are incorporated into the intrapersonal category. Having emphasized readiness for EBP in her dissertation (Pierce, 2002), Pierce and two colleagues, Pravikoff and Tanner (2003), described a forthcoming study to establish the validity and reliability of an instrument for assessing gaps in information literacy skills related to nurses' readiness for EBP; no follow-up report of that proposed study is available. However, in 2005, Pravikoff, Tanner, and Pierce asserted that RNs in the US have significant gaps in their information literacy and computer skills, limited access to high-quality resources, and attitudes that rendered them unprepared to achieve an evidence-based practice.

Several studies have suggested that educational level and professional experience may moderate knowledge and attitudes toward the use of research in practice (e.g., McCloskey, 2008; McKenna, H. P. et al., 2004). In a review of seven studies evaluating the effect of teaching critical skills on gains in knowledge, undergraduate medical students consistently made improvements in knowledge, but changes in residents were small (Norman & Shannon, 1998), suggesting that experience in one's professional role may influence evidence-based cognitions.

Craighead (2008) evaluated the validity and reliability of a nine-item measure of attitudes toward embracing EBP recommendations using a classic test theory approach. This study established the content validity of the survey items, evaluated convergent validity by reviewing relations between respondents' test score and personality patterns, and assessed one predictor-criterion relationship about EBP-related committee membership. As well, the internal structure of the measure was explored to determine how the scale behaved psychometrically. The best models identified for assessing a homogeneous construct relied on either four or five items. The fit indexes associated with these models were not stellar, but

impressively acceptable given that the scale's development was originally built from only nine items, one of which had to be discarded for generating negative covariances. The best two-factor model consisted of *Embracing EBP* and *Reviewing Current Practice*, although the factor loadings and uniquenesses were better for Factor *Embracing EBP* than for Factor *Reviewing EBP*. Craighead recommended that:

> Integrating EBP cognitions, behaviors, and attitudes into one scale creates the opportunity for organizations to track the direction and progress/strength with which their EBP culture evolves. Using the data from an objective EBP assessment, nursing leaders can determine which interventions (e.g., classroom, practicum) and dynamics (e.g., leadership style, personality traits, communication technologies employed) most reliably and efficiently (i.e., by maximizing the resource/outcome ratio) promote that evolution. (p. 12)

Indeed, positive attitudes and receptivity toward change are important variables in fostering an EBP culture – perhaps as essential as the knowledge and skills required for defining and measuring best practice. Freddi (2008), for example, compared the evidence for and against psychoanalysis and psychotherapy from the evidence-based paradigm, and declared the allegiance to one's own discipline, resulting from economic and sociological considerations, creates a "dodo bird effect" – in which existing evidence fails to change professionals' perspectives about pre-existing and fundamental differences. In contrast, Spring (2007), in reviewing the influence of healthcare's evidence-based movement on clinical psychology, proposed that EBP is larger than the integration of best practice recommendations into clinical decisions and delivery of care, declaring it a "transdisciplinary, idiographic approach that promotes lifelong learning" (p. 611).

Interpersonal determinants. A few studies evaluating managerial relationships suggest that healthcare managers may be inadequately prepared to support EBP, or that manager perceptions are inconsistent with those of staff nurses (Kovner & Rundall, 2006; Rycroft-Malone, 2008). A research utilization survey conducted with registered nurses (Funk, Champagne, Wiese, & Tornquist, 1991b) was replicated four years later with nursing managers (Funk, Champagne, Tornquist, & Wiese, 1995). Barriers cited by the staff RNs in the original

study were overwhelmingly attributed to the setting: e.g., lack of authority to change practice, insufficient time on the job to implement new ideas, and being unaware of the research. The top suggestion for facilitating research utilization, initiated with free-text entry by over one-third of the respondents, was enhancing administrative support and encouragement. Administrators in the second study, on the other hand, attributed barriers to aspects of the nurse, the setting, and the way research is presented. More than 70% of the clinicians in the first study cited the extent to which administration permitted the implementation of research into practice as a moderate or great barrier, ranking it 5th; in contrast, only 45% of the administrators in the follow-up study cited this barrier at the same level, ranking it 24th. The authors concluded that administrators needed to provide supports to staff and to communicate the availability of these resources. The striking differences, though, between staff nurse- and manager-perceived barriers highlight the confusion surrounding the EBP movement, and may help to explain why many healthcare organizations do not have a concrete plan for achieving an evidence-based culture (Rycroft-Malone et al., 2004).

Organizational determinants. Although many of the barrier studies have assessed the perceptions of individual nurses, the professional literature documents an escalation of interest in evaluating the contextual determinants of use of evidence in practice (e.g., Kitson, 2002; Rycroft-Malone, 2006). Organizational structures and intraprofessional hierarchies play a central role in how evidence is perceived and used in practice (Broom, Adams, & Tovey, 2008). The inadequacy of financial resources, dedicated time, and availability of knowledgeable nurse researchers has been identified repeatedly as obstacles (e.g., Fink, Thompson, & Bonnes, 2005; Turkel et al., 2005). Brown, Wickline, Ecoff, and Glaser (2009) administered two EBP measures to 458 nurses at an academic medical center: Funk et al. (1991a) *The BARRIERS to Research Utilization* scale and Upton and Upton's (2006) *EBP Questionnaire*. Brown et al. found that two organizational predictors, lack of time and lack of nursing autonomy, were the two top barriers. Indeed, the process of reviewing and synthesizing the professional literature

and retrieving other relevant evidence is labor and resource intensive (Clancy & Cronin, 2005; Sanghavi, 2008). Bedside nurses are chronically consumed with addressing and resolving individual patient care crises, and subsequently allocate little if any time to tackling recurring problems (Alexander et al.; Tucker, Edmondson, & Spear, 2002). Another study created a conceptual map of busyness and concluded that the perception of lack of time as a barrier to research utilization may be more accurately described as the lack of mental time and energy to navigate the complexities associated with a culture of busyness (Thompson et al., 2008).

Although the nursing profession is well suited to participate in research initiatives, it requires widespread organizational support (Redfearn, Lacey, Cox, & Teasley, 2004). Redfearn et al. (2004) proposed that essential resources include dedicated personnel; statistical support; paid time; peer support groups; communication strategies that include annual symposia, monthly presentations, research rounds, and lecture series; grants; an Institutional Review Board; and collaboration with quality improvement activities and external resources. Some have proposed that the labor intensity of strategies for initiating an evidence-based nursing program will cause them to fail unless the program is supported with dedicated staff and time (Schulman, 2008).

The literature summarized above lends support to categorizing the determinants of research utilization behaviors as intrapersonal, interpersonal, and organizational predictors of evidence-based behaviors. These studies also represent a foundation of survey topics upon which the proposed evidence-based culture measure will be established. However, before crafting this measure, I next critique current EBP models and measures and associated recommendations for change, and then propose the ICER Model© as a solution.

Current evidence-based nursing practice models and measures. EBP models and frameworks are plentiful. Examples from the research literature are presented in Table 1. In general, these models emphasize the retrieval of evidence, an evaluation of the evidence quality, application of the evidence to the plan of care, and the integration of the evidence into

the delivery of care. Some of these models are being used with great success in the nursing arena, e.g., the Johns Hopkins (Newhouse et al., 2007) and Iowa (Titler et al., 2001) models. Yet, some models fail to define the constructs embedded in their frameworks, and many, developed from an applied perspective, have not been tested empirically. These challenges are symbolic of several categories of change that have been proposed in the professional literature by nursing leaders and researchers within other disciplines, or that are compelled by building on or reinterpreting previously proposed conclusions.

Literature-Based and Innovative Recommendations for the EBP Agenda

Increase model specificity: Practice as a link between evidence and outcomes. The EBP agenda has characteristically focused on the *use* of research in practice as the desired endpoint, regarding which the delivery of best practice is a crucial responsibility of clinicians. Indeed, EBP is purported to offer a wide range of benefits, including a transparent clinical decision-making process (Reynolds, 2000), a carefully defined standard by which clinicians can hold themselves accountable (Closs & Cheater, 1999; Klardie, Johnson, McNaughton, & Meyers, 2004; McKenna, H. et al., 2004), increased consistency of care (Leung, 2001), faster integration of new treatments into practice (Closs & Cheater 1999; Pape, 2003), and multidisciplinary care (i.e., coordinated care; Trinder, 2000).

Despite these claims, inherent in the EBP movement is a widespread assumption that integrating research into practice will improve outcomes for patients, providers, and/or organizations (Kitson, 1997). Estabrooks (2007b) recently clarified that the rightful goal of EBP is not that clinicians employ evidence-based practice, but rather that the best outcomes possible be achieved. The Modified Pipeline Model (Wimpenny, Johnson, Walter, & Wilkinson, 2008), which emphasizes patient outcomes resulting from adherence to evidence, represents the emerging focus on patient outcomes. The shift in emphasis from practice to outcomes is also consistent with the American Nurses Credentialing Center's (2008) recent announcement that the original 14 Forces of Magnetism for their Magnet Recognition Program® had been

Table 1. *Contrasting Major Constructs within the ICER Model© to Other EBP and RU Models*

Model *Targeted Context or Journal*	**ICER© Steps**				**Additional Details about the Model**
	Step 1: **Identify**	**Step 2:** **Communicate**	**Step 3:** **Embrace**	**Step 4:** **Review**	
ICER Model© (Identify, Communicate, Embrace, & Review outcomes from Best practice recommendations) Craighead *Healthcare organizations & systems*	• Create questions about & new ideas for practice (these can emerge, e.g., from staff, clinical specialists, professional literature, academics, finance, patients/families) • Prioritize topics for review • Craft practice recommendation o Review guidelines o Review & synthesize professional lit & other evidence o Conduct research	• Employ communication strategies and plans that link the message to its target (audience), and that specify the medium, messenger, and timing • Enable reciprocal communication between a clinician and a designated expert to enable questions and clarifications until the clinician confirms their comprehension of the new practice	• Receptivity to changing from current practice to the recommended practice • Behavioral integration of recommendation into practice • Review outcomes are influenced by the quality of data entered into the patient record during the Embrace step →	• Review change(s) in outcomes targeted during Identify stage; e.g., o Physiological outcomes o Cost-effectiveness, efficiency (e.g., costs/charges, time) o Customer (e.g., patients/families, care providers), satisfaction • Review outcomes are influenced by the quality of data entered into the patient record during the Embrace step	• Each ICER Step is influenced attitudes, knowledge, social norms, and OCs o OCs include, e.g., staffing (FTEs), funding, technological supports and the quality of intra- and interdisciplinary collaboration • Model core is the patient/family • Documentation of interventions & patient outcomes is used in Review Step
A New Model for the Magnet Recognition Program® (2008) American Nurses Credentialing Center (**ANCC**) *Nursing organizations*	• New knowledge, Innovation, & improvements		• Exemplary professional practice	• Empirical quality results	• A 5-component model • OCs: o Transformational leadership o Structural empowerment
ACE Star Model Stevens (2004) *Nursing*	1. Knowledge discovery 2. Evidence synthesis or summary 3. Translation into clinical recommendations	3. Translation into clinical recommendations	4. Implementation into clinical settings	5. Evaluation	• ACE: Academic Center for Evidence-Based Practice at The University of Texas Health Science Center at San Antonio • Star: 5-point star illustrates five major stages of knowledge transformation

Note. EBP = Evidence-Based Practice; FTEs = Full-time equivalents; RU = Research Utilization; OC(s) = Organizational Control(s)

Table 1 (Continued). *Contrasting Major Constructs within the ICER Model© to Other EBP and RU Models*

Model *Targeted Context or Journal*	**ICER© Steps**				
	Step 1: **Identify**	**Step 2:** **Communicate**	**Step 3:** **Embrace**	**Step 4:** **Review**	**Additional Details about the Model**
AHRQ Model: From Science to Service Nieva et al. (2005) *Patient care / safety*	1. Knowledge creation and distillation	2. Diffusion and dissemination	3. Adoption 4. Implementation	5. Institutionalization (confirmation and routinization)	
Arizona State University Evidence-Based Practice Model Melnyk & Fineout-Overholt (ASU, *n.d.*) *Nursing*	1. Ask the burning clinical question 2. Collect the most relevant and best evidence 3. Critically appriase & synthesize the evidence		4. Integrate all evidence with one's clinical experience, patient preferences & values in making a practice decision or change	5. Evaluate the practice decision or change	
A collaborative model of knowledge translation between research and practice **Baumbush**, et al. (2008) *Clinical settings*	• Research question • Sharing emerging findings in "real time" • Refine research question • Develop and…	• …implement knowledge translation initiatives • "Just in time" teaching and action plans	• Transformative practice		• Model outer layer: Data synthesis, Data collection, and Data Analysis • Model inner core: Accountability, reciprocity, & respect; Research champions, and Credible messengers
Predictors of RU **Champion & Leach** (1989) *Nursing*	• Availability • Support		• Attitudes • Research use		46 item questionnaire conducted with 59 nurses working in a community hospital
Iowa Model of EBP Titler et al. (2001, p. 499) *Nurses + other health care providers*	2. Assemble & evaluate research literature 3. Craft practice recommendation	4. Determine if change is appropriate for adoption into practice	5. Change practice	1. Problem- and knowledge-focused triggers 6. Monitor outcomes	
Iowa Model of Research-Based Practice Titler et al. (2001, p. 500) *Nurses + other health care providers*	2. Is this topic a priority for the organization 3. Critique & synthesize research for us in practice	4. Pilot the change 5. Determine if change is appropriate for adoption into practice	6. Institute the change in practice	1. Problem- and knowledge-focused triggers 7. Monitor outcome data	

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Table 1 (Continued). *Contrasting Major Constructs within the ICER Model© to Other EBP and RU Models*

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Johns Hopkins EBP Model (PET) Newhouse et al. (2007) *Nursing practice*	1. Practice question 2. Evidence		3. Translation	1. Practice question	• PET: Practice question, evidence, translation
The Joanna Briggs Institute (JBI) Model of Evidence-based Health Care **The Joann Briggs Institute** (*n.d.*a) *Health care*	• Health care evidence generation • Evidence synthesis o Qualitative research o Quantitative research o Expert opinion and text o Economic data	• Evidence / knowledge transfer o Develop understandable and actionable messages o Accommodate the context of a target audience's info needs o Deliver messages in cost-effective ways	• Evidence utilization o Practice change o Embed evidence through organizational / system change	• Evidence utilization o Evaluate impact of evidence utilization on the health system, the process of care, and health outcomes	• Achieving improved global health is the goal (endpoint) of EBP, as well as its driving force • Evidence utilization is influenced by available resources, expertise, patient preferences, available evidence, & organizational & individual clinician factors
Multidimensional Nature of Context as it Relates to Research Utilization **Kitson** (1999) *Nursing*	• Evidence o Scientific o Experience o Patient preferences	• Means of communicating evidence to individual	• Individual o Role o Status o Education o Power base • Context o Leadership styles o Social Networks o Systems for problem-solving, evaluation o Culture o Inner context: Resources, politics o Outer context: Economics, social/ political environment		• Diffusion models (such as those below) fail to adequately address implementa-tion complexities o Rogers (1995) Diffusion of innovations o Bandura's (1986) Social learning theory o Argyris & Schon's (1974) Action science o Pettigrew's (1985) Perspectives on linkage between change and context

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Table 1 (Continued)

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	Step 1: **Identify**	**Step 2:** **Communicate**	**Step 3:** **Embrace**	**Step 4:** **Review**	
Evidence-Based Practice Paradigm "modified from Leung" **Leach** (2006) *Nursing*	2. Ask an answerable clinical question 3. Acquire the evidence 4. Appraise the evidence	5. Apply the evidence →	6. Apply the evidence	1. Assess the patient situation	• The Leech model is indistinguishable from the Leung 5 A's model in the opinion of this author
The A's: The Evidence-Based Decision-making Cycle **Leung** (2001) *Evidence-based movements*	2. Ask an answerable clinical question 3. Acquire the evidence 4. Appraise the evidence	5. Apply the evidence →	6. Apply the evidence	1. Assess the patient situation	
Wimpenny, Johnson, Walter, & Wilkinson (2008) **Modified Pipeline Model** *Individuals & organizations*	• Evidence: 1. Awareness 2. Acceptance 3. Applicability *Evidence transitions*	• Evidence: 4. Ability → 6. Agreed to → *from conceptual impact*	• Evidence: 5. Acted on 7. Adhered to *to instrumental impact*	• Patient Outcomes: The flow of evidence is measured by patient outcomes, both clinical and experiential	• Model traces the flow & identifies the impact of evidence
PARIHS Framework Kitson, Harvey, & McCormack (1998); Rycroft-Malone, Harvey et al. (2004) *Nursing*	• Evidence € o Research o Clinical experience o Patient experience o Info from local context	• Facilitation (F) o Role o Skills and attributes	• Context (C) o Receptive context o Culture o Leadership	• Evaluation	• Successful implementation (SI) of research into practice is a function of the dynamic, simultaneous relationship among evidence, context, and facilitation • SI = *f* (E,C,F)
Problem Solving for Better Health Nursing (PSBHN) Hoyt (2007) *International nursing; Dreyfus Health Foundation*	1. Define the problem 2. Prioritize the problem 3. Define a solution 4. Create an action plan	5. Take action to implement the project			• Future directions include evaluating benefits/outcomes and sustainability of projects

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Table 1 (Continued)

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PRISM (Practical, Robust Implementation and Sustainability Model) Feldstein & Glasgow (2008) *The Joint Commission Journal on Quality and Patient Safety*	• Intervention o Organizational perspective o Patient perspective	• Implementation & sustainability infrastructure • External environment • Recipients o Organizational characteristics o Patient characteristics	• Adoption • Implementation • Maintenance	• Reach & effectiveness	• Concepts from quality improvement, chronic care, diffusion of innovations, & measures of population-based effectiveness of translation • Focus: implementing & sustaining interventions
Rosswurm & Larrabee (1999) Model for Change to EBP *Nursing*	1. Assess need for change 2. Link problem interventions & outcomes 3. Synthesize best evidence	4. Design practice change	5. Implement & … →	5. Evaluate 6. Integrate & maintain	6-step model based on theoretical and research literature on EBP, RU, standardized language, and change theory
The practice of EBM **Sackett** et al. (2000) *Medicine*	1. Convert the need for info into an answerable question 2. Track down the best evidence with which to answer the question 3. Critically appraise the evidence for validity, impact, & applicability		4. Integrate the critical appraisal with clinical expertise and patient's unique biology, values, & circumstances	5. Evaluate effectiveness & efficiency in executing steps 1-4 and seek ways to improve them both for next time	
5-A's EBM Process **Sackett** et al. (2000) *Care providers*	1. Ask (formulate a clinical question) 2. Acquire (search evidence) 3. Appraise (evaluate quality of evidence)	4. Apply (the results) →	4. Apply (the results)	5. Assess (the outcomes)	Ask Advise Assess Assist Arrange

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Table 1 (Continued)

Contrasting Major Constructs within the ICER Model© to Other EBP and RU Models

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Saint Vincent Guide for EBP Implementation Kresse, Kuklinski, Cacchione (2007) *Multidisciplinary EBP in a tertiary hospital setting*	1. Research & organize	2. Planning for implementation	3. Implementation and go-live	4. Hardwiring EBP adoption	
Stetler Model Stetler (1994) *Nursing*	1. Preparation 2. Validation 3. Comparative evaluation 4. Decision-Making		5. Translation / Application	6. Evaluation	
Updated **Stetler Model** of RU to Facilitate EBP Stetler (2001) *Nursing*	1. Preparation 2. Validation 3. Decision-Making		4. Translation / Application	5. Evaluation	Stetler's update expanded the individual practitioner focus to include a group operations focus
Translation Research Model Titler (2008, March) *Nursing*	• Characteristics of the EBP	• Communication process	• Social system • Users of the EBP	• Rate and extend of adoption	Model was redrawn from Rogers' Diffusion of Innovations (2003)
Model for the Implementation of EBP as Part of the Magnet Recognition Process **Turkel**, Ridinger, Ferket, & Reno (2005)	1. Establish a foundation for EBP 2. Identify areas of concern 5. Contribute to a research study	3. Create internal expertise	4. Implement EBP		

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reconfigured into five model components; the fifth component, empirical outcomes, is diagrammed as a foundation for the other four components.

These recent theoretical advances are consistent with several studies that have empirically documented nursing's comprehensive influence on patient and organizational outcomes. Evaluations have included the influence of nurse staffing on nosocomial complications, length of stay (Dall, Chen, Seifert, Maddox, & Hogan, 2009); patient safety (Needleman & Buerhaus, 2003); quality of care (e.g., urinary tract infections, upper gastrointestinal bleeding, pneumonia, shock or cardiac arrest; Needleman, Buerhaus, Mattke, Stewart, & Zelevinsky, 2002); and added costs to patient care (Pappas, 2008). Other evaluations have explored relations among adherence to care, patient satisfaction, general health, functional outcome, and cost (Feuerstein, Hartzell, Rogers, & Marcus, 2006); and hospital nursing characteristics and 30-day mortality rates (Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005). Yet, a recent study indicated that outcomes associated with six newly developed nursing best practice guidelines (asthma, breastfeeding, delirium-dementia-depression, foot complications in diabetes, smoking cessation, and venous leg ulcers) remained unchanged following their release, leading the authors to suggest that future initiatives focus on refining the implementation process (Davies, Edwards, Ploeg, & Virani, 2008).

The incomplete link between evidence-based practice and improved health outcomes clearly merits further attention (Freddi, 2008). Yet, relatively few nursing practices, and their influence on outcomes, are routinely measured by healthcare organizations. Further, outcomes of interest to nurses are also often matters of concern to other groups. These perspectives include care providers from other disciplines, clinical support teams (e.g., managers, educators, researchers), organizational support teams (e.g., leadership, finance, and public relations), and patients and families. Although resources for healthcare consumers (Agency for Healthcare Research and Quality, *n.d.*) are available, "currently, it is nobody's job to disseminate research evidence or to ensure that decision makers' needs are brought into the research process in a

systematic way" (Waddell, 2002, p. 40). Gibbons (1999) argued that although the traditional contract between science and society relied on the communication of discoveries to society, the emerging contract requires that "scientific knowledge is 'socially robust', and that its production is seen by society to be both transparent and participative" (p. C81). Scherer and Juanillo (2003) asserted that bringing scientific and community perspectives and concerns together can be very helpful. "Far from diluting science, the involvement of affected stakeholders in health risk assessment has evidently resulted in even better science" (p. 231).

Finally, outcome evaluations can be sorted into three general categories: physiological, psychodynamic, and cost outcomes. Although the healthcare arena has recognized the importance of assessing customer satisfaction and customer feedback (e.g., Avatar, *n.d.*), the term psychodynamic outcomes is useful in representing a broader interaction of the emotional and motivational forces that affect behavior and mental states – not only within patients/families, but any relevant customer group, including members of the clinical and organizational support teams. Simultaneous evaluation of these three categories offers the opportunity to determine how interventions designed to influence one category may unintentionally but noticably influence the outcomes in another. Understanding the relations between these categories offers critical data to healthcare leaders in identifying areas of relative strength and weakness in order to determine where to most effectively allocate resouces in an increasingly restrictive healthcare economy and to target the ideal balance of outome categories (e.g., Jack et al., 2009).

Thus, I advocate for measuring the influence of practice on evidence-outcome relations, and for simultaneously evaluating as many of the three following categories of outcomes as possible: physiological, psychodynamic (e.g., customer feedback), and cost outcomes.

Increase model specificity: Communication as a link between evidence and practice. The Institute of Medicine's Strategy Map (Institute of Medicine Roundtable on Evidence-Based Medicine, 2009) categorizes the key challenges of evidence-based medicine as evidence generation and evidence application. Note, however, that evidence application

blends two distinct activities, communicate and embrace, into a single construct. This fusion does not fit well with nursing's emphasis on teamwork within a healthcare organization. Unique processes are used for, and different nurses are likely to participate in, crafting practice recommendations, communicating practice recommendations, and delivering those recommendations while caring for patients. For example, a librarian and a Clinical Nurse Specialist might contribute extensively to identifying a recommendation for preventing postoperative pneumonia but these individuals are neither likely to participate in communicating these recommendations to staff nor personally use/embrace that recommendation, as their job descriptions do not include the delivery of care at the bedside. It is this team approach that compels the separate measurement of the communication of and engagement with practice recommendations.

Lending support to the separation of communication and compliance behaviors are studies documenting that noncompliance can occur in either high or low communication conditions. That is, clinicians who have not been informed about the recommended change cannot engage in behavior change, but other practitioners who have been fully informed of the recommendation might be unwilling or unable, for a variety of reasons, to engage in the recommended practice change. Following the communication of a practice recommendation, the decision by a clinician to make a change in practice may be influenced by a variety of intrapersonal, interpersonal, or other pressures, but this choice is ultimately within the command of the individual. The enormity of these implications was exemplified in 2004 when a Midwestern community hospital developed and implemented an innovative set of pain management orders (Moline, Salimbeni, & Craighead, 2004). Failing to achieve the hypothesized certainty of improved pain management outcomes, further investigation of the patient records documented that the expected compliance rate of 90-95% was actually only 42%. Follow-up interviews with the clinicians participating in the study revealed that the

inadequacies in embracing the new practice recommendations were primarily a result of ambiguous communication (Eisenberg, 1984).

Indeed, combining the communication of and compliance with best-practice recommendations into one step is problematic when measuring the relation between practice and outcomes. By separating the concept of translation into two steps, communicate and embrace, researchers can account for the variance in outcomes that is attributable to communication inadequacies and/or partial or complete discrepancies in compliance. This increased specificity will enable greater accuracy in measuring the true and error components of the relation between a new evidence-based recommendation and its targeted outcomes.

Therefore, I advocate that research translation be viewed as two separate constructs – communicating and embracing best practice recommendations.

Context: From evidence-based practice to evidence-based healthcare.

Intradisciplinary coordination. The nursing profession has historically engaged a team perspective in its organizational culture. This team dynamic has filtered into the EBP endeavor, where nurses who provide care at the bedside typically rely on a variety of sources to identify best practice recommendations, including their organization's clinical nurse specialists and policy and procedure committees (Oman et al., 2008) as well as specialty conferences and white papers released by professional associations (Van Achterberg et al., 2006). Yet, much of the research associated with the EBP agenda has approached it as an individual responsibility. This assumption may find its origins in evidence-based medicine in which a physician making the effort to retrieve best evidence would likely make that effort only if intending to use the information. Nevertheless, crafting best practice recommendations can be a formidable challenge for individual clinicians. Davidoff, Haynes, Sackett, and Smith (1995) suggested that each medical practitioner would need to read 17 articles every day of the year to keep up with studies of direct importance to clinical practice. Indeed, the failure to incorporate a team emphasis into evidence-based nursing research may help to explain disappointing findings,

such as successful completion of an information literacy program not segueing into ongoing identification of research evidence in the practice setting (Rosenfeld, Salazar-Riera, & Viera, 2002).

Although EBP models specify the tasks that need to be completed to achieve evidence-based practice, little has been said about linking specific individuals or groups of individuals with specific tasks, rather than all EBP tasks/behaviors. One exception is Stetler (2001), who denoted the importance of the group dynamic when she expanded her 1994 research utilization model, which had focused on individual practitioners systematically using research. Her updated model emphasized the participation of individuals within groups applying a broader range of evidence in order to achieve best outcomes for patients and providers/units. Empirical studies lend support to this team approach to achieving an evidence-based culture. For example, the time intensity in successfully addressing patients' changing clinical needs typically precludes addressing and altering the underlying causes of recurring problems (Tucker et al., 2002). This study concluded that nursing managers should preserve nursing's successful management of exceptions – individual patient's deviations from the typical course of hospitalization – but also adjust traditional quality improvement processes by utilizing a problem solving coordinator – an individual with allocated time and responsibility for investigating the causes of recurring exceptions and crafting new practice recommendations.

Achieving an evidence-based healthcare culture (EBHC) may be well served by coordinating responsibility for essential EBP behaviors. This includes matching tasks to staff members who are able by virtue of their training, and/or in the best position by virtue of their job/departmental responsibilities, to fulfill an assigned portion of the EBP agenda. For example, clinical researchers or advanced practice nurses, whose education and/or training creates familiarity with systematic review processes, may be quite efficient in identifying best practice recommendations; staff nurses, who are likely to not be trained in synthesizing these recommendations, may be highly successful in integrating best practice recommendations into

the care they provide at the bedside. Further, specifying the responsibilities of each team member, allocating time and tangible resources necessary for task completion, and coordinating the objectives between teams may increase the efficiency and improve the management of resources associated with achieving an EBP. Individuals can be organized into highly efficient committees or *dream teams* (Salas, Rosen, Burke, Goodwin, & Fiore, 2006) using individual-level variables such as nursing role, education level, and personal interest/commitment.

Interdisciplinary collaboration. As the evidence-based movement gains momentum, the autonomy of individual practice is yielding to engagement with standards of practice and guidelines developed by credible governing bodies. Further, physicians are increasingly being employed by healthcare organizations, in which evidence-based policies, procedures, and standards must be coordinated among the disciplines engaged in planning and delivering care to the patient. These changes emphasize the importance of interdisciplinary collaboration in the quest to achieve an evidence-based organizational culture.

The complexities of enlarging an intradisciplinary EBP agenda into an interdisciplinary evidence-based healthcare agenda are daunting:

> Our biggest challenge in this field of research is to avoid rushing to solutions and certainty and to resist the belief that there will be straightforward replicable explanations. As researchers, policy makers, and clinicians, we have to learn to tolerate ambiguity, paradox, and uncertainty to an extent that makes our rational and intuitive minds hurt. Embracing our own quest for knowledge with honesty, integrity, and respect for multiple perspectives and experiences means that we are more likely to build a strong evidence base for [knowledge translation]. (Kitson, 2007, p. S2)

Intradisciplinary coordination is a dynamic separate from, albeit overlapping with, interdisciplinary collaboration. Lack of synchronization has been identified as a significant obstacle to the evidence-based movement (Kovner & Rundall, 2006; Redfearn et al., 2004). For example, EBP's distinction from or commonality with the quality improvement activities deeply entrenched in healthcare has not been well established (Hall, Moore, & Barnsteiner, 2008). Quality improvement departments or committees typically incur the responsibility for longitudinal measurement of specific markers mandated by regulatory agencies. To illustrate, The Joint

Commission (*n.d.*) mandates that hospitals routinely evaluate compliance with specific interventions and outcomes that currently include inpatient falls and hand washing technique. Quality Resources or Quality Improvement departments within hospital typically manage these initiatives. When organization, unit, or clinician practices or outcomes are overtly measured, the trending graphs and reports are often generated and reviewed by support teams outside the nursing department (e.g., the Quality Committee, managers), implying that opportunities to manage practice and outcomes is detached from the staff who directly care for patients. Wensing, Wollersheim, and Grol (2006) searched the PubMed and Cochrane Library literature to determine the effects of organizational strategies on improvements in patient care. The authors concluded that the benefits of quality management were uncertain, but that a revision of professional roles, use of interdisciplinary teams, and use of computer systems were associated with increased research utilization. By locating quality improvements initiatives within the larger EBP agenda, the opportunity for organizations to achieve evidence-based interdisciplinary healthcare may be strengthened.

System redesign activities proposed by the Institute of Medicine Committee on Quality of Health Care in America (2001) emphasized a combination of changes in organizational structures and processes; clinical practices and procedures; staffing and working conditions; information systems and technologies; incentives; and culture to enhance care quality, efficiency, and/or access.

> Interest in evidence-based management—informing decisions about organizational or financial strategies to improve health care (for example, utilization management, use of hospitalists, disease management programs, or pay-for performance programs)—has greatly increased in recent years. Today that interest is not matched by a robust scientific base. (Clancy & Cronin, 2005, p. 155)

Interviews with 16 health care providers and researchers at organizations redesigning their care to achieve the six primary objectives identified by the Institute of Medicine (2001) revealed that few organizations and systems had attempted to tackle this complex and resource-intensive agenda (Wang, Hyun, Harrison, Shortell, & Fraser, 2006). The authors concluded that

successful redesign was predicated on shifting from isolated projects to coordination and management of complex change sets across multiple system levels. Indeed, a systems approach to achieving an EBP has yet to be successfully achieved, but it offers appeal, particularly in an era of limited resources.

Finally, coordinating the priorities of clinicians, managers, and researchers offers additional opportunity to the nursing profession in resolving its evidence-related challenges (Estabrooks, 2007a). Using a series of semi-structured interviews with top leaders at several healthcare systems, Alexander et al., (2007) found that healthcare leadership had not sufficiently utilized the research experts and resources for achieving an EBP. The authors recommended that health care managers communicate directly with the research community to construct their priorities in researchable terms, including quality outcomes and cost issues associated with healthcare. The emergence of these coordinated conversations are exemplified by a partnership between academicians and clinicians that has facilitated an EBP program at a nonteaching hospital (Ravert & Merrill, 2008), and the interplay of clinical, academic, and business perspectives represented at a recent forum on the emergence of drug resistant infectious diseases (Northern Colorado Health Research Coalition, 2009). The success of these emerging joint ventures reinforces the importance of an interdisciplinary and applied approach to achieving an EBHC.

Thus, I advocate for modification from an individual responsibility for EBP to a coordinated intradisciplinary team approach in identifying, communicating, and embracing recommendations and reviewing their associated outcomes.

I further propose shifting the emphasis from evidence-based practice to an emphasis on evidence-based healthcare, underscoring the importance of interdisciplinary collaboration and the incorporation of the patient and family perspectives.

Summary: Redefining the Evidence-Based Agenda

Current definitions, models, and measures of an EBP merit modification in order to improve the accuracy and efficiency with which an organization achieves an EBHC. Recommendations for change include: (a) respecifying the end point of the evidence-based agenda from practices to outcomes; (b) simultaneously evaluating as many of the three general categories of outcomes as possible, i.e., physiological, psychodynamic, and cost outcomes; (c) respecifying practice as a link between evidence and outcomes; (d) specifying communication as a link between evidence and practice; (e) shifting from an emphasis on individual responsibility to a coordinated intradisciplinary team effort; and (f) recrafting evidence-based practice into an evidence-based healthcare agenda, underscoring the importance of dedicated resources, innovation, and collaboration among the disciplines within the healthcare organization on behalf of the patient/family and organizational outcomes.

In response to these recommendations for change, I define evidence-based healthcare as a culture of lifelong inquiry, innovation, and receptivity that enables interdisciplinary clinicians and/or specialty teams to identify, communicate, and embrace evidence-based recommendations, and to integrate patient/family preferences into the delivery of care with the specific intention of measurably improving patient/family, provider, and/or organizational outcomes.

Further, I define evidence-based nursing as a culture of lifelong inquiry, innovation, and receptivity that enables nurses to collaborate effectively with intra- and interdisciplinary clinicians and/or specialty teams to identify, communicate, and embrace evidence-based recommendations, and to integrate patient/family preferences into the delivery of care with the specific intention of measurably improving patient/family, provider, and/or organizational outcomes.

I next propose the ICER Model for Achieving an Interdisciplinary Evidence-Based Healthcare Culture©.

The ICER Model for Achieving an Interdisciplinary Evidence-Based Healthcare Culture©

The ICER Model for Achieving an Interdisciplinary Evidence-Based Healthcare Culture©, displayed in Figure 1, endorses four essential steps for achieving an interdisciplinary EBHC: (a) ***I****dentify* best practice recommendations, (b) ***C****ommunicate* best practice recommendations, (c) ***E****mbrace* best practice recommendations, and (d) ***R****eview* outcomes associated with actual practice. Each step of the model represents a stand-alone activity and an influence from or on the successful completion of adjacent activities. The core of the ICER Model© is the patient and family system, for whom best practices and outcomes are motivated. The backdrop of the model is the organizational culture, in which the ICER© processes are influenced by the

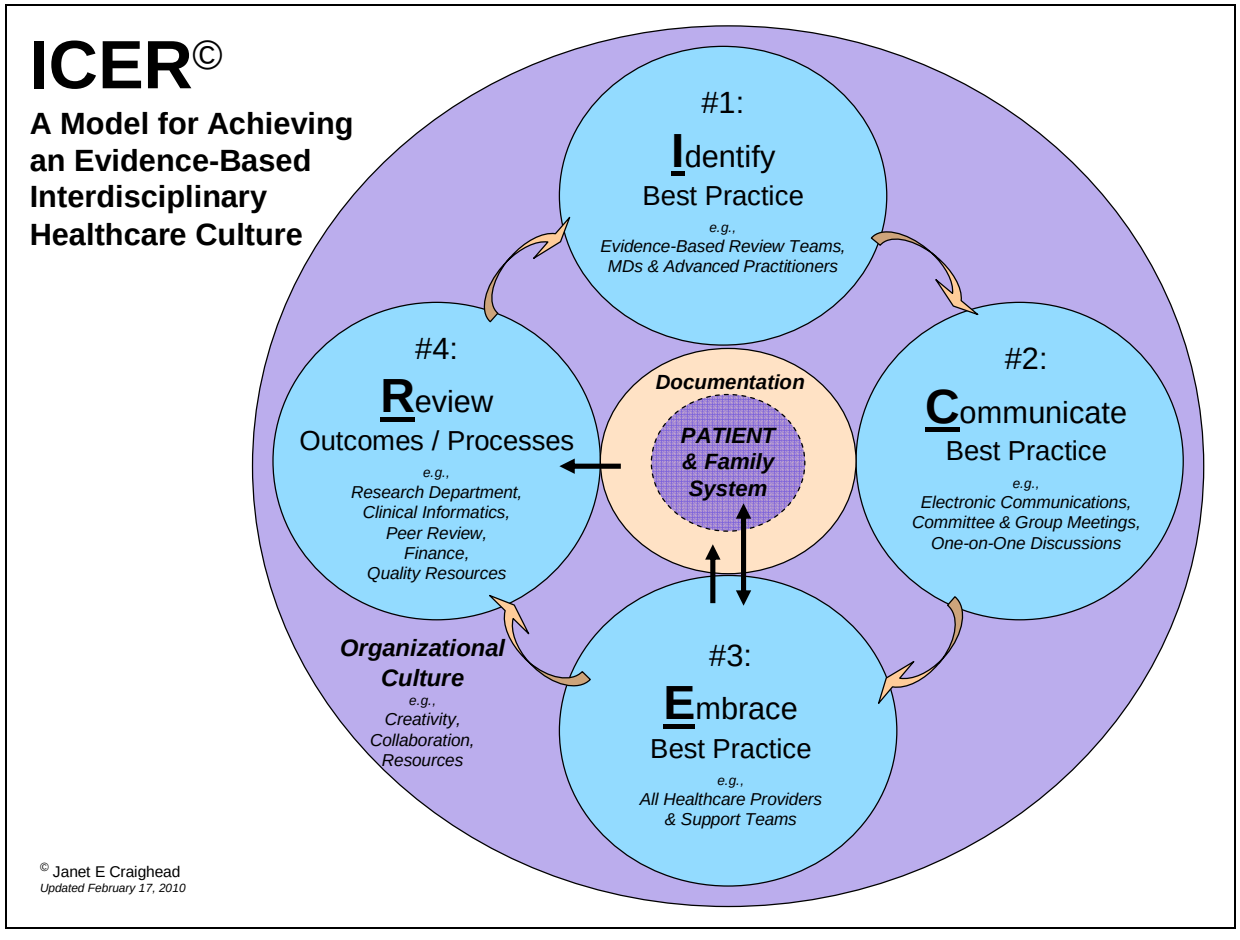


Figure 1. ICER Model for Achieving an Interdisciplinary Evidence-Based Healthcare Culture©

innovation and resources dedicated to, and the quality and efficiency of collaboration among the disciplines engaged in, planning, funding, delivering, and evaluating interventions and outcomes. Documentation of the care that is planned for and delivered to patients is entered by clinicians into the patient record in Step 3, and retrieved for evaluation purposes in Step 4.

I next describe in greater detail each of the seven primary components of the ICER Model©, but first add a comment about the application of other theories to this framework. Although ICER© behaviors are inherent in healthcare practice, labeling them in ICER© terms enhances their clarity and explicitness. Thus, researchers and clinicians can collaborate to identify and test the theoretical models that integrate with specific ICER© activities or concepts to achieve best outcomes for patients/families, clinicians, and the organization (e.g., National Cancer Institute, 2005). Accordingly, I embed a few examples of theoretical or clinical applications for the reader to consider in the following description of the ICER Model©.

Description of the ICER Model©. *ICER© Step 1: Identify best practice recommendations*. Practice recommendations are crafted using a variety of mechanisms: (a) original research and its replication or extension creates innovative practice recommendations, (b) systematic reviews synthesize topic-specific extant research into practice recommendations, and (c) guidelines proffer a set of interdisciplinary recommendations for treating patients with a specific diagnosis or undergoing a specific procedure. Procedures for developing practice recommendations are widely available (e.g., Houser & Bokovoy, 2006; Titler et al., 2001). Thus, it is not the intention of ICER's© Step 1 to specify these activities. Instead, healthcare organizations are encouraged to conduct a gap analysis of their current and desired level of commitment. Institutions may limit their participation to identifying and integrating best practice recommendations that have been developed by credible entities, engaging in systematic reviews that resolve local practice challenges (Chulay, 2006), or contributing more extensively by conducting research that is not only meaningful locally but also enlarges an existing body of evidence.

Little has been written, however, about the contribution that practice frustrations expressed by direct care providers can make to highlight topics that merit attention. Reframing recurring clinical challenges as opportunities for improvement is consistent with the lifelong learning dynamic and spirit of inquiry inherent in a thriving evidence-based culture. Yet, transforming frustrations into solutions requires an effective communication process between direct care providers and **I**dentify teams, that may begin as simply as enabling staff to submit a practice question to the organization's **I**dentify team (Poudre Valley Hospital Evidence-Based Practice Committee, 2008; Straus & Sackett, 1998). Practice frustrations and creative ideas for improving practice are evaluated and prioritized as part of Step 1 in the ICER Model©, but they can also originate within Step 4's **R**eview process.

ICER© Step 2: Communicate best practice recommendations. In order for recommendations to influence practice, they must be **C**ommunicated to end-users. Yet, as counterintuitive as it may seem, many healthcare organizations have no systematic communication process established. Further, receiving a communiqué does not necessarily ensure the recipient's understanding of the message. In fact, the contribution of poor communication to compromised outcomes (Lomas, 1997; Scherer & Jaunillo, 2003) highlights the necessity for healthcare organizations to evaluate their current communication mechanisms and determine if improvements can be achieved.

Although the ICER Model© does not specify which communication methods should be employed within healthcare organizations, it does emphasize that healthcare organizations must find a way to efficiently and reliably communicate among the ICER© teams. Hovland, Janis, and Kelley's (1953) seminal work offers a succinct formula with which healthcare organizations can plan the effective dissemination of EBP recommendations to care providers: (a) plan the message content, (b) target the audience, (c) select the channel or medium, and (d) identify the ideal message source. A large body of research is available for crafting an organizational communication plan using these categories. For example,:

> Nurses most frequently turn to human sources of information, such as context-specific interaction with colleagues around clinical issues (Benner et al., 1997; Thompson et al., 2001b). The results of this review suggest that interventions tapping into this pattern of source use are on solid ground, such as the incorporation of human knowledge sources (information resource personnel) into the practice setting (Milner et al., 2005, in press). Further, it would appear that interventions that maximize interactivity, sensitivity to the practice context and participation in design and decision-making around knowledge sources are more likely to succeed. (Spenceley, O'Leary, Chizawsky, Ross, & Estabrooks, 2008, p. 967)

Other creative ideas have been explored for reengineering traditional communication into a plan for continuous and multiple communication mechanisms (Walston & Kimberly, 1997). For example, one study found that clinical guideline recommendations rewritten in behaviorally-specified ''plain English'' led to stronger intentions to implement the guidelines, more positive attitudes towards them, greater perceived behavioral control over using them, and no difference in satisfaction or perceived comprehension (Michie & Lester, 2005).

A well-organized and resourceful plan of communication can be channeled using electronic technology, on which healthcare is becoming increasing reliant (e.g., Tate, Jackvony, & Wing, 2003; Walther, Pingree, Hawkins, & Buller, 2005). New practices can be electronically announced to practitioners; an e-mail reply or electronic tracking strategy used to confirm receipt of the announcement; and follow-up opportunities enabled for questions, clarification, and confirmation of comprehension between the clinician and a designated expert prior to and during the implementation of a new practice (Craighead, 2004). Advances in health information technology can also introduce electronic reminders and alerts into the communication system, and more specifically the electronic patient record, to facilitate greater accuracy and expediency into decision-making and the delivery of care.

ICER© Step 3: Embrace best practice recommendations. When best practice recommendations have been **I**dentified and **C**ommunicated to applicable clinicians, they can be integrated into patient care. The term embrace designates the influence of conscious choice on applying recommendations at the point of care and, further, connotes a higher level of involvement than an alternative term, engagement. Four categories of clinician response are

identified. First, best practice recommendations will be used, in most cases, at the point of care. Yet, Step 3 of the ICER Model© enables the essential individualization of evidence, or the person centeredness (Kitson, 2002), in healthcare practice. Thus, in some cases, integrating the patient's preferences and values into the plan of care may lead to the second category of response, omitting a specific portion of a practice recommendation set, or, third, even choosing no interventions whatsoever. Clinicians may also initiate these departures from standard or newly recommended practices that, based on their clinical expertise, may not be appropriate or even cause harm for a specific patient or situation. These three classifications of behaviors embody fitting **E**mbrace responses.

However, engagement with practice recommendations that are appropriate for a patient does not occur in all cases (e.g., Cabana et al., 1999; Ingham, Lewvinger, Graves, & Peckham, 1974; Moline et al., 2004). These inadvertent departures from the recommended plan of care, which represent the fourth category of clinician response, are troubling. A review of 235 studies reporting 309 comparisons of interventions designed to integrate guideline recommendations into the delivery of care found that the strategies generated varying degrees of efficiency under different circumstances (Grimshaw et al., 2004). One of the study conclusions was that the knowledge translation field within the nursing domain proffers few empirically based or tested interventions for disseminating and implementing practice guidelines. Yet, given that many organizations have not established a systematic mechanism for communication, Grimshaw et al.'s findings may have been influenced as much by varying degrees of **C**ommunication, or even by whether the communiqué reached all clinicians, as by whether clinicians chose or were able to **E**mbrace the recommendation. Therefore, the diverse literature addressing the efficiency and accuracy with which recommendations are integrated at the point of care delivery should be used to creatively influence future study designs. For example, the social psychology literature is replete with persuasion strategies (e.g., Chaiken, Wood, & Eagly, 1996), and the nursing

literature offers insights into the contextual implications of evidence implementation (e.g., McCormack et al., 2002).

Finally, this step of the ICER Model© emphasizes the interaction between clinicians and the patient record. As organizations shift to an electronic health record (EHR; United States Department of Health and Human Services, 2004), EHR screens and electronic alerts and reminders can be used to stimulate compliance with recommended practices. Further, by employing temporary EHR screens and tracking engagement with new practices, clinicians can monitor their own compliance during periods of transition until the practice is solidified.

ICER Step 4: Review outcomes. The statistical influence of communication and compliance on the relationship between practice recommendations (i.e., ICER© Step 1) and outcomes (i.e., ICER© Step 4) has not been overtly addressed in the professional literature. However, by accounting for variations or inadequacies in communication and compliance, greater accuracy in measuring the true relations between new evidence-based recommendations and the targeted outcomes can be achieved. By collaborating with all four ICER© teams, applied researchers can facilitate the measurement of communication and compliance, and quantify their influence on intervention-outcome relationships.

Four general categories of evaluation are available in the **R**eview Step. First, the review process is designed to evaluate whether a new practice recommendation is associated with superior outcomes in comparison to a former or current practice. This application requires planning, in that some measurement must occur at least twice: preceding and following the implementation of a new practice recommendation. The review process may conclude that the recommended practice generated an improvement, did not result in change, or worsened outcomes. These findings may either solidify a decision about the practice recommendation under review, which should be **C**ommunicated to clinicians; or compel additional **R**eview, achieved by forwarding an edited or follow-up practice question to Step 1 in the ICER© process.

Second, describing routine clinical practices and their associated outcomes in measurement terms has received little attention in the professional literature. However, these enumerations highlight relative weaknesses and strengths in a straightforward fashion, and their objectivity represents an intriguing opportunity to target and prioritize clinical issues that merit review. Descriptive statistics may be particularly useful when evaluated at a variety of levels, e.g., admitting diagnosis, hospital unit, facility within a system.

Third, EHR data repositories can be used to identify practices for which the incidence of noncompliance, either by clinicians and/or patients/families, is higher than average. The rationale for deciding to opt-out should be investigated, as the findings may inform a potential revision to the existing standard of care. Alternatively, the data repositories can be used to monitor and quantify the progress with which new recommendations are integrated into practice. Errors during practice transition can be evaluated to determine the cause of their breakdown (e.g., communication, compliance), thereby enabling the implementation of remediation strategies that are carefully targeted at a specific source.

Fourth, the large data sets available in EHR repositories enable opportunities to discover statistical models for predicting adverse events and complications. The statistical formulae generated from this type of research can be embedded in the live EHR, and their computations run upon a patient's admission to the hospital and at pivotal junctures during their hospital stay. These calculations can identify the patients at risk for complications or other adverse outcomes, and automate a prompt to the clinical team to initiate interventions designed to mitigate negative circumstances.

Health information technology and processes that are already well established in the healthcare industry offer to play an important and specific role in the **R**eview step of an evidence-based agenda. Quality improvement teams are adept at retrieving physiological outcomes data from the EHR's data repository, including information about patients' conditions, interventions, and patient responses. Finance teams can contribute billed and actual cost

information, and public relationships teams can forward patient satisfaction survey results (e.g., Avatar International Inc., *n.d.*), to the review team. Applied researchers can manage these data sets to simultaneously evaluate three categories of outcomes: physiological, psychodynamic, and cost-effectiveness. Clarifying how changes in one category may unintentionally but noticably influence the outcomes in another offers critical data to healthcare leaders for titrating quality outcomes and customer satisfaction with costs in an increasingly restrictive healthcare economy (Girion, 2009). A Midwestern hospital, for example, recently opened a five-bed outpatient Chest Pain Center designed to provide a comfortable and therapeutic environment for patients undergoing testing to determine the etiology of their chest pain (Dawson, Craighead, Finch, & Perske, 2010). Longitudinal analyses of the intervention and outcome measures recorded by the nursing staff identified that the Chest Pain Center offered sufficiently superior physiological outcomes to warrant the financial cost of maintaining the Center. Indeed, cost-benefit ratios established from describing intervention-outcome relationships provide meaningful data upon which to achieve a thriving evidence-based environment.

The review process also plays an important role in fostering a culture of inquiry and innovation. Clinicians should be encouraged to confront their own practice thoughtfully. These reflections can be articulated as a general question: “Are we providing the best care possible?” or crafted as a specific idea for improving the care delivered to patients. Levin (2008) described this dynamic as “noting a discrepancy between what our practice is and what we want it to be” (p. 7). These thoughtful reflections advanced courageously and respectfully can stimulate creative improvements in care and efficient processes required by a rapidly changing healthcare culture.

Patient- and family-centered core. Sackett’s (2004) editorial about revitalizing academic medicine suggested that inattention, greed, or simple incompetence have placed academic medicine in a “simply awful mess. ...The issue is that basic medical scientists have hijacked the granting bodies and have erected research policies that place greater value in

serving their own personal curiosities than in serving sick people" (p. 294). This insight from one of evidence-based medicine's strongest advocates underscores the importance of integrating a multidisciplinary perspective committed to serving patients and families. Indeed, at the core of the ICER Model© are the patient and family.

Any lingering debate about what constitutes best evidence, and its interplay with patient preferences and values as well as clinical expertise, is typically articulated within discussions about sources of evidence for crafting best practice recommendations (Closs & Cheater, 1999; Melnyk, Fineout-Overholt, Stillwell, & Williamson, 2009). However, patients' preferences and values and clinician expertise are distinctly unique from scientific findings; to force-fit autonomous patients' decisions into a categorization system designed to hierarchically rank levels of scientific rigor is perplexing. The ICER Model© circumvents this entanglement, and in straightforward fashion, specifies that best practice recommendations are crafted from objective evidence in Step 1 of the ICER Model©, and that Step 3 **E**mbrace is the point at which the patient's preferences and values and clinical expertise are introduced. Detailing the recommended plan of care to patients and their families creates a forum in which their interests and decisions are assimilated into an individual plan of care (Levin & Feldman, 2006). Bedside report is representative of the strategies being studied for achieving an informed plan of care in hospitalized patients (Craighead et al., 2012), in which the historic exchange of information between off-going and on-coming nurses at shift change is conducted at the bedside, thereby enabling patients and their families to understand, correct, and modify the plan of care. The ICER Model© incorporate the exchange of information, and the potential modifications to the standardized plan of care that are generated, with a double-headed arrow located between the patient/family and the clinician directly providing patient care in Step 3, **E**mbrace.

Documentation. Another noteworthy feature of ICER© is the documentation that constitutes a record of the patient's condition, the care that is planned by clinicians and support teams, the modifications made to that plan by the patient and family system, and the patient's

responses to the treatments and care actually delivered. The ICER Model© represents this required documentation by placing a single-headed arrow from the **E**mbrace Step to the patient record.

Three points related to documentation in an EHR merit elaboration. First, the historic challenge of balancing documentation sufficiency and accuracy with efficiency persists in an era of transition from paper documentation to an EHR. Some health systems have shifted from a policy of documenting all relevant details to using some variation of streamlined charting (Kerr, 1992), in which adherence to predefined assessment and intervention norms is assumed, and exceptions to those norms are charted (Wroblewski, Werrbach, & Gattuso, 1999). Whether using traditional or streamlined charting, exceptions should be overtly noted, and the rationale for each exception clearly articulated. Tracking the frequency of and rationale for exceptions creates a rich opportunity to identify specific practices that merit inspection and reconsideration. Further, exceptions without an associated rationale are categorized as clinician nonengagement with the established norms. Second, as clinicians increasingly engage with the EHR, electronic reminders and alerts can also be integrated to facilitate greater accuracy and expediency in decision making and the delivery of care. Third, an EHR offers tremendous potential to retrieve more efficiently the data necessary for evaluating intervention-outcome relations. The ICER Model© represents evaluation activities by placing an arrow from the patient record to the **R**eview Step.

Organizational context and culture. The importance of achieving a culture of lifelong inquiry and innovation cannot be overemphasized, but it is also fraught with complexity.

> Health-care research [about diffusion and research utilization] continues to conceptualize the implementation stage as a point when discreet interventions such as continuous medical education… clinical guidelines, and opinion leaders can be used to embrace the uptake of the innovation. There is scant acknowledgement of the complex interactions, interdependencies, power struggles, and general confusion that characterize most clinical settings. (Kitson, 1999, p. 18).

Further, being satisfied with single-loop learning, i.e., detecting and correcting system or performance errors, precludes the double-loop learning, i.e., redefining organizational goals, norms, policies, and structures (Argyris, 1976) required to innovate. "Perhaps a mature organization is one where professionals and patients learn together and where systems and processes are not set up by one constituency on behalf of the other, but where activities are jointly undertaken" (Kitson, 2002, p. 184).

Although the ICER© steps designate stand-alone behaviors or processes, each step represents an influence from or on the successful completion of adjacent steps. For example, best practice recommendations are created in Step 1, but improving patient outcomes (i.e., Step 4) requires that clinicians change their practice (i.e., Step 3); yet, complying with recommendations (i.e., Step 3) requires that clinicians be informed of the new guidelines (i.e., Step 2). Further, each ICER© step represents an influence from or on the quality of collaboration inherent in the organizational culture. Although physicians and nurses coordinate many details in caring for patients, employees from many other disciplines also play an essential role in delivering the full spectrum of care that will achieve the best outcomes possible for the patient. For example, dietary services lays a foundation of healthy nutrition necessary for reversing and preventing new heart vessel damage, and housekeeping services plays an integral role in maintaining a protective environment for immunocompromised patients. As well, the organization's fiscal resources influence limitations on the length of time that nutritionists and housekeepers can interact with the patient or the patient's environment.

To illustrate the range of disciplines routinely interacting with or on behalf of a patient, just follow a planned admission: admitting clerks record demographics and billing information; physician providers develop a plan of care and write orders; RNs retrieve a medical history and physical assessment of the patient that is used to individualize the plan of care; this care is then delivered by pharmacists, respiratory therapist, nutritionists, the IV team, pain management specialists, infection control, rehabilitation services, wound and skin care specialists,

housekeepers, maintenance crews, and so on. Behind these front-line staff are additional support teams that include human resources, finance, information technology, telecommunications, senior management, purchasing services, and so on.

Achieving best processes and outcomes for patients, providers, and healthcare systems requires intricate collaboration to effectively and efficiently influence an evidence-based culture (Baumbush, et al., 2008; Kresse, Kuklinski, & Cacchione, 2007; Spring et al., 2005). Thus, the ICER Model© underscores the importance of a coordinated intradisciplinary, interdisciplinary, and organizational team approach to achieving an evidence-based culture. Achieving a collaborative environment requires that each member of the healthcare team understands the importance of his/her individual contribution to organizational outcomes. More specifically, each team member must be able to locate his or her personal participation with the evidence-based agenda within the ICER Model© blueprint for his/her own discipline, and also understand how the contributions made by his/her team influence and synergize the organizational blueprint. For example, bedside RNs on a Surgical Unit who locate themselves within the **C**ommunicate and **E**mbrace Steps of the ICER Model© must: know how they will receive notification of best practice recommendations; agree to communicate with a designated expert to clarify their understanding about the recommendation; and make a commitment to implement this recommendation into their practice and notify their designated contact if they experience difficulties or adverse outcomes from this new practice. These RNs should also understand the link between their behaviors and the outcome improvements targeted, and be apprised of these outcome measures as the new practice recommendation is solidified.

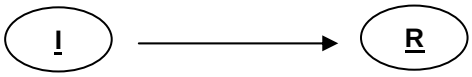
Summary. The ICER Model for Achieving an Evidence-Based Healthcare Culture© incorporates important literature-based and innovative recommendations into a practical, clinically relevant step-by-step process for achieving an EBHC. Points of distinction from other models include: (a) solidifying an emphasis on if and how best practices influence outcomes, and expanding these measures beyond an emphasis on physiological outcomes to include cost

and psychodynamic (e.g., customer feedback) evaluations whenever possible; (b) dichotomizing research translation into the communication of and compliance with practice recommendations; (c) modifying the historic assumption of EBP as an individual responsibility to an intradisciplinary team approach specifying the ICER© Step(s) to which each individual will contribute; (d) recrafting the emphasis from evidence-based practice to an evidence-based healthcare agenda, underscoring the importance of interdisciplinary collaboration and the incorporation of the patient and family perspectives; and (e) a recognition of the benefits and limitations of the patient record on the reliability of assessing relationships between and among ICER© behaviors.

The increased specificity of the ICER Model© addresses the historic dilemma over the contribution of research evidence, clinical expertise, and patients' preferences to evidence-based clinical decisions by locating research evidence within the **I**dentify step, and clinical expertise and patient's preferences within the decision-making process (e.g., Satterfield et al., 2009) of the **E**mbrace step. Further, individual clinicians can select the evidence-based teams with which they feel they are most capable of, and will enjoy, making a personal contribution to an EBHC. The contributions of individuals working within a common ICER© Step can be coordinated to efficiently and accurately achieve the team objectives. Further, by describing and measuring physiological, customer satisfaction, and/or cost outcomes, and by measuring those same outcomes following the release of practice recommendation, improvements associated with practice change can be quantified. Additionally, by measuring the adequacy of the communication (i.e., Step 2) and compliance processes (i.e., Step 3), the relationship between practice recommendations (i.e., Step 1) and outcomes (i.e., Step 4) can account for the variance attributable to inadequacies in the communication of and compliance with new recommendations, generating a more accurate representation of the true relationship between new evidence-based recommendations and the targeted outcomes. Finally, the ICER Model© recognizes that essential processes are influenced by organizational culture, which includes the

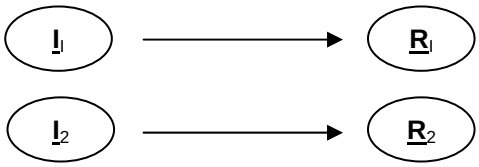
quality of intra- and interdisciplinary collaboration within, and the allocation of tangible resources to, the EBHC endeavor.

Structural and measurement models. ***Relations between practice recommendations and outcomes***. Current EBP models that include an evaluative component typically consider the relation between a practice recommendation and its outcome. This concept is modeled structurally in Figure 2. Outcome improvements associated with a practice change recommendations are evaluated by measuring outcomes associated with current practice and those following the recommended change in practice, and then by comparing these outcomes. Comparative outcome assessments are modeled structurally in Figure 3. A



Codes: ***I*** *= Practice recommendation* ***I****dentified*
R *= Relevant outcome(s)* ***R****eviewed*
→ *= Statistical relationship between*

Figure 2. The Influence of Best Practice Recommendations on Outcomes



Codes: $\underline{I}_1$ *= Recommendation associated with practice #1, i.e., current practice recommendation*
$\underline{R}_1$ *= Relevant outcome(s) associated with practice #1*
→ *= Statistical relationship between*
$\underline{I}_2$ *= Recommendation associated with practice #2, i.e., new practice recommendation*
$\underline{R}_2$ *= Relevant outcome(s) associated with practice #2*

Figure 3. Outcome Differences Associated with Practice Changes

determination of “improvement” may rely on the expert opinion of clinical teams, or in other cases, may be evaluated statistically. For example, these evaluations might specify the following null and alternative hypotheses:

$$H_O : \underline{\mathbf{R}}_1 = \underline{\mathbf{R}}_2 ,$$

and

$$H_A : \underline{\mathbf{R}}_1 < \underline{\mathbf{R}}_2$$

where $\underline{\mathbf{R}}_1$ is the outcomes associated with current practice and $\underline{\mathbf{R}}_2$ is the outcome associated with a new practice. This hypothesis might, for example, be evaluated using a *t*-test or *chi*-square analysis. Note that **R** is underscored and in bold font to distinguish it from the statistical symbol R, which represents a correlation coefficient, or R^2, which represents the percentage of variance accounted for by predictors.

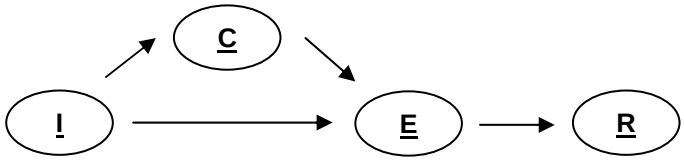
Evaluation of current outcomes and outcome improvements typically assume that $\underline{\mathbf{R}}_1$ is associated solely with $\underline{\mathbf{I}}_1$, i.e., Practice #1; and that $\underline{\mathbf{R}}_2$ is associated solely with $\underline{\mathbf{I}}_2$, i.e., Practice #2. However, current practice is typically not uniform, and previous research has documented that clinicians do not uniformly **E**mbrace recommended practice changes. Yet, little attention is routinely allocated in healthcare organizations to measuring the practices that are actually employed by clinicians. In fact, outcome assessments following the release of a practice recommendation $\underline{\mathbf{R}}_2$ may actually be associated with $\underline{\mathbf{I}}_1$, $\underline{\mathbf{I}}_2$, or even $\underline{\mathbf{I}}_3$, an unidentified practice used by a clinician. Accordingly, current intervention-outcome assessments are likely to incur measurement error resulting from clinician noncompliance and other causes of practice variation.

Influence of Communication and Engagement on the relation between practice recommendations and outcomes. The ICER Model© recognizes the essential influence of communication and compliance on intervention-outcome relationships. By measuring the **E**mbrace step, outcome assessments can be linked to the actual, not the assumed, practices of

clinicians (Donaldson, Rutledge, & Ashley, 2004). This is achieved by reclassifying variations in actual clinician practice to accurately represent whether the clinician used Practice 1 (i.e., current practice), Practice 2 (i.e., the newly recommended practice), or Practice 3 (i.e., some other practice). This specificity enables an accurate and objective mechanism for identifying best practices, i.e., practices associated with the best outcomes.

The ICER Model© also highlights that clinicians can embrace new practices only in conditions where they have been informed about and fully understand the recommendation. For example, when conveying a new practice technique to RNs about inserting IVs in patients, nurses' units can be randomly assigned to receive this communiqué either electronically or by poster display, and the speed and thoroughness of practice change can be compared across units. In this case, a streamlined portion of the ICER Model© is used as a foundation for the hypothesis testing. That is, the outcome of interest in this example is **E**mbrace, and the differences in **E** associated with two different **C**ommunication methods can be tested statistically.

The structural model for assessing the relations among the ICER© concepts is presented in Figure 4, and a graphical display is presented in Figure 5. The statistical technique selected



Codes: ***I*** *= Practice recommendation **I**dentified*
C *= **C**ommunication of practice recommendation*
E *= Practice recommendation **E**mbraced by clinician*
R *= Relevant outcome(s) **R**eviewed*
→ *= Statistical relationship between*

Figure 4. Influence of **C**ommunication and/or **E**mbrace on the **I**dentify-**R**eview Relation

for assessing these relationships is a regression analysis. The full ICER Model© regression formula proposed in this study is:

$$Y_{\underline{R}}' = a + b_{\underline{I}}X_{\underline{I}} + b_{\underline{C}}X_{\underline{C}} + b_{\underline{E}}X_{\underline{E}}$$

where $Y_{\underline{R}}'$ is the predicted outcome; a is the intercept; $b_{\underline{I}}$ is the slope associated with $X_{\underline{I}}$, which are the practice options that influence the outcome under review; $b_{\underline{C}}$ is the slope associated with $X_{\underline{C}}$, which is the communication of the practice recommendation; and $b_{\underline{E}}$ is the slope associated with $X_{\underline{E}}$, which is clinician engagement with the practice recommendation.

Recognizing that outcomes are influenced by the practices actually delivered by clinicians, and not necessarily by the practices recommended for use, an alternate, and simpler, ICER Model© regression formula is proposed for measuring outcomes associated with practice:

$$Y_{\underline{R}}' = a + b_{\underline{E}}X_{\underline{E}}$$

where $Y_{\underline{R}}'$ is the outcome predicted; a is the intercept; and $b_{\underline{E}}$ is the slope associated with $X_{\underline{E}}$, which is the practice recommendation actually embraced by the clinician. Future research should compare the alternate model to the full regression model by evaluating the change in R^2 as each predictor used in the full model is systematically and hierarchically integrated into the alternate model.

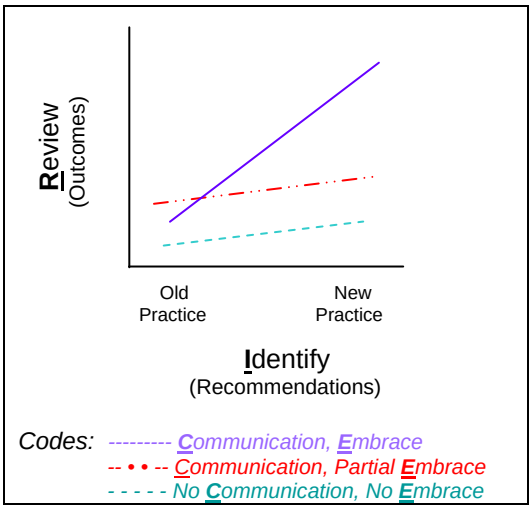


Figure 5. **C**ommunication and/or **E**mbrace Moderates the **I**dentify-**R**eview Relation

As an alternative to streamlining the portions of the ICER Model© being evaluated, the statistical model can be expanded to include additional variables. These demographics include, for instance, discipline (e.g., medicine, nursing, pharmacy, finance, and senior management), role (e.g., staff RN, unit RN manager, and department RN manager) and unit or specialty designations (e.g., medicine, general surgery, orthopedics, and neurology). Additional predictor variables can be evaluated with a variety of techniques, including their integration into the regression formula.

Further, although physiological outcomes are commonly targeted in healthcare evaluations, other important assessments include financial and psychodynamic (e.g., clinician and patient/family satisfaction) outcomes. These measurements are symbolized as:

$$Y_{\underline{\mathbf{R}}Phy},\ Y_{\underline{\mathbf{R}}F},\ \text{and}\ Y_{\underline{\mathbf{R}}Pd},$$

where $Y_{\underline{\mathbf{R}}Phy}$ is a physiological outcome, $Y_{\underline{\mathbf{R}}F}$ is a financial outcome, $Y_{\underline{\mathbf{R}}Pd}$, is a psychodynamic outcome (e.g., clinician satisfaction, patient/family satisfaction). In fact, quantifying these additional outcomes simultaneously can help managers maximize the titration of resource allocation with best outcomes.

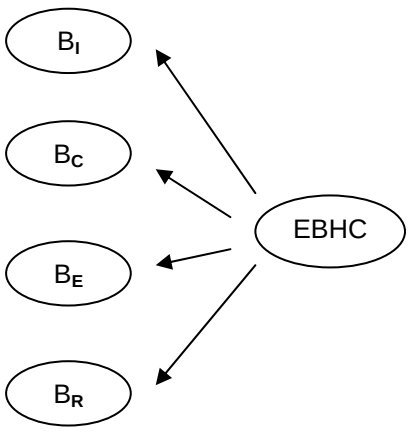
The ICER Model© as a foundation for measuring an evidence-based culture. An additional ICER© model merits presentation. If the study objectives include assessing the influence of the **R**eview process (e.g., the quality and/or quantity of resources) on outcomes, an alternate ICER© regression model is:

$$Y_O = a + b_{\underline{I}}X_{\underline{I}} + b_{\underline{C}}X_{\underline{C}} + b_{\underline{E}}X_{\underline{E}} + b_{\underline{R}}X_{\underline{R}}$$

where Y_O is the outcome under review, a is the intercept, $b_{\underline{I}}$ is the slope associated with $X_{\underline{I}}$, $X_{\underline{I}}$ is the practice recommendation intended to influence the outcome under review, $b_{\underline{C}}$ is the slope associated with $X_{\underline{C}}$, $X_{\underline{C}}$ is the communication of the practice recommendation, $b_{\underline{E}}$ is the slope associated with $X_{\underline{E}}$, $X_{\underline{E}}$ is the engagement with the practice recommendation, $b_{\underline{R}}$ is the slope associated with $X_{\underline{R}}$, and $X_{\underline{R}}$ is the review process and measurement of the targeted outcomes.

Heretofore, each of the ICER Model© steps has been configured as essential behaviors or processes. Collective behaviors may certainly be used to represent an organization's commitment to the evidence-based agenda, yet they do not address the underlying motivations for and influences on behavior and on behavior change. Although previous research has explored the facilitators and barriers to EBP, no scales have been developed for measuring an evidence-based culture. Indeed, additional evaluation of the variables predictive of behavior and behavior change associated with an evidence-based culture is warranted.

The final ICER© regression model presented above establishes a foundation upon which an evidence-based culture measure can be conceptualized. This regression model, recrafted into the vertically-aligned structural model presented in Figure 6, creates a foundation for the measurement of an ICER Model© evidence-based culture. I next propose this culture measure, and integrate structural equation modeling as a measurement approach.



Codes: B_I = *Behaviors associated with **I**dentifying best practice recommendations*
B_C = *Behaviors associated with **C**ommunicating best practice recommendations*
B_E = *Behaviors associated with **E**mbracing best practice recommendations*
B_R = *Behaviors associated with **R**eviewing outcomes associated w/ best practice recommendations*
*EBHC = Behaviors associated with **I**dentifying best practice recommendations*
→ = *Statistical relationship between*

Figure 6. Measuring an Evidence-Based Healthcare Culture Using ICER Model© Constructs

The ICER Model Measurement of an Evidence-Based Nursing Culture©

The magnitude of emphasis on EBP within the healthcare industry is articulated in the Institute of Medicine's (IOM, 2008) agenda that "by 2020, ninety percent of clinical decisions will be supported by accurate, timely, and up-to-date clinical information, and will reflect the best available evidence" (p. iv). Models have been created for achieving evidence-based practice or the utilization of research (see Table 1), and EBP scales have been developed for measuring specific aspects of the EBP quest and/or the efficacy of interventions designed to enhance this quest (see Table 2).

Despite these advances, the EBP agenda continues to suffer from several serious limitations. Although the Institute of Medicine (2008) agenda calls for measures to be "developed to track and stimulate progress" (p. iv) in achieving their evidence-based healthcare agenda, much of the EBP measurement emphasis has focused narrowly on evaluating the effects of educational interventions (e.g., Sherriff, Wallis, & Chaboyer, 2007). Even then, the reliability and validity of measures merit greater rigor in the future. In a review of the psychometric characteristics of 104 EBP education instruments, content validity had been assessed in only 17 of the scales, internal consistency in only 13, "discriminative" validity in 10, and criterion validity in 7; three or more types of validity had been established for only 11 of the scales (Shaneyfelt et al., 2006).

Although EBP has benefited in recent years from the healthy influx of clinically relevant studies, the movement has a weak history of using theory to guide research (Eccles et al., 2005; Estabrooks, 2007b; Estabrooks et al., 2006). Oxman, Sackett, Chalmers, and Prescott's (2005) humorous "surrealistic mega-analysis of disorganization theories" (p. 563) highlights this pressing need for theory-based research.

Finally, although an evidence-based healthcare agenda is larger than a research utilization agenda, which is larger than an evidence-based practice agenda, missing from many organizations' EBP blueprints are the strategies and resources for coordinating an intra- and

interdisciplinary effort that will systematically achieve the best outcomes possible (Clancy & Cronin, 2005). In fact, no consensus exists for how organizations can achieve an evidence-based culture (Rycroft-Malone, Harvey et al., 2004). The need for a systems approach to achieving an EBHC is appealing (Clancy & Cronin, 2005), particularly in an increasingly restrictive healthcare economy (Girion, 2009). Titler et al. (2007) proposed that measuring a common set of concepts may help to uncover why evidence-based performance measures of some agencies are better than others. Although no scales have yet been developed that are sufficiently comprehensive to measure an evidence-based culture, emerging collaborations between researchers and practitioners (Baumbusch et al., 2008; Ravert & Merrill, 2008; Spring et al., 2005) across disciplines (e.g., Rycroft-Malone, 2007; Titler, 2008) offer great potential to this agenda.

The ICER Model© represents a solid foundation upon which an accurate and efficient measurement of an evidence-based culture can be built. The ICER© framework identifies four essential processes designed to achieve best practices and outcomes for the patient/family and healthcare organization, and overtly recognizes the important influence of organizational culture on these dynamics. Theoretical models from other disciplines have proposed specific constructs and variables with which evidence-based behaviors, outcomes, and organizational culture can be predicted (e.g., Michie et al., 2005). By integrating these concepts into the ICER© framework, the specificity with which an EBHC can be measured is increased. Indeed, this research study will establish a scale for measuring an evidence-based nursing culture. I modify Ajzen and Fishbein's Theory of Planned Behavior (Ajzen & Manstead, 2007), in which attitudes, subjective norms, and perceived behavioral controls are used to predict behavioral intentions and/or behaviors, into a measure that uses attitudes, knowledge, social norms, and organizational controls to predict the behaviors specified in each of the ICER Model© steps. However, before presenting the model for this evidence-based nursing culture measure, I review several theoretical models and a sampling of the empirical research from the

Table 2. *EBP Scales Summarized in TBP Constructs*

Measure Title, Author(s), *Journal or Targeted Group*	**Predictors**				**Outcomes**	**Additional Details about the Scale**
	Attitudes *Intrapersonal*	**Knowledge** *Intrapersonal*	**Subjective Norms** *Interpersonal*	**Organizational Controls**	**Behaviors**	
ICER© EBNP Culture Craighead *Nursing departments within healthcare organizations & systems; Poudre Valley Health System, CO*	• Attitudes	•	• Norms	• OCs o $s / Time o Innovation & creativity o Interdis-ciplinary collabora-tion	• To be evaluated in future applications of the scale	• Content validity TBD • Discriminant validity TBD • Psychometric assessment TBD • Structural equation modeling assessment
Predictors of research utilization **Champion & Leach** (1986) *Nursing*	• Attitudes			• Support • Availability	• Research use	• Cronbach's alpha for support 0.57, availability 0.75, and attitudes 0.94 • n = 58 • Nurses at large university hospital
Predictors of research utilization **Champion & Leach** (1989) *Nursing*	• Attitudes			• Support • Availability	• Research use	• 46-item scale • n = 59 nurses at community hospital • Accounted for 42% of the variance in research use by assessing support, attitude and availability • Positive attitudes, availability, and support from peers & administrators were positively associated with research use
Measurement of Knowledge, Cognitions, & Behaviors associated with Systematic Review Education **Craighead et al.** (2007)	• Attitudes	• Knowledge			• Behaviors	• 28-item scale; Cronbach's alpha = .92 • n = 13 nurses at community hospital; *n* = 70 comparison nurses • Improvements in EBP cognitions were sustained for at least 10 weeks; $F(1,18)=8.03$, $p=.011$, partial $\eta^2=.31$ • Non-significant improvements in behaviors following education merit additional longitudinal evaluation
Measurement of Attitudes Supporting an EBNP Culture **Craighead** (2008)	• EBP Attitudes					• 9 item stems using 6-point Likert scale • Psychometric analysis • 1-factor model used 5 items: RMSEA=0.18, $m_C=0.92$, $\alpha=.91$, discrepancy= 0.17 • 2-factor model used 7 items: RMSEA=0.12, $m_C=0.92$, $\Phi_{1,2}=.51$, discrepancy= 0.16

Note. OC = Organizational controls

Table 2 (Continued). *EBP Scales Summarized in TBP Constructs*

Measure Title, Author(s), *Journal or Targeted Group*	**Predictors**				**Outcomes**	**Additional Details about the Scale**
	Attitudes *Intrapersonal*	**Knowledge** *Intrapersonal*	**Subjective Norms** *Interpersonal*	**Organizational Controls**	**Behaviors**	
The BARRIERS to Research Utilization Funk et al. (1991a) *Nursing*					• Research use	• Respondents *n*=1,948 • Factor analysis predicting use of research using 4 factors o Adopter characteristics o Organization characteristics o Innovation characteristics o Communication characteristics
Assess Undergrad EBP Teaching & Learning **Johnston et al.** (2003) *Medical Education*	• Attitudes toward EBP o 6-point Likert scale	• Knowledge of EBP 6-point Likert scale			• Practice of EBP o 6-point Likert scale • Actual use of EBP o Open-ended & multiple choice responses	• Also measured *Behavioral Intention*, i.e., Future use of EBP o 6-point Likert scale about willingness, usefulness, or frequency
Evaluation of Intervention for Implementing EBP **Mott, Nolan, Zarb, Arnison, Chan, Codner . . . Glanfield** (2005) *Nursing*		• Knowledge of EBP 6-point Likert scale				• 5 question survey; 3 questions had two parts • Respondents *n*=229 • 5-item survey tool • Descriptive statistics
EBP Supports & Barriers **Nagy, Lumby, McKinley, & Macfarlane** (2001) *International J of Nursing Practice*	• Belief in the value of EBP for patient care • Clinical usefulness of research	• Skills in locating & evaluating research reports • Knowledge of research language & statistics		• Availability of support to develop EBP • Time to devote to EBP		• Self-report questionnaire;32 items using 1-5 Likert scale • Respondents *n*=816 (response rate of 65%) • Principal axis factor analysis identified 7 factors, 6 of which were significant (i.e., factor loading $\geq$ 0.4)

Table 2 (Continued). *EBP Scales Summarized in TBP Constructs*

Measure Title, Author(s), *Journal or Targeted Group*	**Predictors**				**Outcomes**	**Additional Details about the Scale**
	Attitudes *Intrapersonal*	**Knowledge** *Intrapersonal*	**Subjective Norms** *Interpersonal*	**Organizational Controls**	**Behaviors**	
Readiness of US Nurses for EBP **Pravikoff et al.** (2005) *US Nursing*						• 93-item questionnaire • Content validity "established" by experts in nursing, nursing informatics, and information science
Effectiveness of EBP Teaching **Taylor, Reeves, Mears, Keast, Binns, Ewings, & Khan** (2001) *Medical Education*	• Attitude (A) o 14 item stems o 5-point Likert scale from strongly disagree to strongly agree	• Knowledge (K) o 11 item stems o True, false, don't know				• Content validity: 20 health care professionals with varying EBP experience reviewed questions • Discriminant validity: Novice vs expert score differences K p<.001, A p<.001 • Internal consistency: Cronbach's alpha K=.72, A=.64; Spearman's corr. coeff. K=.12, A=.66 • Responsiveness (sensitivity): pre-post education comparisons K p=.001, A p=.026 • Sample sizes of 4 groups completing questionnaire n=152 (50+12+57+33)
EBP Questionnaire (EBPQ) **Upton & Upton** (2006) *Methodological Issues in Nursing Research*	• Attitudes toward EBP	• Knowledge of EBP / Skills associated with EBP			• Practice of EBP (i.e., behaviors)	• Self-report questionnaire; 24 items using 1-7 Likert scale • Principal components analysis w/ oblique rotation yielded 3 factors • Kaiser-Meyer-Okin score of 0.861 (p<.001) • Total R^2=.62 o Practice: R^2=.33, Eigenvalue 3.97, Pearson's r with total score 0.71 o Attitude: R^2=.17, Eigenvalue 2.05, Pearson's r with total score 0.95 o Knowledge: R^2=.12, Eigenvalue 1.40, Pearson's r with total score 0.54

professional literature that support my selection of the Theory of Planned Behavior.

Theories Relevant to the Measurement of an Evidence-Based Healthcare Culture

A plethora of theories offer supportive frameworks for identifying behavioral predictors and strategies that influence evidence-based practice change and outcome improvements. One pertinent theoretical perspective is the Innovation-Diffusion Theory, which examines the adoption of innovative practices. Rogers (2003) proposed positioning recommendations in the best possible light to enhance their appeal. He identified five key evaluations of benefit that seem fitting for diffusing practice recommendations: (a) relative advantange, i.e., superiority of the recommendation relative to current practice; (b) recommendation compatibility with the staff; (c) complexity or ease of switching practices; (d) trialability; and (e) observability of benefits. Titler et al.'s (2001) Translation Research Model for the nursing profession posed a variation of Rogers' diffusion of innovations model to provide a framework in which adoption of EBPs could be tested (Titler, 2008).

However, Greenhalgh, Robert, Macfarlane, Bate, and Kyriakidou (2004) pointed out that most of the research based on diffusion theory has focused on the individual and on diffusion by simple imitation. They cautioned that diffusion theory needs to be tested more rigorously in service organizations where teams, nursing units or departments, and entire organizations – not individuals – are the appropriate unit of adoption and, in parallel, the targeted unit of analysis; and where change is planned and managed – not self-organized and emergent. Further, Kitson (1999) pointed out that "little connection has been made between the role of the change agent…, the opinion leader or research champion, and the implementation process" (p. 17-18). She went on to state that:

> The growing acknowledgement of wider contextual issues, in turn, changes the emphasis on the nature and role of the change agent within diffusion research or research utilization. Classically, the change agent has been described as an individual who influences clients' innovation decisions in a direction deemed desirable by the change agent. The role has been instrumental insofar as it has worked with individuals to identify a need, provide information, diagnose the problems, and work with the client on achieving the change. There is no explicit reference to the change agent developing

> improved self-management, self-awareness, decision-making, problem-solving, or reflective skills in the client, thus leading one to deduce that instrumentally the relationship is about completing a task and then retreating. (p. 19)

The concerns-based adoptions model (CBAM) is also relevant to the discussion of understanding how clinicians change, and emphasizes the conditions under which innovations will succeed. The concerns of individuals facing change are purported to reflect their stage in the adoption process (Van den Berg & Ros, 1999). CBAM measures (e.g., Cheung, Hattie, & Ng, 2001) can be used to locate individuals within adoption stages, and help to explain why evidence-based recommendations are adopted or not.

Prochaska and DiClemente's Transtheoretical Model (1992; Prochaska, Prochaska, & Levesque, 2001), also known as the Stages of Change model, is applicable to individual and organizational change. This model, which focuses on intentional change, defines five stages of change: (a) precontemplation, or no intention of taking action within six months; (b) contemplation, or action intended within six months; (c) preparation, or preparing for action within thirty days; (d) action, or behavior change for less than six months; and (e) maintenance, or behavior that has been changed for more than six months.

The Health Belief Model (National Cancer Institute, 2005), with health motivation as its primary focus, offers implications for addressing concerning or risky behaviors. By proposing change strategies for six concepts, this model seems suitable for addressing the challenges of fostering compliance with EBP recommendations: (a) perceived susceptibility to the issue, (b) perceived severity of consequences, (c) perceived benefits of compliance, (d) perceived barriers, (e) exposure to cues that prompt action, and (f) confidence in one's ability to perform the recommendation.

Social influence theory purports that an individual's attitudes, beliefs, and behaviors are influenced by others. Deutsch and Gerard (1955), for example, identified two forces that can prompt conformity. The first, normative social influence, is founded in concern for social image, and can be positively (e.g., gain acceptance, stay in people's good graces) or negatively

motivated (e.g., avoid rejection). Informational social influence, on the other hand, is founded in the desire to have accurate beliefs about reality, which may be swayed by thinking that the majority knows more than the self. Social influence strategies can be matched to the targeted audience in an effort to influence change.

Ajzen and Fishbein's Theory of Reasoned Action (Ajzen & Albarracin, 2007) falls into the framework called social cognition. This model predicts premeditated behaviors with attitudes, subjective norms, and intentions. The theory's sequel, the Theory of Planned Behavior (TPB; Ajzen & Manstead, 2007), was developed to use attitudes, subjective norms, and perceived behavioral controls to predict behavioral intentions, which is used to predict planned behaviors. Revisions included recognizing that actual behavioral controls influence the relation between perceived control and behavior relative to the direct influence of perceived controls on behavior.

Studies Documenting the Suitability of the Theory of Planned Behavior

Theories applicable for measuring an EBHC are abundant. However, the challenges in achieving a research-based practice are complex and dynamic (Kitson, 2007). Correspondingly, a robust measurement model must have sufficient specificity to evaluate multifaceted influences – e.g., attitudes, knowledge, and tangible resources – on the practices and/or outcomes sought in an EBHC. The TPB seems particularly well suited for the measurement of an EBHC. Ajzen and Fishbein's theories have been used in hundreds of studies, including many that have been conducted within the healthcare domain (e.g., Levin, 1999; Swaim, Perrine, & Aloise-Young, 2007; Young, Lierman, Powell-Cope, Kasprzyk, & Benoliel, 1991). Further, studies predicting the use of research in nursing practice have repeatedly tapped into constructs similar to those specified in the TBP. For example, Funk's (*n.d.*; Funk et al., 1991a) well-known "BARRIERS" and other measures from Sherriff, Wallis, and Chaboyer (2007) and Upton and Upton (2006) are designed to assess attitudes and resources (i.e., behavioral controls) associated with an EBHC. Champion and Leach (1986)

found that nurses with positive attitudes toward research were more likely to use research in practice. In mapping research utilization (i.e., EBP behaviors), Estabrooks (1999) included individual determinants that appear to approximate attitudes, organizational determinants that approximate subjective norms, and other variables that exemplify OBC's. Several examples of scales that have measured EBP predictors and outcomes are summarized in TBP constructs in Table 2.

Grol and Wensing (2004) reviewed theories and models of change that apply to individual professionals, the social context, and the organizational and economic environment. They categorized individual determinants of change as cognitive, educational, attitudinal, and motivational; social context determinants as social learning, social network and influence, patient influence, and leadership; and organizational and economic context determinants as innovativeness of the organization, and quality management which included culture, complexity, organizational learning, and economic factors. Although the authors described these theories using a two-factor approach by combining social and organizational factors into a common factor, their original three categories into which change theories were sorted resemble the three predictors of behavior identified in the TPB – attitudes, subjective norms, and behavioral controls. Kresse et al. (2007) emphasized the contribution of organizational culture, or climate for change, to practice change, citing variables affecting adoption that are reflected in the TBP behavioral predictors. Graham et al. (2006) suggested that the implications of knowledge translation for continuing education in the health professions include the need to base education on the best available knowledge, the use of educational and other transfer strategies that are known to be effective, and the value of learning about planned action theories to be better able to understand and influence change in practice settings. Another study found that knowledge acquired from educational interventions does not always generate evidence-based behavior change (Watson et al., 2006). Using the Theory of Planned Behavior as the theoretical basis for their study, the authors concluded that existing attitudes and intentions, in some cases, were

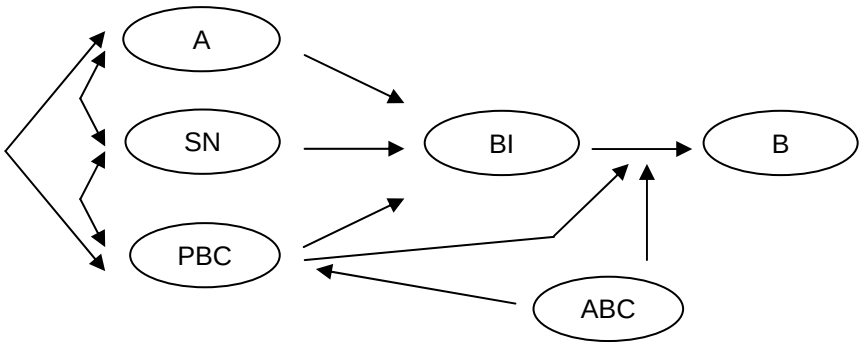
more predictive of behaviors than being informed about best practice recommendations. This study highlights that merely communicating best-practice recommendations to clinicians does not ensure their adoption, and that employing strategies designed to directly influence attitudes and subjective norms may strengthen compliance with new recommendations.

Kitson's (1999) research utilization model emphasizes the importance of context in linking individuals to evidence. She identified several layers of influence surrounding the individual, including leadership styles (i.e., personal relationships, roles/accountability, and multidisciplinary functioning); social networks (i.e., amount of contact outside the organization and across boundaries); systems in place for problem-solving, evaluating, monitoring, and obtaining feedback on performance; culture (i.e., values, philosophy, atmosphere, rewards, sanctions, and decision-making patterns); inner context (i.e., resources, capabilities, structures, culture, and politics); and outer context (i.e., economics and social/political environment). The multidisciplinary and multilevel complexity of achieving an evidence-based culture influences compels the increased specificity achieved by integrating the behavioral predictors identified in the TPB into new scales.

Ogden (2003), on the other hand, questioned whether measuring TBP constructs accesses or creates cognitions, but conceded that this criticism may be more appropriate when behaviors being evaluated are novel. Indeed, the behaviors targeted in evidence-based healthcare are planned (Ajzen & Fishbein, 2004) and primarily volitional (Godin & Kok, 1996). Ogden also criticized the TBP constructs as tautological, but factor analyses from previous studies have demonstrated that attitudes and organizational resources/barriers are separate constructs. Further, Ajzen and Fishbein (2004) have suggested that the strongest evidence for the validity of the TPB may result from the evidence documenting the effectiveness of interventions designed to change behavior.

Building the Model for Measuring an Evidence-Based Healthcare Culture

Restructuring the TPB model. I conclude that the ICER Model© culture measure will benefit from the specificity with which an EBHC is measured by integrating predictors of behavior into the model. Basic structures from the Theory of Planned Behavior relevant to this study are modeled in Figure 7. Findings and recommendations from previous research support the inclusion of these predictive constructs into the ICER Model©, and, further, corroborate some modification to their structural layout. Accordingly, I have categorized behavioral predictors into three groups: intrapersonal, interpersonal, and organizational variables. Knowledge is relocated from its inclusion with actual behavioral controls to join attitudes as an intrapersonal predictor of behavior. Subjective norms are relabeled social norms, categorized as interpersonal predictors, and include but are not limited to hospital unit, specialty, educational level, and managerial support. Perceived and actual behavioral controls are categorized as organizational variables, and include but are not limited to resource allocations such as number

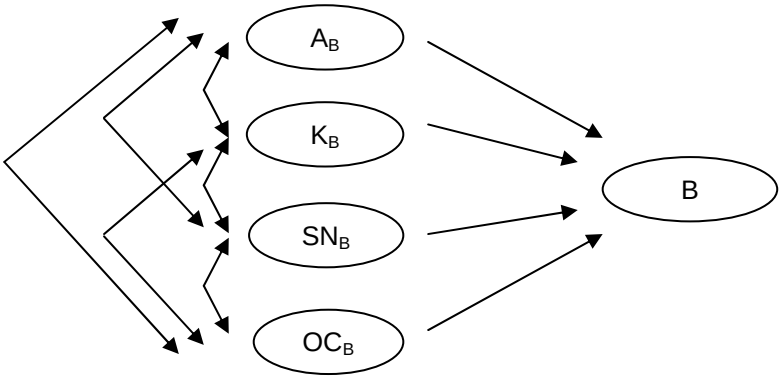


Codes: *A = Attitude toward the behavior*
SN = Subjective norms, i.e., Perceived social pressure to engage or not engage in the behavior
PBC = Perceived behavioral control, i.e., Perceptions of one's ability to perform the behavior
BI = Behavioral intention, i.e., Intention indicates readiness to perform the behavior
ABC = Actual behavioral control, i.e., Skills, resources, etc. necessary to perform the behavior
B = Behavior, i.e., Behavioral engagement
→ = Statistical relationship between

Figure 7. Theory of Planned Behavior Basic Structural Model

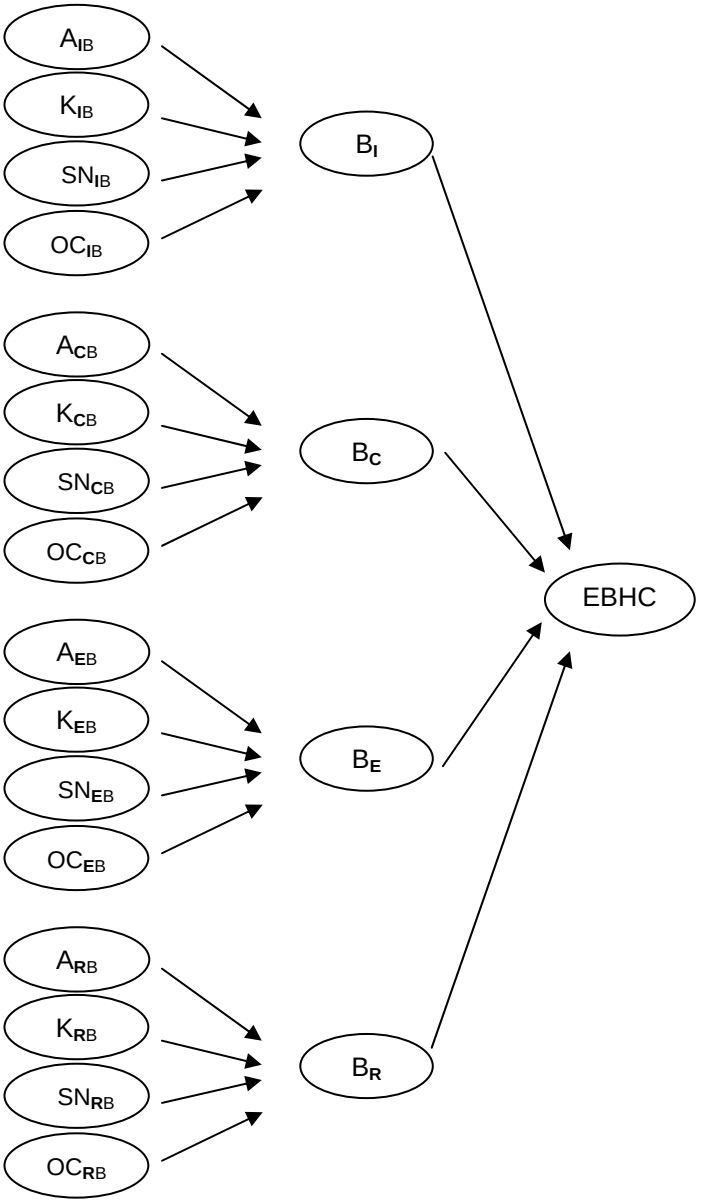
of personnel, financial support, electronic and technological supports, and quality of interdisciplinary collaboration. These modifications to the TBP are modeled in Figure 8.

Integrating the restructured TPB predictors into the ICER Model©. A structural model for integrating TPB predictors with ICER© behaviors is displayed in Figure 9. By integrating intrapersonal, interpersonal, and organizational predictors identified in the TPB with each of the four essential behaviors (i.e., steps) specified in the ICER Model© within a common measure, the specificity with which predictor-outcome relationships can be evaluated is improved. For example, the entire scale can be used to measure the longitudinal progress achieved by an individual, team, hospital unit, or entire organization in pursuit of an evidence-based culture; or, subscales can be used to precisely evaluate the effectiveness of an intervention directed at a specific ICER© step. An example for using an ICER© subscale to evaluate and compare the efficacy of two communication mechanisms on practice change is



Codes: A_B = *Attitude toward the behavior*
K_B = *Knowledge about the behavior*
SN_B = *Perceived social pressure to engage or not engage in the behavior*
OC_B = *Organizational controls (e.g., resources, collaborations) necessary to perform the behavior*
B = *Behavioral engagement*
→ = *Statistical relationship between*

Figure 8. Modifications to the Theory of Planned Behavior to Support the ICER© Theory of Evidence-Based Behaviors

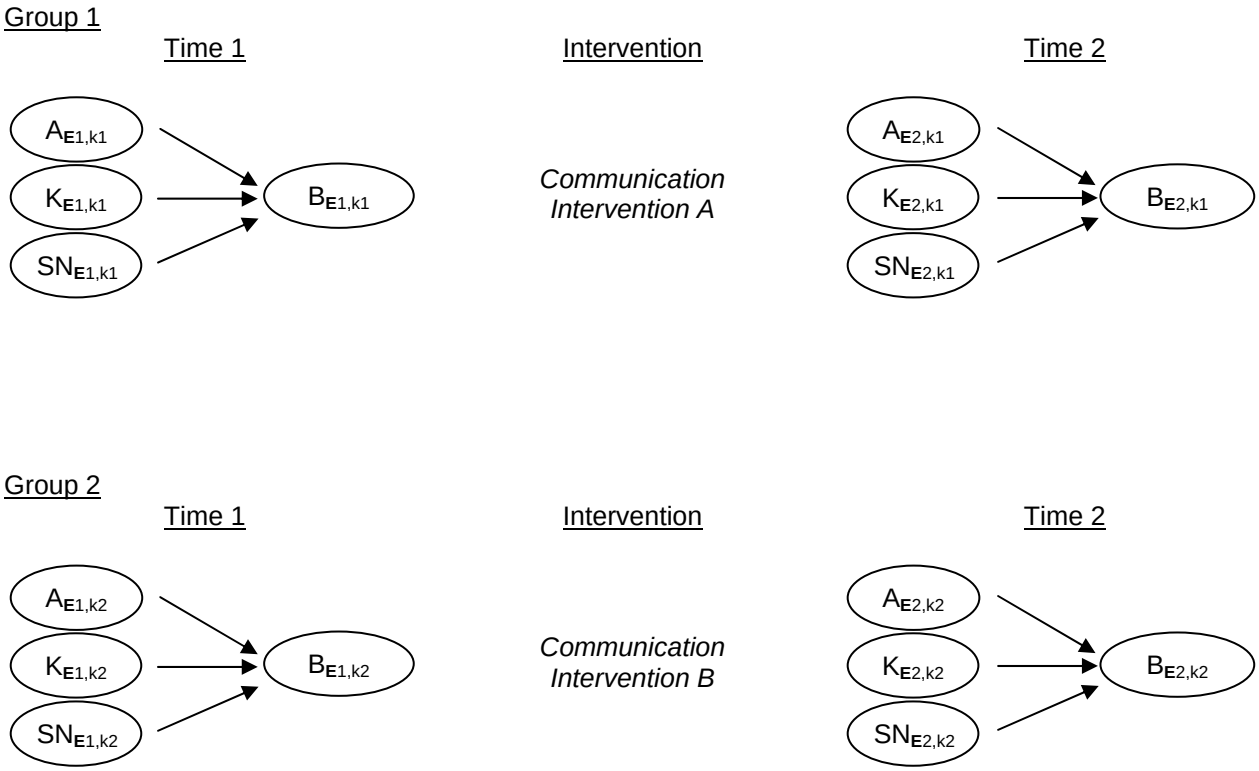


Codes: *A = Attitudes*
K = Knowledge
SN = Social Norms
OC = Organizational Controls
B = Behaviors
EBHC = Evidence-Based Healthcare Culture

Subscripts: ***I*** = ***I****dentify*
C = ***C****ommunicate*
E = ***E****mbrace*
R = ***R****eview*
B = Behaviors

Figure 9. Structural Model for Predicting the ICER Model© Behaviors Associated with an Evidence-Based Healthcare Culture

modeled structurally in Figure 10. The changes in behavior resulting from two different communication interventions can be compared to help individual or teams of healthcare professionals solidify their preferences about how practice recommendations should be communicated.



Codes: *A = Attitudes*
K = Knowledge
SN = Social Norms
B = Behaviors

Subscripts
*E1 = **Embrace** Time 1*
*E2 = **Embrace** Time 2*
k1 = Group 1
k2 = Group 2

Figure 10. Using an ICER© Subscale to Compare Outcomes from Different Interventions

Targeting the Measure within the Nursing Domain

The ICER Model© emphasizes an interdisciplinary approach (Kresse et al., 2007) to achieving best outcomes. The diversity of interdisciplinary perspectives was reviewed earlier in this paper, which includes patients/families, nurses, physicians, finance, organizational leadership, and a wide variety of other support teams (e.g., housekeeping, maintenance, information technology). However, one's profession typically influences the contributions that will be made by each individual to ICER© behaviors and the organizational culture. Although a single scale could attempt to address these diverse perspectives, the length of it would likely be problematic, if not prohibitive, due to respondent fatigue and difficulties in completing the scale during normal work hours. Although separate scales could, in due course, be developed to represent each perspective, I narrowed the options for a starting point to three groups – patients/families, physicians, and nurses.

Patient compliance with treatment recommendations has been documented to significantly influences clinical outcomes and costs (Feuerstein et al., 2006), highlighting the importance of including the influence of patient and family dynamics in outcome measures. On the other hand, the healthcare system could not sustain its current state without physicians, who typically develop the patient plan of care. Physicians also perform complex procedures, but their patients are often sedated or anesthetized as they work. In contrast, nurses routinely touch and interact with their patients – more than practitioners from any other discipline. Further, nursing's influence on patient and organizational outcomes is significant (e.g., mortality rates, length of stay; Dall et al., 2009; Estabrooks et al., 2005; Needleman & Buerhaus, 2003; Needleman et al., 2002; Pappas, 2008).

Indeed, patient, physician, and nurse perspectives are all important, and although each makes a unique contribution to outcomes, their contributions merit evaluation. However, finding interest and commitment within the nursing profession, and needing to start somewhere, I have elected to craft a measure of an evidence-based *nursing* culture within an organization, noting

that additional scales may need to be developed in the future in order to assess the specific perspectives of physicians, patients/families, and other relevant stakeholders. Although developed for and completed by the nursing profession, this scale will, necessarily, include an interdisciplinary emphasis. This interplay was reviewed in Step 4 of the ICER Model©, which emphasized the simultaneous measurement of physiological, psychodynamic, and cost outcomes. Interdisciplinary colleagues and the financial strength of a healthcare organization exert their own unique influences on nursing processes and outcomes (e.g., Kazahaya, 2005; Newbold, 2008), requiring the nursing profession to extend its expertise beyond caring for patients to engage with these entities.

To illustrate, nurses can craft the best research-based recommendation possible for a specific practice; but if the case for shifting to the use of a new order set is not sufficiently compelling to physicians to write those new orders, or if the cost of the drugs to be dispensed by the pharmacy team exceeds the reimbursement allocated by the insurance industry, or if nursing unit staffing budgets are unable to accommodate the increased staffing required to deliver the new practice, then the evidence-based recommendations will not be implemented to influence patient outcomes. In order to achieve an EBC, nurses must be able to effectively and systematically collaborate with other specialty teams, including senior management, finance teams, physicians, technology, and quality improvement departments. Indeed, Szreter and Woolcock's (2004) social capital theory suggests that the proximity of nurses to patients and families may place them in a unique position to decipher the questions, concerns, and outcomes of relevance to patients and families that link to the practice of and directions being undertaken by their interdisciplinary healthcare colleagues.

Unit(s) of Analysis

Research designs attempting to explain or predict nurses' use of research have at times generated inadequate or misleading conclusions by failing to account for interaction effects between different levels of analysis. For example, Sales (2007) demonstrated that the findings

from a study evaluating the impact of patient-to-nurse staffing ratios using a simple cluster correlation analysis (Aiken, Clarke, Sloane, Sochalski, & Silber, 2002) were very different from a similar study that used hierarchical linear modeling to avoid biased coefficient estimates (Estabrooks et al., 2005). In response, nursing leaders have called for increasing the level of analytic sophistication in nursing research studies (e.g., Cummings, Hayduk, & Estbrooks, 2007; Kitson, 2007), including the use of structural equation modeling (e.g., Midodzi, Hayduk, Cummings, Estabrooks, & Wallin, 2007) and multilevel analyses (e.g., Estabrooks et al., 2007).

Studies documenting unit- or specialty-specific differences in outcomes lend support to the use of social norms and the potential covariance with attitudes in predicting behavioral intention and behavior. Estabrooks et al. (2008) studied patterns of research utilization on patient care units. Using an array of quantitative and qualitative instruments and extensive fieldwork, the authors concluded that "modifiable characteristics of organizational context at the patient care unit level influences research utilization by nurses. These findings have implications for patient care unit structures and offer beginning direction for the development of interventions to enhance research use by nurses" (p. 2). Titler et al., (2007) proposed accounting for individual-, unit-, and organizational-level variance associated with research utilization and outcomes. They specifically evaluated the influence of: (a) individual emotional exhaustion and internet use, (b) unit facilitation, context group, nurse-to-nurse collaboration, and autonomy, and (c) hospital size. Estabrooks et al. (2008) found that the differences in research utilization could be predicted well by the nurse's specialty unit. McCloskey (2008) found that the educational preparation of nurses and organizational position influenced research attitudes and use. Indeed, increasing the specificity with which research utilization is predicted and with which an EBP culture is measured is appealing. In some cases, this can be facilitated by simply retrieving relevant respondent demographics during data collection.

Further, in 2000, Aiken and Patrician identified three subscales in the Nursing Work Index (Kramer & Hafner, 1989): nurse autonomy, nurse control over the practice setting, and

nurse relations with physicians. Kramer and Hafner had proposed that by aggregating individual nurse's Nursing Work Index, an appropriate hospital-level measure of a construct of interest could be defended if scores were more homogeneous within a hospital than between hospitals. Estabrooks et al. (2002) evaluated this assertion by administering the Nursing Work Index in four large Alberta, Canada hospitals, and found that between-hospital score variance was greater than within-hospital variance. Able to account for almost all of the variance in NWI scores by using only 26 of the original 65 items, the authors further proposed that the parsimony achieved by using a single construct approach merited its use in measuring the nursing practice environment.

These studies suggest that scores representing an individual nurse's attitudes, knowledge, social norms, and perceived organizational controls can be aggregated and used to represent the individual's intention to engage with a single ICER Model© Step. Further, individual's scores for attitudes, knowledge, social norms, controls, or behavior can be aggregated with other individual's scores to represent unit-, hospital- and/or system-level measures (e.g., Ceccato, Ferris, Manuel, & Grimshaw, 2007).

Summary

In summary, this study proposed to develop a measure of an evidence-based nursing culture based on the ICER Model of an Interdisciplinary Evidence-Based Healthcare Culture©. Using a modified version of Ajzen and Fishbein's Theory of Planned Behavior (Ajzen & Manstead, 2007), attitudes, knowledge, social norms, and organizational controls are used to predict behaviors specified by each of the ICER Model's© four steps, i.e., **I**dentify, **C**ommunicate, and **E**mbrace best practice recommendations, and **R**eview outcomes associated with practice.

Scale construction used a 2-step structural equation modeling to specify, identify, estimate, fit, and respecify a valid, reliable, and most-possible parsimonious model for measuring an EBNC. Step 1 established the best fitting measurement model, and Step 2 will

compare the goodness of fit of the structural models. These evaluations will emphasize the relation of attitudes, knowledge, social norms, and organizational controls with each of four behaviors identified in the ICER Model©.

Several hypotheses will be evaluated in this study.

1) Hypothesis 1: **I**dentify is a single-factor structure predicted by attitudes, knowledge, social norms, and perceived organizational controls associated with behaviors for **I**dentifying best practice recommendations.
2) Hypothesis 2: **C**ommunicate is a single-factor structure predicted by attitudes, knowledge, social norms, and perceived organizational controls associated with behaviors for **C**ommunicating best practice recommendations.
3) Hypothesis 3: **E**mbrace is a single-factor structure predicted by attitudes, knowledge, social norms, and perceived organizational controls associated with behaviors for **E**mbracing best practice recommendations.
4) Hypothesis 4: **R**eview is a single-factor structure predicted by attitudes, knowledge, social norms, and perceived organizational controls associated with behaviors for **R**eviewing outcomes associated with best practice recommendations.
5) Hypothesis 5: An evidence-based nursing culture is comprised of four factors, i.e., **I**dentify behaviors, **C**ommunicate behaviors, **E**mbrace behaviors, and **R**eview behaviors, each of which is predicted by attitudes, knowledge, social norms, and perceived organizational controls associated with those behaviors.
6) Hypothesis 6: Specifying knowledge as an intrapersonal predictor is associated with a better model fit than specifying it as a perceived behavioral control, which in this study has been renamed as organizational control.

CHAPTER 2

METHOD

This research study was undertaken to establish the ICER Model© measure of an evidence-based nursing culture (EBNC). Using a modified version of Ajzen and Fishbein's Theory of Planned Behavior (Ajzen & Manstead, 2007), attitudes, knowledge, social norms, and organizational controls were used to predict the essential behaviors identified in the ICER Model© that are associated with an EBNC. The four behavioral steps identified in the ICER© framework are identify, communicate, and embrace best practice recommendations, and review outcomes associated with recommended practice.

Having constructed a preliminary culture scale designed to measure each of the predictor constructs and behavioral outcomes, and having integrated the culture scale and demographic questions into an electronic survey, the study procedure included: (a) piloting the preliminary survey with a small sample of nurses employed at a medical center and using the pilot feedback to highlight and modify EBNC scale items that were unclear or lacked response variability; (b) disseminating the survey to nurses working for a healthcare system; and (c) specifying, identifying, estimating, fitting, and respecifying a valid, reliable, and most-possible parsimonious model for measuring an EBNC.

Participants

Pilot Study

Nurses working for Wyoming Medical Center (WMC), an acute care hospital in Casper, WY, were invited to pilot (i.e., complete and critique) the preliminary draft of the proposed survey. This pilot evaluation targeted a convenience sampling of 10-30 nurses. Consequently, nursing leaders at Wyoming Medical Center (WMC) invited all clinical and

nonclinical nurses to participate in the pilot, 22 of whom completed the on-line survey. Pilot testing of the scale was conducted at WMC in late-July and early-August 2011.

Recruitment procedures. WMC nurses who participated in the pilot study were given two hours of education pay from the WMC Magnet Coordinator budget. This information was communicated to WMC nurses by the WMC Clinical Nurse Researcher (see Appendix A), who also forwarded the investigator's electronic invitation to participate in the pilot study (see Appendix B) that included a hyperlink to the survey. An invitation reminder e-mail was sent approximately one week after the initial invitation (see Appendix D).

Full Study

Approximately 1500 nurses working at Poudre Valley Hospital (PVH) and Medical Center of the Rockies (MCR), acute care hospitals within the Poudre Valley Health System (PVHS) in northern Colorado, were invited to complete the revised survey during the last three weeks of August 2011. Six hundred seventy-seven respondents opened the SurveyMonkey™ hyperlink and accessed the survey introduction. Seven respondents declined to participate; four of these respondents cited insufficient time, and three stated that the survey was not applicable to their practice. Data from participants who did not complete the survey were excluded from the analyses, as were responses from nonnurse respondents. Post hoc anecdotal feedback suggested that: the e-lists recommended by the Chief Nursing Officers included clinicians in roles related to nursing but not requiring an RN license; some nurses shared the hyperlink with nonnursing colleagues; and some participants started the survey and could not complete it in one sitting, but restarted the survey and completed it at a later time. The psychometric analyses associated with crafting an EBNC measure were conducted using data from 559 participants, resulting in a response rate of 37%. Structural equation modeling analyses require a sample size of at least 200 participants. The average length of time to complete the survey was 32.8 minutes. Respondent demographics are presented in Table 3.

Table 3. PVHS Participant Demographics

Age	***n***	**%**
18-29	64	11.4
30-39	145	25.9
40-49	141	25.2
50-59	166	29.7
60-69	42	7.5
70 and over	1	.2
Total	*559*	*100.0*

Full Time Equivalent (FTE)	***n***	**%**
Relief	29	5.2
0.5 or less	35	6.3
0.6 FTE	49	8.8
0.7 FTE	9	1.6
0.8 FTE	186	33.3
0.9 FTE	179	32.0
1.0 FTE	72	12.9
Total	*559*	*100.0*

Role	**n**	**%**
Other	47	8.4
Clinical Educator	34	6.1
CNO or CNO Director	3	.5
Clinical Nurse Specialist	10	1.8
Education Nurse Specialist	2	.4
Nurse Manager	43	7.7
PCC or CC	54	9.7
Staff Nurse	366	65.5
Total	*559*	*100.0*

Nursing License Years	**n**	**%**
New - 2 years	52	9.3
3-5 years	86	15.4
6-10 years	104	18.6
11-15 years	74	13.2
16-20 years	56	10.0
21-25 years	37	6.6
26-30 years	58	10.4
31 years or more	92	16.5
Total	*559*	*100.0*

Education	***n***	**%**
Unknown	4	.7
ADN / Diploma Nurse	130	23.3
Bachelors	357	63.9
Masters or higher	68	12.2
Total	*559*	*100.0*

# of Summits Attended[a]	***n***	**%**
0	483	86.4
1	33	5.9
2	22	3.9
3	21	3.8
Total	*559*	*100.0*

Nursing Certification	***n***	**%**
Yes	339	60.6
No	220	39.4
Total	*559*	*100.0*

Committee service	***n***	**%**
Never been a comm member	307	54.9
Current or past comm member	252	45.1
Total	*559*	*100.0*

Fit with ICER© Behaviors	Best fit with Identify		Best fit with Communicate		Best fit with Embrace		Best fit with Review		Total fit by Role	
Role	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**	***n***	**%**
Clinical Educator	3	3.2	15	14.7	15	4.7	1	2.2	34	6.1
CNO or CNO Director	2	2.2	1	1.0	0		0		3	0.5
CNS	6	6.5	1	1.0	3	0.9	0		10	1.8
ENS	0		1	1.0	1	0.3	0		2	0.4
Nurse Manager	13	14.0	16	15.7	7	2.2	7	15.6	43	7.7
PCC or CC	7	7.5	18	17.6	23	7.2	6	13.3	54	9.7
Staff Nurse	50	53.8	42	41.2	251	78.9	22	48.9	365	65.4
Other	12	12.9	8	7.8	18	5.7	9	20.0	47	8.4
Total	*93*	*100*	*102*	*100*	*318*	*100*	*45*	*100*	*558*	*100*

Note: ADN=Associate Degree in Nursing; CNO=Chief Nursing Officer; PCC=Patient Care Coordinator; CC=Clinical Coordinator

[a]The Summits were half-day workshops designed to promote an EBNC and offer information about the ICER Model©

Recruitment procedures. A small team of MCR and PVH nurses from the Nursing Research Committee (NRC) review team helped to publicize the study to PVHS nurses. Their activities included announcing the study at a June 2011 EBNC conference held at PVH, posting an announcement about the study on VIC (the PVHS employee website), displaying flyers in areas of MCR and PVH commonly accessed by nurses (see Appendix H), an extra reminder e-mail sent by a Chief Nursing Office (CNO) Administrative Assistant to PVH nurses, and short presentations to nursing groups at routine meetings to explain the importance of the survey. These messages were consistent with and/or disseminated using the study abstract (see Appendix I), flyers, and e-mails inviting PVHS nurses to participate in the study that had been approved by the PVHS IRB, fully supported by the PVHS CNOs, and approved by the NRC. This team affirmed their support for the use of incentives to enhance participation rates. This information was communicated to participants in the cover e-mail (see Appendix E), at the end of the survey (see Appendix F), and in the reminder e-mail (see Appendix G); further, anecdotal feedback from NRC support team members conveyed that this information was also included in group meeting announcements.

All pilot and study participants were, by virtue of their employment status and attainment of professional nursing licensure, 18 years of age or older, and, by virtue of employment standards at the participating organizations, Registered Nurses (RNs).

Materials

EBNC Instrument

Construction. The conceptual and theoretical basis for the ICER Model Measure of an Evidence-Based Nursing Culture© established in this study is elaborated in the Introduction. The scale statements that represent the predictor constructs (i.e., attitudes, knowledge, social norms, and organizational controls) and outcome behaviors (i.e., identify, communicate, and embrace, and review outcomes associated with best practice recommendations) were derived from a review and critique of the evidence-based literature and from clinical research

experience and are presented in Table 4. Attitudes, knowledge, social norms, organizational controls, and behaviors were used to assess each of the four behavioral categories (i.e., identify, communicate, embrace, and review) embedded in the ICER Model©, resulting in an evaluation of 20 categories of information.

Classic measurement techniques rely on the use of at least three item stems (i.e., survey statements) for each construct assessed, and these analyses are well-served by ordered category or Likert scale responses. Accordingly, the preliminary draft of survey items used a total of 115 statements. The number of items within each of the 20 categories of information varied, ranging from three to eight. Although organizational controls are not consistently relevant across the four behavioral categories, these survey items generally included work time committed to the behavior, funding, equipment, electronic and technological supports, and quality of intra- and interdisciplinary collaboration. Self-report responses were scored using a 7-point bipolar scale. Predictor responses were assessed with a measure of agreement, and outcome (i.e., behaviors) responses are assessed with a measure of frequency. Given that the analyses emphasized achieving a parsimonious model that demonstrates acceptable fit with the data, the final model for measuring an EBNC was anticipated to rely on fewer items than proposed in the preliminary model.

Content validity. Earlier drafts of the study proposed several activities for establishing the scale's content validity. Clinicians and managers familiar with the evidence-based agenda at PVH and knowledgeable about the organization's culture would be invited to critique the preliminary survey; their feedback would contribute to a revised preliminary scale. Next, clinicians providing care directly to patients would review the items for omitted content. Finally, nurses whose roles or whose membership on committees supported the local evidence-based movement would be asked to rank-order the importance of: (a) the item stems associated with a single factor, (b) the factors within a single ICER© step or behavior, and c) each of the ICER© steps as they contribute to an evidence-based culture. Interrater reliability would then be

Table 4. *Item Stems for ICER Model Measure of an Evidence-Based Nursing Culture*©

IDENTIFY # of items = 29; Cumulative *n* = 29							
Predictors				**Outcomes**			
A F1	V1	Ia1	• The research process used to create practice recommendations is trustworthy	**B** F5	V23	Ib1	• I read research articles in professional journals
	V2	Ia2	• The systematic review process used to create practice recommendations is trustworthy				
	V3	Ia3	• The recommendations released by the EBP Comm are trustworthy		V24	Ib2	• I critique research articles
	V4	Ia4	• Practice recommendations must be based on scientific evidence more than on clinical experience		V25	Ib3	• I critique guidelines before they are integrated into practice at my organization
	V5	Ia5	• Practice recommendations appear more credible to me if they include professional references				
	V88	Ra8	• The findings of research studies conducted at my organization are trustworthy		V26	Ib4	• I participate in a systematic reviews of the literature
K F2	V6	Ik1	• I know how to obtain research articles from professional journals		V27	Ib5	• I participate in developing an EBP recommendation
	V7	Ik2	• I know how to read and critique a research article				
	V8	Ik3	• I know how to conduct a literature review		V28	Ib6	• I participate in developing a research study protocol
	V9	Ik4	• I know how to conduct a systematic review of the literature				
	V10	Ik5	• I know how to contribute to a nursing research study (e.g., brainstorming a study design, collecting data)		V29	Ib7	• I participate in research studies (e.g., brainstorming a study design, data collection)
	V11	Ik6	• I know how to develop a research protocol				
SN F3	V12	Is1	• The nurses on my unit respect the recommendations created by the EBP Comm				
	V13	Is2	• My unit leaders understand the importance of best practice recommendations				
	V14	Is3	• My nursing director understands the importance of best practice recommendations				
	V15	Is4	• My CNO understands the importance of best practice recommendations				
	V16	Is5	• Keeping my practice consistent with that of other nurses on my unit is important to me				
OC F4	V17	Is6	• Physicians & other interdisciplinary colleagues collaborate with nursing best practice recommendations				
	V18	Io1	• My organization has a process for prioritizing clinically relevant issues				
	V19	Io2	• My unit / team has a process for prioritizing clinically relevant issues				
	V20	Io3	• Library resources (e.g., journal articles, lit search support) are available to me				
	V21	Io4	• My hospital has enough resources (e.g., FTE's) for identifying clinical priorities from the professional literature				
	V22	Io5	• My hospital has enough resources (e.g., FTE's) to develop practice recomm. for clinically important issues				

Note. Blue = Reverse-coded items; Red=Items relocated from another factor; Green = Verbiage may need to be adjusted to suit local organization completing the scale

Table 4 (Continued). *Item Stems for ICER Model Measure of an Evidence-Based Nursing Culture*©

COMMUNICATE # of items = 22; Cumulative *n* = 51							
Predictors				**Outcomes**			
A F6	V30	Ca1	• When the EBP Comm makes a best practice recommendation, I am confident that I will receive it	**B** F10	V47	Cb1	• I receive practice recommendations developed by the EBP Committee
	V31	Ca2	• I am confident that the EBP Comm will respond to my questions and/or feedback about a best practice recommendation		V48	Cb2	• I carefully review best practice recommendations that I receive
	V32	Ca3	• I feel overloaded with new practice recommendations				
	V33	Ca4	• I am interested in information that will help me improve the care I give my patients		V49	Cb3	• I have questions about the best practice recommendations that I receive
	V34	Ca5	• The EBP recommendations communicated to me are applicable to my practice				
K F7	V35	Ck1	• I understand the EBP recommendations when I read them		V50	Cb4	• I ask my EBP leaders about best practice recommendations that I do not understand
	V36	Ck2	• When I do not understand a new practice recommendation, I know who to contact to get help				
	V37	Ck3	• Practice recommendations released by the EBP Committee are typically clear and understandable		V51	Cb5	• I talk with my colleagues about the best practice recommendations
	V42	Co1	• I understand how best practice recommendations are communicated to me (e.g., face-to-face, e-mail, flyers)				
SN F8	V38	Cs1	• New practice recommendations are welcomed by nurses on my unit / team				
	V39	Cs2	• Nurses on my unit / team share information with others in my group				
	V40	Cs3	• Unit leaders encourage my questions until I can understand a new practice recommendation				
OC F9	V41	Cs4	• Physician and other colleagues are informed about new nursing practices that overlap with their practice				
	V43	Co2	• Best practice recommendations are disseminated in a predictable manner				
	V44	Co3	• I like the mechanism my organization uses to communicate best practice recommendations to me				
	V45	Co4	• I would choose a different method with which practice recommendations are communicated to me				
	V46	Co5	• I have enough time to read and review new practice recommendations in order to understand them				

Note. Blue = Reverse-coded items; Red=Items relocated from another factor; Green = Verbiage may need to be adjusted to suit local organization completing the scale

Table 4 (Continued). *Item Stems for ICER Model Measure of an Evidence-Based Nursing Culture*©

EMBRACE # of items = 29; Cumulative *n* = 80							
Predictors				**Outcomes**			
A F11	V52 V53 V54 V55 V56 V57	Ea1 Ea2 Ea3 Ea4 Ea5 Ea6	• Using EBP recommendations helps to improve the care I provide • If the EBP Comm makes a best practice recommendation, I will change my practice • EBP is flexible enough to let me individualize the care to my patients • It is important to me to continually improve my practice • I am more likely to change my practice when reference citations are included with a practice recommendation • I am more likely to change my practice when a practice recommendation summarizes *why* I should do so	**B** F15	V73 V74 V75 V76 V77 V78 V79 V80	Eb1 Eb2 Eb3 Eb4 Eb5 Eb6 Eb7 Eb8	• I change my practice to integrate best practice recommendations for nursing practice • I change my practice when a new recommendation is released • If needed, I seek help for integrating the recommendation into my practice • I see colleagues not using EBP recommendations • If I see colleagues not using an EBP recommendation, I ask them about it • I inform my patients about their plan of care • I invite my patients to modify the plan of care based on their preferences and values • If I deviate from a recommended practice, I document my rationale in the patient record
K F12	V58 V59 V60 V61	Ek1 Ek2 Ek3 Ek4	• The EBP Comm's best practice recommendations can be integrated into my nursing practice • The EBP recommendations are easy to integrate into nursing practice • There are occasions when an EBP recommendation should *not* be used with a specific patient • I can deviate from using a practice recommendation for individual patients as long as I document why				
SN F13	V62 V63 V64 V65	Es1 Es2 Es3 Es4	• Nurses on my unit / team are eager to use new practice recommendations • My leaders are eager to help me use new practice recommendations • New practices for improving our nursing care are welcomed by my unit leaders • My nursing director is very supportive of helping my team achieve an evidence-based practice				
OC F14	V66 V67 V68 V69 V70 V71 V72	Es5 Eo1 Eo2 Eo3 Eo4 Eo5 Eo6	• Physicians & other interdisciplinary colleagues are receptive to changing practice in order to improve outcomes • The EHR promotes my use of best practice recommendations • Patient equipment needed to provide best practice is available • I have enough time to implement best practice recommendations without cutting corners • I have enough time to document the care I give my patients • Recommendations for best nursing practice are coordinated effectively with the practices of physicians and other disciplines • Physician preferences do not match nursing practice				

Note. Blue = Reverse-coded items; Red=Items relocated from another factor; Green = Verbiage may need to be adjusted to suit local organization completing the scale

Table 4 (Continued). *Item Stems for ICER Model Measure of an Evidence-Based Nursing Culture*©

REVIEW # of items = 35; Cumulative *n* = 115							
Predictors				**Outcomes**			
A F16	V81 V82 V83 V84 V85 V86 V87	Ra1 Ra2 Ra3 Ra4 Ra5 Ra6 Ra7	• Integrating EBP recommendations into my practice improves patient and/or nursing outcomes • My EBP leaders are interested in hearing about my ideas for improving patient care • New ideas for improving our nursing care are welcomed by my unit leaders • Self-review / critique is important to improving my nursing care • Inconsistent practice among nurses compromises patient outcomes • Our professional practice is based more on experience than on research evidence • Outcomes will be improved as a result of using best practice recommendations *V88 replaced to F1*	**B** F20	V110 V111 V112 V113 V114 V115	Rb1 Rb2 Rb3 Rb4 Rb5 Rb6	• I forward my questions or ideas for improving patient care to my leaders or the EBP Committee • I notice that certain nurses seem to have better outcomes than others • I notice that certain units seem to have better outcomes than others • I inform my unit / team leaders when I see inconsistencies in practice among nurses • I have participated in interpreting how research recommendations should affect our unit practice • I think about my outcomes, and consider whether they can be improved
K F17	V89 V90 V91 V92 V93 V94 V95	Rk1 Rk2 Rk3 Rk4 Rk5 Rk6 Rk7	• I am thoughtful about the quality of my own clinical performance • I think of questions or ways to improve nursing care • I am too busy to think of questions or ways to improve nursing care • When I have an idea for improving patient care, I know how to get it to my EBP leaders • I am able to understand the graphs and reports about practices or outcomes that my team is trying to improve • I feel capable of helping my team interpret study findings that form the basis of practice recommendations • I know about one or more practices that we need to improve on my unit				
SN F18	V96 V97 V98 V99 V100 V101	Rs1 Rs2 Rs3 Rs4 Rs5 Rs6	• The nurses on my unit / clinical team share ideas with each other about our outcomes • My unit / team culture makes it feel safe to acknowledge practices that need to be improved • My unit / team gets excited when we are able to improve our performance • My unit/team collects data in order to measure outcomes that we are trying to improve • My unit/team enjoys participating in research and/or quality studies • The EBP committee evaluates outcome changes after making a new best practice recommendation				
OC F19	V102 V103 V104 V105 V106 V107 V108 V109	Rs7 Ro1 Ro2 Ro3 Ro4 Ro5 Ro6 Ro7	• Physicians are receptive to feedback from nursing's quality or research evaluations • My unit / clinical team has sufficient opportunity to exchange ideas about our outcomes • My unit / clinical team has sufficient opportunities to review the quality of our nursing care • Even when I identify ways to improve care, there is not enough time to do anything with those ideas • Practice recommendations derived from research conducted at my org are supported by senior leadership • Practice recommendations derived from research conducted at my organization are supported by physicians • Resources for analyzing data are available to me or my team • I have confidence that QR and EBP teams can accurately measure nursing outcomes after a new practice has been implemented				

Note. Blue = Reverse-coded items; Red=Items relocated from another factor; Green = Verbiage may need to be adjusted to suit local organization completing the scale

evaluated using Cohen's weighted *kappa*. Thus, the early study drafts proposed that feedback from healthcare professionals representing a wide range of health disciplines, experience, and interest in the evidence-based agenda would help to establish the content validity of the questionnaire.

However, initial conversations with these colleagues culminated in a hodgepodge of thoughts and opinions. Feedback was founded primarily on personal experience and opinion, and on individual interpretation of the Magnet model's implication for the local evidence-based nursing agenda. In many, perhaps most, of these discussions, colleagues documented little familiarity with the EBP and research utilization literature beyond that associated with intention to incorporate processes used at other healthcare organizations in the United States well-known for conducting systematic reviews and/or research studies.

I next considered inviting nursing professors to act as content experts. This endeavor revealed that nursing academia was, at that time, in a state of transition. Graduate nursing programs, compelled to comply with national credentialing and funding changes, were redesigning coursework to enable an enlarging emphasis on the Doctor of Nursing Practice programs (Beckstead, 2010). Although Masters or PhD students were technically offered the option of completing a research thesis or dissertation, I learned that four graduate nursing students wanted, but were unable at that time, to find a professor to be their research advisor. Indeed, the hope of transforming nursing from a highly-respected profession into a science was in a "simply awful mess," to borrow an expression from David Sackett (2004).

All told, opinions about the evidence-based agenda were plentiful, as were clinicians with expertise regarding a specific health service line. Yet, eliciting a research-informed perspective about the evidence-based agenda was uncommon. Given these circumstances, I decided to forego the content validity evaluations originally proposed for this study, believing that force-fitting the inclusion of opinion-based assessments in my procedure devalued what was otherwise good form in scale development.

Procedures

Study Approvals

WMC nursing leaders, including the Chief Nursing Officer, endorsed the engagement of WMC nurses in the pilot study. WMC IRB approval was granted in July 2011. The full study was endorsed by the PVHS Chief Nursing Officers, approved by the MCR and PVH Nursing Research Committees in June 2011, and approved by the PVHS IRB in June 2011. Study approval was granted by the CSU IRB in July 2011. Revisions to the study survey generated from the pilot evaluation were submitted to and approved by the PVHS and CSU IRBs.

Pilot Survey

Survey construction. A small-sample evaluation was used to identify survey items that lacked response variability or that were perceived as confusing or problematic, and to establish the length of time needed to complete the scale. The pilot survey was built in nine sections: (a) survey purpose and consent, (b) respondent demographics, (c) scale statements associated with predicting **I**dentify behaviors, (d) scale statements associated with predicting **C**ommunicate behaviors, (e) scale statements associated with predicting **E**mbrace behaviors, (f) scale statements associated with predicting **R**eview behaviors, (g) scale statements representing **I**dentify, **C**ommunicate, **E**mbrace, and **R**eview behaviors, (h) a final demographic item, assessing personal fit with or preferences for evidence-based behaviors, and the survey close-out statements, and (i) feedback about the preceding portions of the survey. The survey used in the pilot evaluation differed from the full survey in the following aspects: (a) because the pilot evaluation was conducted at a healthcare facility with a single site, the pilot survey omitted a demographic question about the facility at which the respondent worked most, (b) the evidence-based nursing culture measure statements included an additional response option, “Problematic, Will provide narrative”, that was not offered in the full study, and (c) the ninth section of the pilot survey inviting feedback about the survey was omitted entirely in the full study survey. Survey queries were integrated into and disseminated as an electronic survey

using SurveyMonkey™ (n.d.). The pilot survey content, including introductory statements for each section, is displayed in Appendix C.

Data collection. Upon opening the survey, participants were informed about the study purpose, risks, and benefits, and asked to indicate their decision to participate or not participate. The pilot survey provided the option of checking an extra bubble response for each culture survey question (i.e., Section Three through Section Seven in Appendix C) to indicate that the participant wished to offer feedback regarding that item. The survey software recorded the time when the survey hyperlink was opened and when the survey was completed. Respondents were then forwarded to an additional page identifying each culture survey item for which they checked the "problematic" bubble, and asked to describe their perceptions of these items and the general construction of or observations about the survey.

Pilot survey responses were assimilated within SurveyMonkey™, downloaded to a Microsoft® Excel file, and transferred by the investigator into SPSS for the analyses.

Full Study

Data collection. Approximately 1500 nurses working at MCR in Loveland, CO and PVH in Fort Collins, CO were invited to participate in this survey. The PVHS Director of Information Security approved study-specific access to and use of CNO-designated nursing e-lists within the PVHS GroupWise e-mail system. Using the access procedures recommended by PVHS, an e-mail was sent to these e-lists to explain the importance of this study and to invite nurses to participate in this survey (see Appendix E). The survey (see Appendix F) was accessible by clicking on a SurveyMonkey™ hyperlink embedded in the e-mail message. A follow-up e-mail was sent approximately 10 days after the survey opened (see Appendix G) reminding nurses about the invitation to complete the survey. The survey remained open for approximately three weeks. Survey responses were assimilated within SurveyMonkey™, downloaded to a Microsoft® Excel file, and transferred by the investigator into SPSS and EQS

for the analyses. Access to the survey was closed shortly after the end of the designated data collection period.

Incentive drawing procedures. At the end of the survey, PVHS respondents were offered the opportunity to enroll in the incentive drawing. Nurses who chose to enroll were asked to print the last page of the survey, enter their contact information, and place that sheet of paper in a centrally-located locked box at the three participating facilities. Entries from all three facilities were combined into a single pool from which a total of eight Apple iPads and Amazon Kindles were awarded. Additional details related to the incentive drawing procedures, held in October, 2011, are included in Appendix J.

Data Analysis

Pilot Evaluation

Analysis of data from the pilot survey focused on identifying the length of time needed to complete the scale, and on identifying and addressing survey items with low response variability or that were perceived as confusing or problematic.

Full Study

Psychometric evaluation approaches. Two approaches were integrated into the construction of this EBNC scale. Classical test theory (CTT) provides a mechanism for developing reliable measures of common factors, i.e., constructs of interest (McDonald, 1999), which in this study are attitudes, knowledge, social norms, organizational controls, and behaviors. In CTT, an individual's observed score is comprised of a true score and random error. Applications of CTT focus on evaluating and refining the psychometric properties of a measure by selecting items that maximize true score and minimize error score, or, more specifically, the true and error score variance. By inspecting the covariance between items, item parameters are calculated to evaluate which items best fit with the constructs associated with and EBNC. The item parameter that represents true fit is the coefficient λ (lambda), which is also referred to as the factor loading of the item. The item parameter that represents error

variance is Ψ^2 (psi squared), which is also referred to as the uniqueness of the item. Item factor loadings and uniquenesses help to establish how well an item fits with each construct, and are useful for comparing which combinations of items best measure the construct. Items should be homogeneous, i.e., measure the same general construct, but the measure may rely on two or more related factors, or subcategories, to adequately assess the construct.

To develop a parsimonious scale that was also capable of assessing the multifaceted and complex nature of an EBNC, this study used structural equation modeling (SEM) analysis. Byrne (2006) described SEM as a confirmatory statistical methodology for testing a hypothesis associated with a phenomenon. She pointed out that the use of pictorial modeling of the relationships among constructs in SEM enables a clearer understanding of the theory under evaluation. Causal relationships in SEM indicate that one factor has a direct influence on another factor included in the model. As a caution, "cause" within this context does *not* imply that all variables of influence have been correctly identified and included in the model; thus, study design issues are the obligation of the investigator. Survey items are viewed as observed variables, and the strength with which they represent a latent variable is referred to as the factor loading. In addition to determining the covariance/correlation among predictor factors, SEM analyses report the strength and direction of the causal relationships between factors as regression coefficients.

In SEM, a model is a hypothesized set of assumptions about the relations among a set of variables. The structural equations implied in that model in turn imply a correlation (or covariance) matrix. Model fit is evaluated by comparing the *sample* correlation matrix to the implied matrix in the *hypothesized* model. The logic of SEM is expressed in the formula:

$$\Sigma - \Sigma(\theta) = R,$$

in which Σ (i.e., sigma) represents the sample covariance matrix, $\Sigma(\theta)$ (i.e., sigma phi) represents the implied model covariance matrix, and R represents the residual or difference between the sample and implied covariance matrixes. Covariance residuals are dependent on

the observed variable's unit of measurement, but standardized residuals, achieved by dividing the covariance by its standard error, are easier to interpret. Accordingly, standardized scores are typically reported in this study, unless specified otherwise.

Data file preparation. Negatively-worded item stems were reverse coded. The minimum possible score for each item was one, and the maximum possible score was seven. EQS (*n.d.*) software was used for the SEM-related analyses in this study. This study employed a 2-step SEM approach for developing the measure of an evidence-based nursing culture. Step 1 focused on achieving the best-fitting measurement model, and Step 2 evaluated, and respecified when indicated, the fit of the sample data with the hypothesized structural model.

Measurement model construction. The variance of the independent/exogenous factors was fixed at unity, and the item-factor loadings freely estimated. Sample data were evaluated for skew and kurtosis. Individual outlier cases contributing to skew and kurtosis were examined, and appropriate treatments or responses employed. The normalized estimate for Mardia's coefficient was used to test for kurtosis; when this *z*-statistic exceeded the accepted cutoff of 5.00 (Bentler, 2005, as cited in Byrne, 2006), robust statistics designed to accommodate nonnormal data were used.

Although Cronbach's alpha is a well-known measure of internal reliability, this coefficient may be inadequate for use with latent variable models, and particularly with multifactorial models. Byrne (2006) recommends the rho coefficient as a measure of internal consistency in multidimensional structures. Indicator sets hypothesized to measure the same construct should be at least moderately correlated, and indicators hypothesized to measure different constructs should not be highly correlated (Campbell & Fiske, 1959). Accordingly, the correlations between factors were used as a measure of the convergent and discriminant validity among the factors.

Several goodness-of-fit tests were used to determine how well the observed data fit the expected data, i.e., the hypothesized model. A Comparative Fit Index (CFI) ranges from 0 to 1,

with 1 representing complete fit between the sample data and hypothesized model. A cutoff value of .90 has been viewed by some as acceptable fit (e.g., Bentler, 1992), but a cutoff value close to 0.95 represents a well-fitting model (Hu & Bentler, 1999). The independence chi-square (χ^2) statistic tests the null hypothesis, or null model, that all variables in the model are not correlated. Congruence between the sample data and the hypothesized model will yield a very high χ^2 value. Other fit indexes represent *mis*fit between the sample data and the hypothesized model. The root mean squared error of approximation (RMSEA) used in this study ranges between 0 and 1. RMSEA scores of 0 are a perfect fit; a cut-off value of < .05 represents good fit (Brown & Cudeck, 1993); adequate fit is represented by a value of $\leq$ .06 (Hu & Bentler) or $\leq$ .08 (Brown & Cudeck, 1993). Finally, the EQS program reports indexes for sample data that are not normally distributed. These include the Satorra-Bentler Scaled Chi-Square statistic (S-B χ^2; Satorra & Bentler, 1988) and robust variations of the CFI and RMSEA. Fit index results are not always consistent with each other, but I used them collectively to shape my decisions in pursuing the best-fitting models (Hu and Bentler, 1999).

After establishing the fit of the baseline model, I used the Lagrange Multiplier Test (LM Test) to evaluate variables for potential fit with a factor other than the one specified in the baseline model. With an emphasis on parsimony, I focused on identifying the four observed variables that best measured a latent predictor or outcome factor. In doing so, I removed items with low factor loadings, and/or discarded the less robust of two closely-related or seemingly redundant items. I made model changes one at a time, each one within the context of whether the recommendations from the literature or clinical experience made the choice logical. When more than one change seemed logical, I permitted the statistical findings to support my decisions, using the relative improvement in overall fit proposed by the univariate LM Test χ^2 results to determine the order in which model changes were introduced. With each adjustment, I compared the new model to the former model, looking for an improvement in the overall

goodness-of-fit test results, and, as indicated, testing for a significant improvement in the Chi-Square results.

Structural model construction. After solidifying the best-fitting measurement models in the first of my 2-step SEM procedures, I crafted each of the study hypotheses, presented at the end of Chapter 1, as a series of structural models. The factor loading of one variable per factor was fixed at unity, as were the factor loadings for the disturbance terms representing overall model error. I evaluated the fit of the actual data to the hypothesized structural models using the goodness-of-fit test procedures that were described for the first of the 2-step SEM analyses. The reliability coefficient rho was prioritized over Cronbach's alpha for the structural analyses. Correlations between the predictor factors were used to help establish the convergent and discriminant validity, and standardized regression coefficients were used to establish the strength and direction of the causal relations between the predictor factors and the outcome factor.

The Wald test evaluates if redundant paths in the model can be set to zero without compromising overall model fit, thereby revealing if fewer parameters can be used to predict an outcome factor. I used the Wald test to establish well-fitted parsimonious models, but present all variations of each of the four best-fitting ICER© models so they can be compared equivalently.

Challenges in achieving an accepting model. Error covariance represents systematic rather than random measurement error within the responses to scale variables (Aish & Jöreskog, 1990). In reality, correlated measurement errors typically indicate that their associated variables measure something in common that is not captured by the latent factor, and cross-loadings indicate that a variable is tapping into more than one construct. Yet, Byrne's (2006) text freely employs the use of cross-loadings and covarying error terms in model respecification procedures. However, I concluded that crossloadings and correlated errors cannot represent long-term solutions, and consequently chose to not integrate them into my

final models. Nevertheless, the LM Test results estimating these crossloadings and error covariances provided helpful guidance during the model respecfication process. Relocating or removing items that cross-loaded on a factor other than the one originally-intended, or removing one of the items with large error term covariance, generally resulted in improved model fit indexes.

In fact, acceptable measurement models do not necessarily segue to acceptable structural models. Model misspecifications, including large correlations among parameter estimates and omitted or superfluous constructs, can generate parameters outside reasonable limits (e.g., correlations greater than one). Proposed solutions include deleting hypothesized factors or combining factors that are highly correlated (Rindskopf, 1984). Further, residual model weaknesses were used in this study to highlight variables and factors that merit revision in future research.

CHAPTER 3

RESULTS

Pilot Study

The pilot analyses in this study targeted three categories of evaluation. First, pilot survey participants required an average of 29 minutes to complete the survey. This finding was used to inform the nurses being recruited for the full study about the general length of time needed to participate in the study.

Next, the EBNC survey items were evaluated for response variability. Ten items were scored using all of the one-to-seven bipolar responses, most of the items used five of the seven responses, only four items used three responses, and no items used fewer than three responses. These findings culminated in no revisions to the pilot survey.

Finally, the pilot evaluation created an opportunity for nurse participants to provide feedback about survey items that were perceived as confusing or problematic. Much of the narrative feedback opined ideas for attending to the evidence-based agenda, rather than ideas for improving the survey content and format. However, one nurse observed that the response options for the behavioral survey items did not seem to fit his/her circumstances well. That respondent reported working approximately 24 hours a month, highlighting that engaging in specific behaviors at a rate of “Several times per month” would be scored “Daily” if working full time. This feedback resulted in the addition of a demographic question about the “full time equivalent” proportion worked by each respondent. One other change to the survey that was stimulated by the pilot evaluation stemmed from additional inspection of the EBNC items by the study investigator. The pilot survey included the item, “I know how to conduct a systematic review of the literature.” However, an additional item, “I know how to conduct a literature review,” was added to emphasize to study participants that a systematic review is not

necessarily the same activity as a literature review. These items were placed adjacent to each other in the full survey with the intention of emphasizing a distinction between the two activities.

Full Study

Identify Models

Identify baseline measurement model. The Identify 5-factor baseline measurement model was built using 30 items. Rho for this model was .933. I reviewed cases with high multivariate kurtosis, but noting that response scores reflected acceptable variability, I elected to not delete these cases. The normalized estimate for Mardia's coefficient was 58.93, exceeding the standard cut-off of 5.00 that indicates nonnormal data (Bentler, 2005; as cited in Byrne, 2006). Accordingly, I used the robust statistical analyses that were available in the EQS software. The CFI for this baseline measurement model was .857, and RMSEA was .067. Factor loadings ranged from .384 to .958. The correlations among these five factors ranged from .050 to .762.

Identify final structural models. Figure 11 presents the 5-factor, 19-item final Identify model. Rho for this model was .922, and the normalized estimate for Mardia's coefficient was 42.86. Factor loadings associated with predictor items ranged from .613 to .881, and for behavioral outcome items from .441 to .846. The correlations among the predictor factors ranged from .272 to .760. The regression coefficient for Knowledge as a predictor of Identify behaviors was .684, for Organizational Controls -.426, for Attitudes .284, and for Social Norms a nonsignificant .057. These four factors collectively achieved an R^2 of .496, i.e., the proportion of variance accounted for in predicting Identify behaviors.

The factor loadings of two Knowledge items about a literature review and about a systematic review were .958 and .936, respectively. Current or former members of an organizational research and/or evidence-based committee were known to have been exposed to systematic review training. Thus, using committee membership as an approximation of systematic review knowledge, a *t*-test was conducted to evaluate whether the scores for a

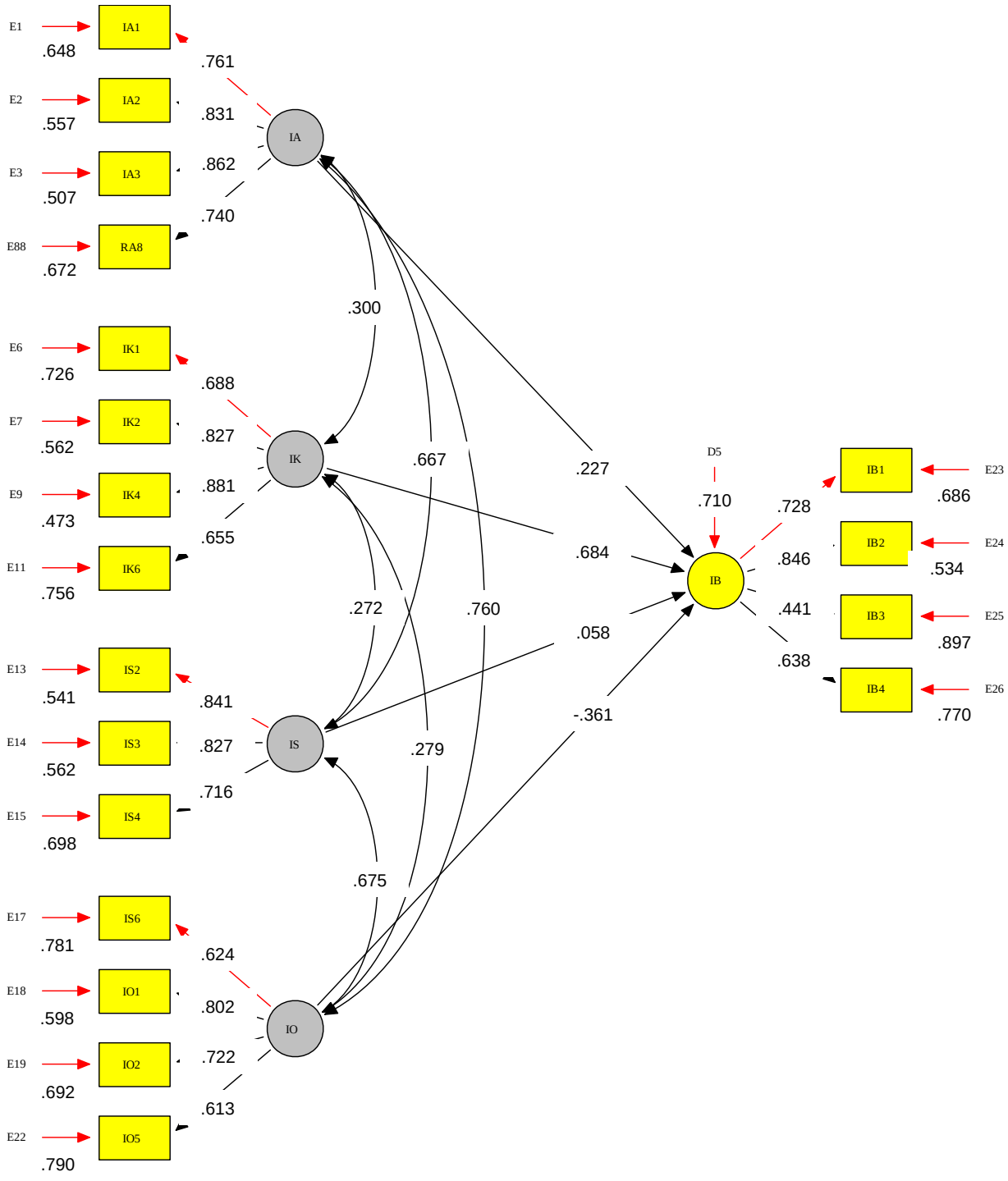


Figure 11. Identify 5-factor final structural model.
A = Attitudes; K = Knowledge; S = Social Norms; O = Organizational Controls; B = Behaviors.
Rho = .922; S-B χ^2 = 377.3826 (*df* = 171); CFI = .944; RMSEA = .055; R^2 = .496.
Identify Behaviors = .227*A + .684*K + .058*SN - .361*OC + .710 Disturbance

survey item loading on the Knowledge factor were different for participants with current or former committee membership than for nonmembers. As anticipated, the mean score of 5.33 for members was significantly higher than the 4.35 mean score for nonmembers, $t(557) = 4.88$, $p < .001$. The survey item referencing systematic review skills was retained in the final structural models, and the item addressing literature review skills was not retained.

Figure 12 presents a more parsimonious model that was achieved after implementing the sole recommendation from the Wald test. This 4-factor, 16-item model omitted Social Norms as one of the predictors of Identify behaviors. Rho for this model remained an acceptable .906, and the normalized estimate for Mardia's coefficient dropped to 33.59. Factor loadings associated with predictor items ranged from .619 to .881, and for behavioral outcome items from .441 to .846. The correlations among the predictor factors ranged from .274 to .767. The regression coefficient for Knowledge as a predictor of Identify behaviors was .684, for Organizational Controls -.343, and for Attitudes .255. These predictor factors collectively accounted for an R^2 of .494.

Communicate Models

Communicate baseline measurement model. The Communicate 5-factor baseline measurement model was built with 22 items. Rho for this model was .915. The normalized estimate for Mardia's coefficient was 49.92, so I used the robust statistical analyses that were available in the EQS software. The CFI for this baseline measurement model was .883, and RMSEA was .063. Factor loadings ranged from .107 to .848. The correlations among these five factors ranged from .230 to 1.000. This perfect correlation between Attitudes and Knowledge was resolved by the fifth iteration of the measurement model.

Communicate final structural models. Two series of Communicate models were generated from the SEM analyses. The baseline structural model in the first series is presented in Figure 13. This 5-factor, 16-item model achieved a rho of .919, and a normalized estimate for Mardia's coefficient of 50.53. Factor loadings for predictor items ranged from .496 to .842, and

for outcome variables from .496 to .747. Correlations among predictor variables ranged from .787 to .880, except for a correlation of 1.042 between the Attitude and Knowledge factors that the EQS software constrained at unity. The regression coefficients were, in descending order,

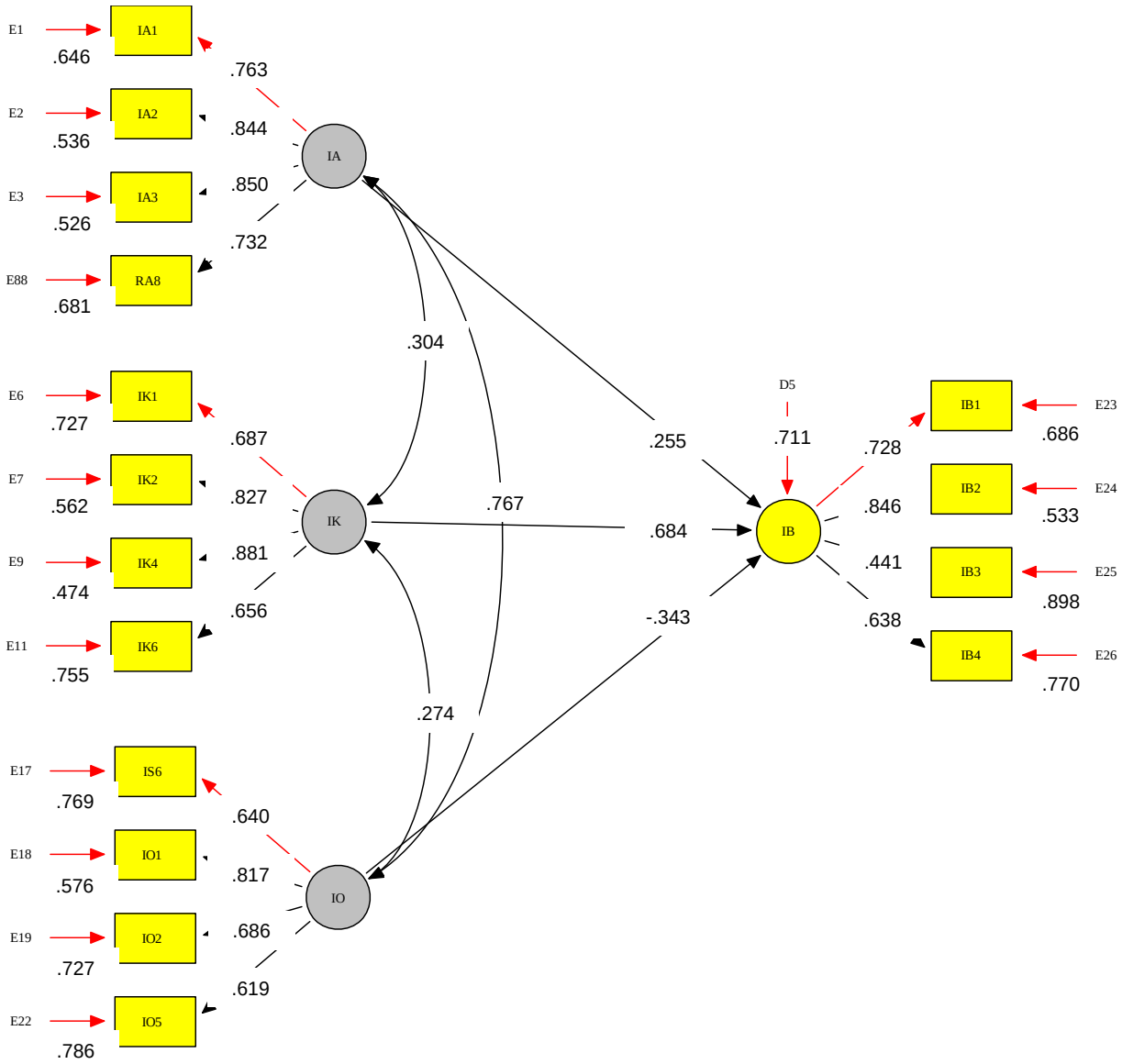


Figure 12. Identify 4-factor final structural model (Social Norms omitted).
A = Attitudes; K = Knowledge; O = Organizational Controls; B = Behaviors.
Rho = .906; S-B χ^2 = 256.0308 (*df* = 98); CFI = .953; RMSEA = .054; R^2 = .494.
Identify Behaviors = .255*A + .684*K - .343*OC + .711 Disturbance

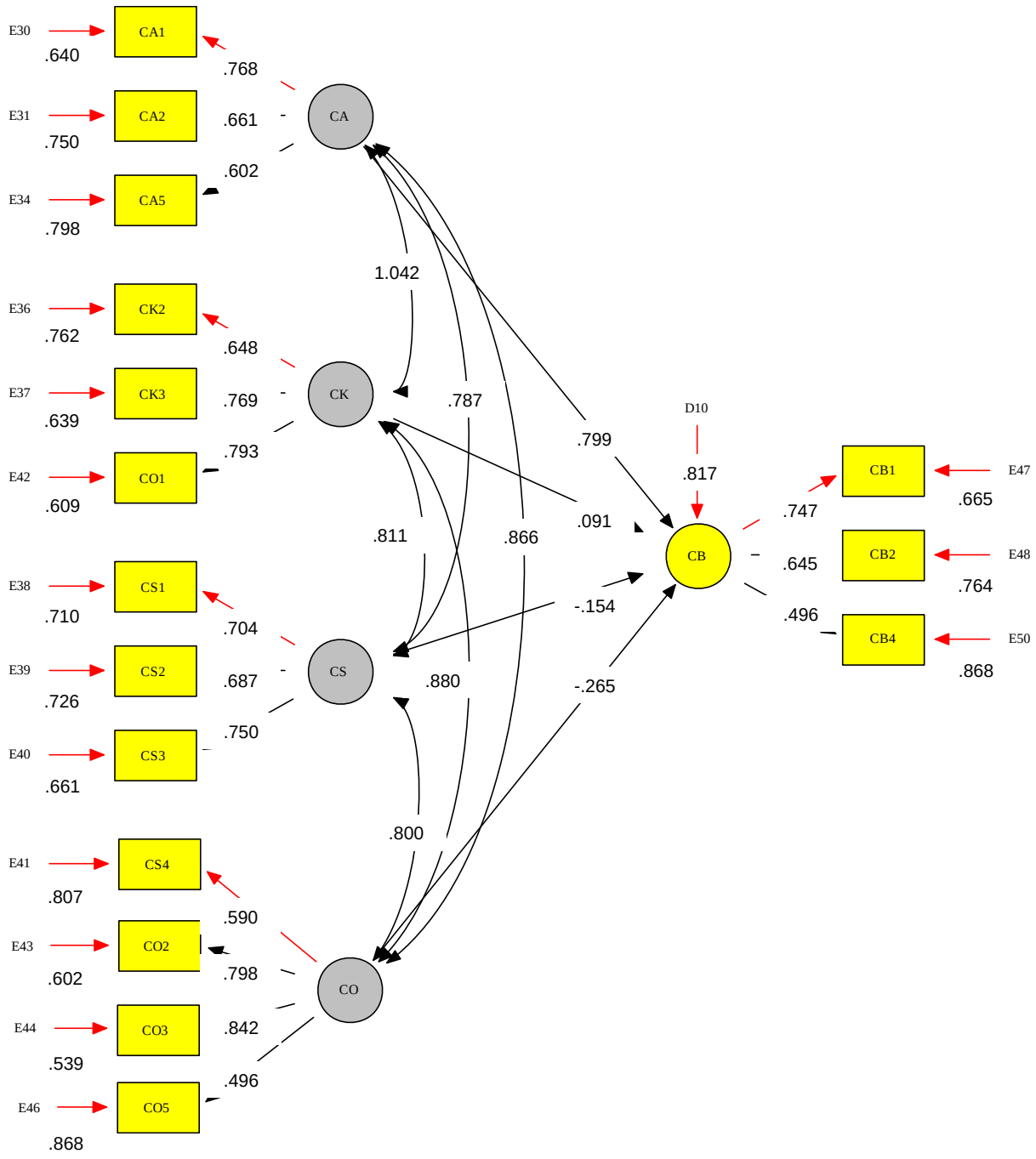


Figure 13. Communicate 5-factor final structural model.
A = Attitudes; K = Knowledge; S = Social Norms; O = Organizational Controls; B = Behaviors.
Rho = .919; S-B χ^2 = 195.0598 (*df* = 120); CFI = .963; RMSEA = .044; R^2 = .332.
Behaviors = .799*A + .091*K - .154*SN - .265*OC + .817 Disturbance

Attitudes at .799, Organizational Controls at -.265, Social Norms at -.154, and Knowledge at .091. These predictor factors accounted for an R^2 of .332.

Three additional models emerged as a result of employing the Walt test results. Knowledge was removed as a predictor of Communicate behaviors, resulting in the model displayed in Figure 14. The Wald test recommendations were employed again, and the

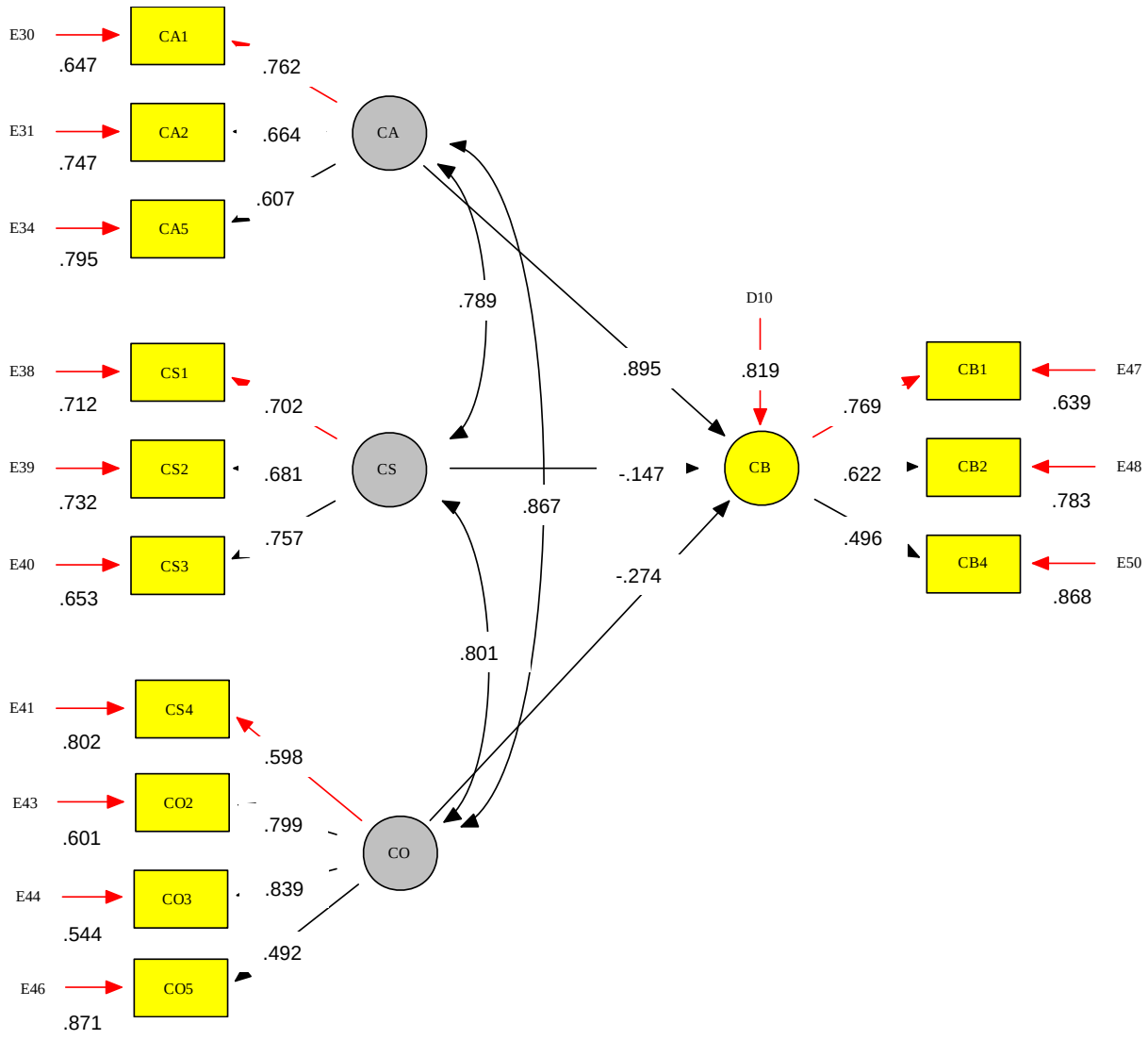


Figure 14. Communicate 4-factor final structural model (Knowledge omitted).
A = Attitudes; S = Social Norms; O = Organizational Controls; B = Behaviors.
Rho = .892; S-B χ^2 = 111.0584 (*df* = 59); CFI = .971; RMSEA = .040; R^2 = .329.
Behaviors = .895*A - .147*SN - .274*OC + .819 Disturbance

resulting model, displayed in Figure 15, used only attitudes and organizational controls to predict behaviors. Figure 16 displays the last and most parsimonious model in the first series of

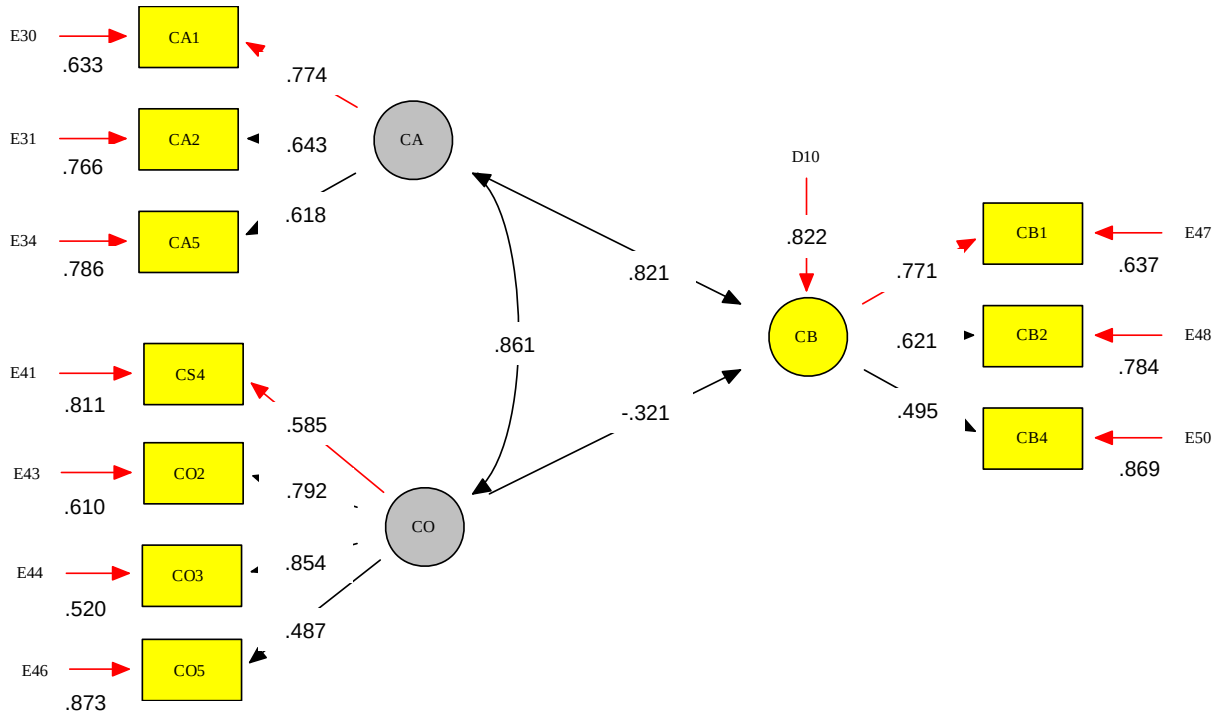


Figure 15. Communicate 3-factor final structural model (Knowledge & Social Norms omitted).
A = Attitudes; O = Organizational Controls; B = Behaviors.
Rho = .859; S-B χ^2 = 49.0821 (*df* = 32); CFI = .986, RMSEA = .031; R^2 = .324.
F10 = .821*A - .321*OC + .822 Disturbance

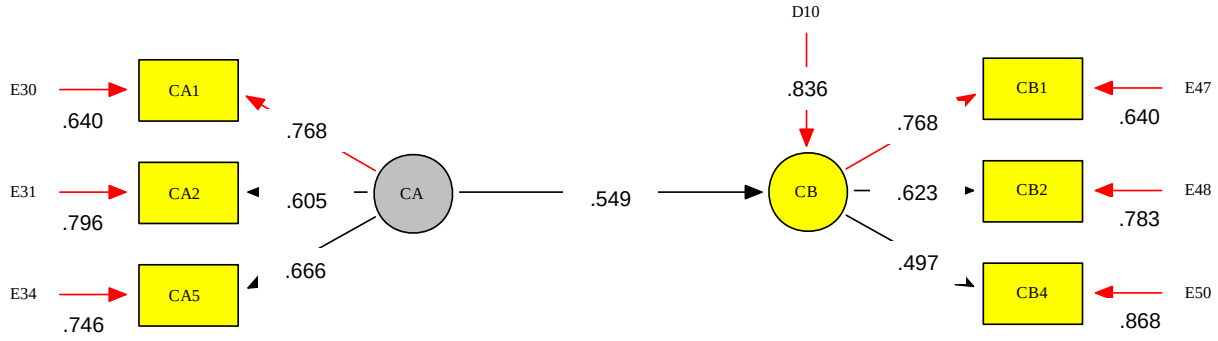


Figure 16. Communicate 2-factor final structural model (Knowledge, Social Norms, & Organizational Controls omitted).
A = Attitudes; B = Behaviors.
Rho = .781; S-B χ^2 = 17.6299 (*df* = 8); CFI = .982, RMSEA = .046; R^2 = .301.
F10 = .549*A + .836 Disturbance

Communicate models, in which behaviors were predicted solely using attitudes. Factor loadings, correlations among predictor variables, and regression coefficients between predictor and outcome factors are identified in Figures 14 through 16.

In fact, the complete correlation between Attitudes and Knowledge in the 5-factor Communicate structural model, and the omission of Knowledge in the Wald test-driven 4-factor model, stimulated an alternate analysis to test whether attitudes and knowledge represented a single construct. In the less parsimonious of these two alternate models, attitude and knowledge items were loaded on a single factor called Attitude/Knowledge, which was used along with social norms, and organizational controls to predict Communicate behaviors. This 4-factor, 14-item model is presented in Figure 17. Rho for this model was .906, and the normalized estimate for Mardia's coefficient was 44.85. Factor loadings for the predictor items ranges from .501 to .836, and for outcome variables from.497 to .754. Correlations among predictor factors ranged from .802 to .866. The single Attitude/Knowledge factor achieved a regression coefficient of .964, in contrast to Social Norms and Organizational Controls that each achieved a negative coefficient, -.285 and -.224, respectively.

By employing the Wald test recommendations to remove organizational controls, Communicate behaviors were next predicted by attitudes/knowledge and social norms; this model is displayed in Figure 18. No further recommendations emerged from the Wald test.

Embrace Models

Embrace baseline measurement model. Rho for the 5-factor, 29-item baseline measurement model was .951. The normalized estimate for Mardia's coefficient was 51.07, so I used the robust statistical analyses available in the EQS software. The CFI for this baseline measurement model was .770, and RMSEA was .074. Factor loadings ranged from -.006 to .873. The correlations among these five factors ranged from .207 to 1.000. This perfect correlation between Attitudes and Knowledge was resolved five model iterations later.

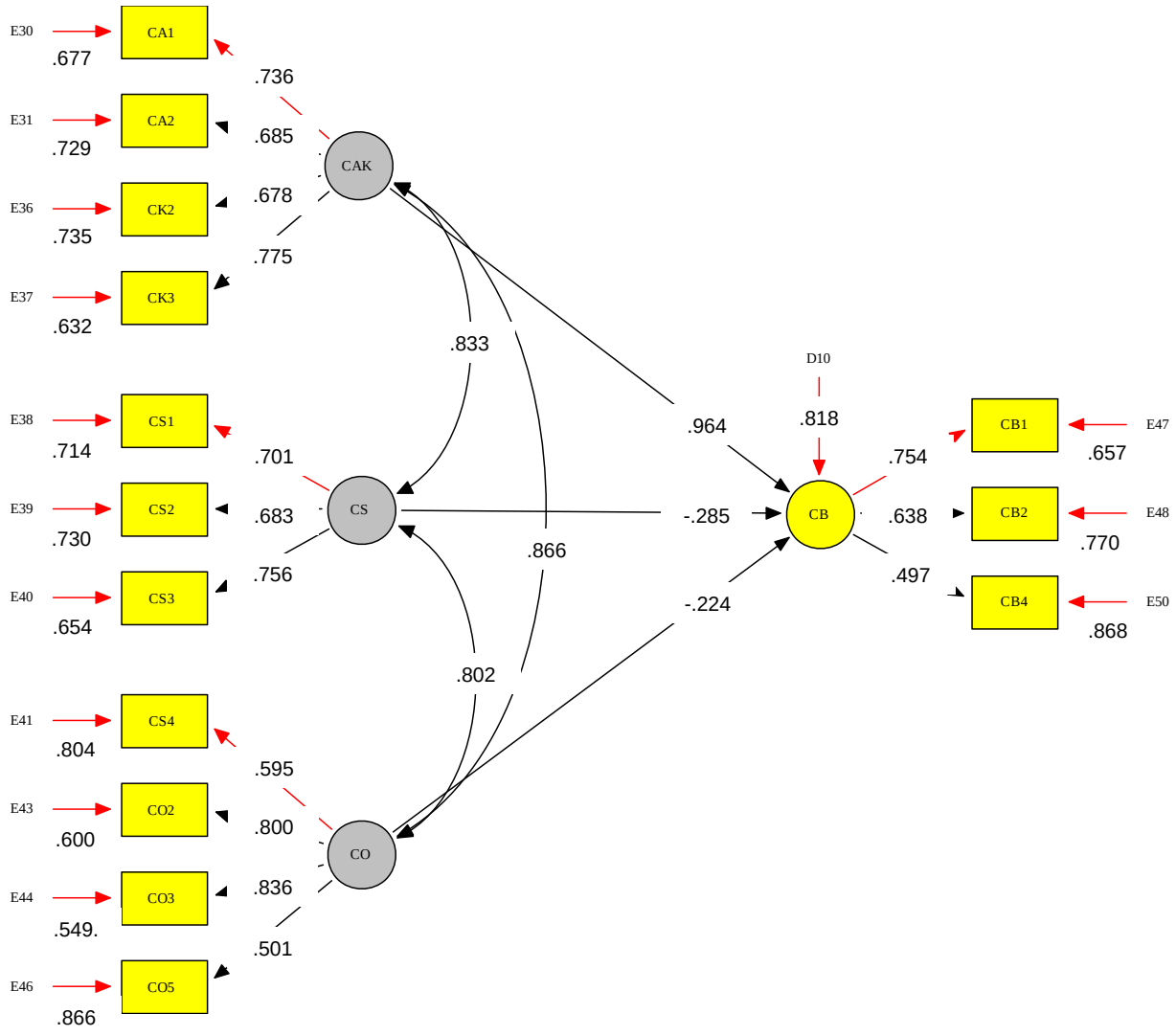


Figure 17. Communicate 4-factor alternate structural model (Attitudes & Knowledge combined into a single factor).
AK = Intrapersonal Attitudes and Knowledge; S = Social Norms; O = Organizational Controls; B = Behaviors.
Rho = .906; S-B χ^2 = 116.7379 (*df* = 71); CFI = .978; RMSEA = .034; R^2 = .332.
F10 = .964*AK -.285*SN - .224*OC + .818 Disturbance

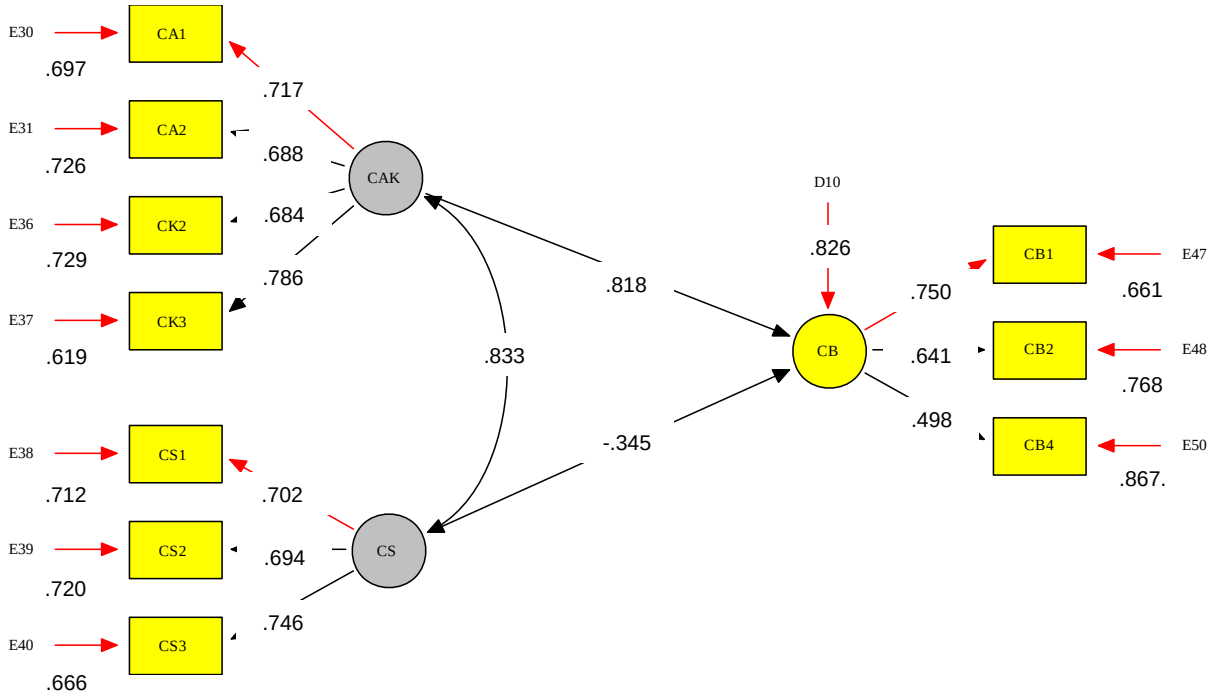


Figure 18. Communicate 3-factor alternate structural model (Attitudes & Knowledge combined into a single factor; Organizational Controls omitted).
AK = Intrapersonal Attitudes and Knowledge; S = Social Norms; B = Behaviors.
Rho = .871; S-B χ^2 = 60.8547 (*df* = 32); CFI = .978; RMSEA = .040; R^2 = .318.
F10 = .818*AK -.345*SN +.826 Disturbance

Embrace final structural models. Four factors emerged to predict behaviors in the final Embrace model. Social Norms and Organizational Controls were included as predictors, but Attitudes and Knowledge emerged as a single predictor factor in Step 1 of the SEM analyses. Further, three of the original Embrace survey items focused on physician-related topics, and these items emerged during the analyses as a new and separate predictor factor. This 5-factor, 17-item model is presented in Figure 19. Rho for this model was .925, and the normalized estimate for Mardia's coefficient was 50.09. Factor loadings for predictor items ranged from .541 to .870, and from .569 to .907 for outcome items. Correlations between predictor factors ranged from .383 to .776. The regression coefficient for using Social Norms to predict Embrace behaviors was -.032, .225 for Physician influence, -.228 for Organizational Controls, and .451 for Attitudes/Knowledge.

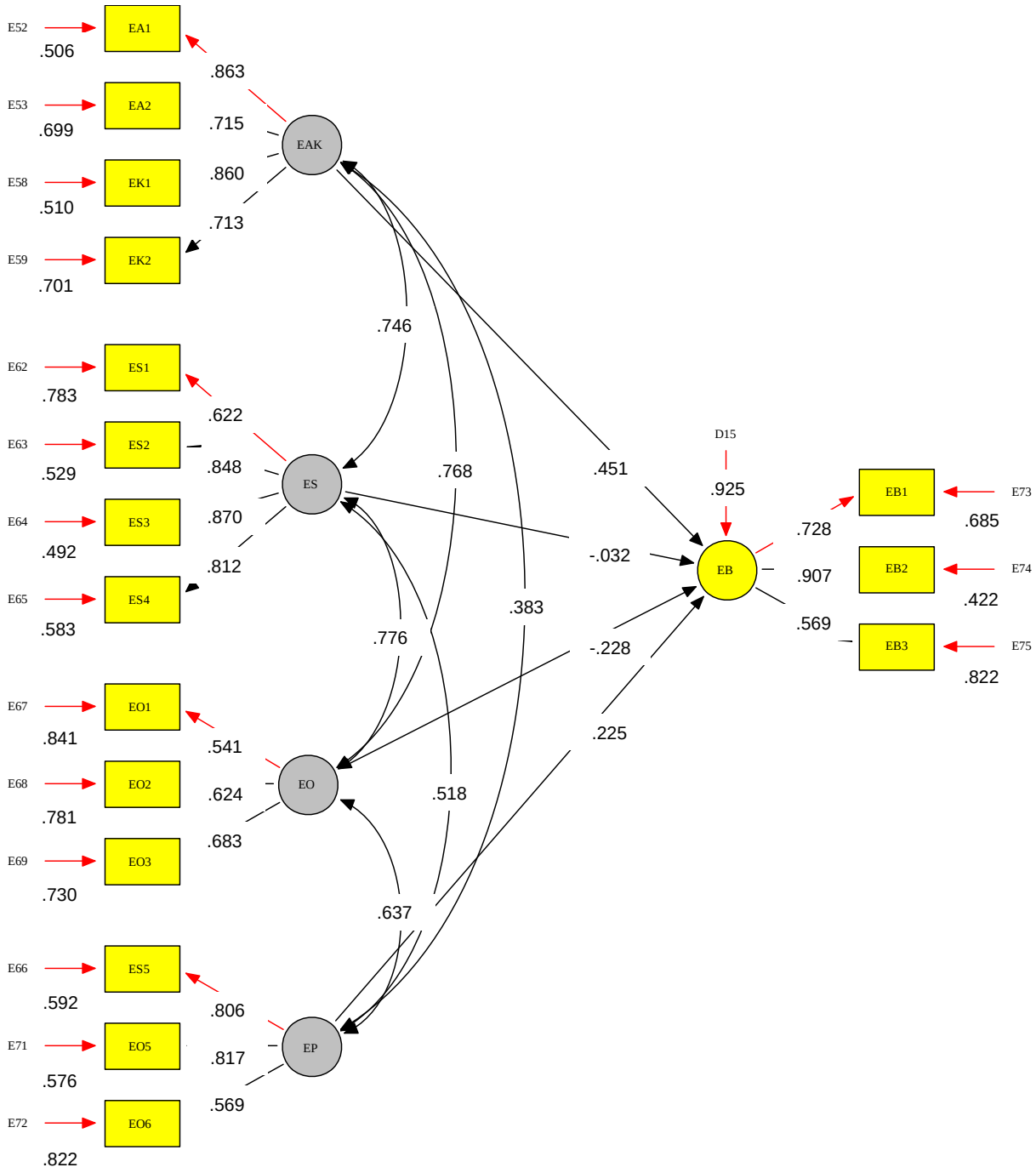


Figure 19. Embrace 5-factor final structural model (Attitudes & Knowledge combined into a single factor).
AK = Intrapersonal Attitudes and Knowledge; S = Social Norms; O = Organizational Controls; P = Physician Influences; B = Behaviors.
Rho = .925; S-B χ^2 = 274.0282 (*df* = 109); CFI = .951; RMSEA = .052; R^2 = .144.
F15 = .451*AK -.032*SN - .228*OC + .225*Phy + .925 Disturbance

Subsequent analyses using the Wald test results removed Social Norms, resulting in the model displayed in Figure 20. Fit indices improved substantially in this model, with essentially no loss in R^2. One additional Wald test recommendation was integrated, resulting in the model displayed in Figure 21, in which Attitudes/Knowledge and Physician Influence predicted Embrace behaviors.

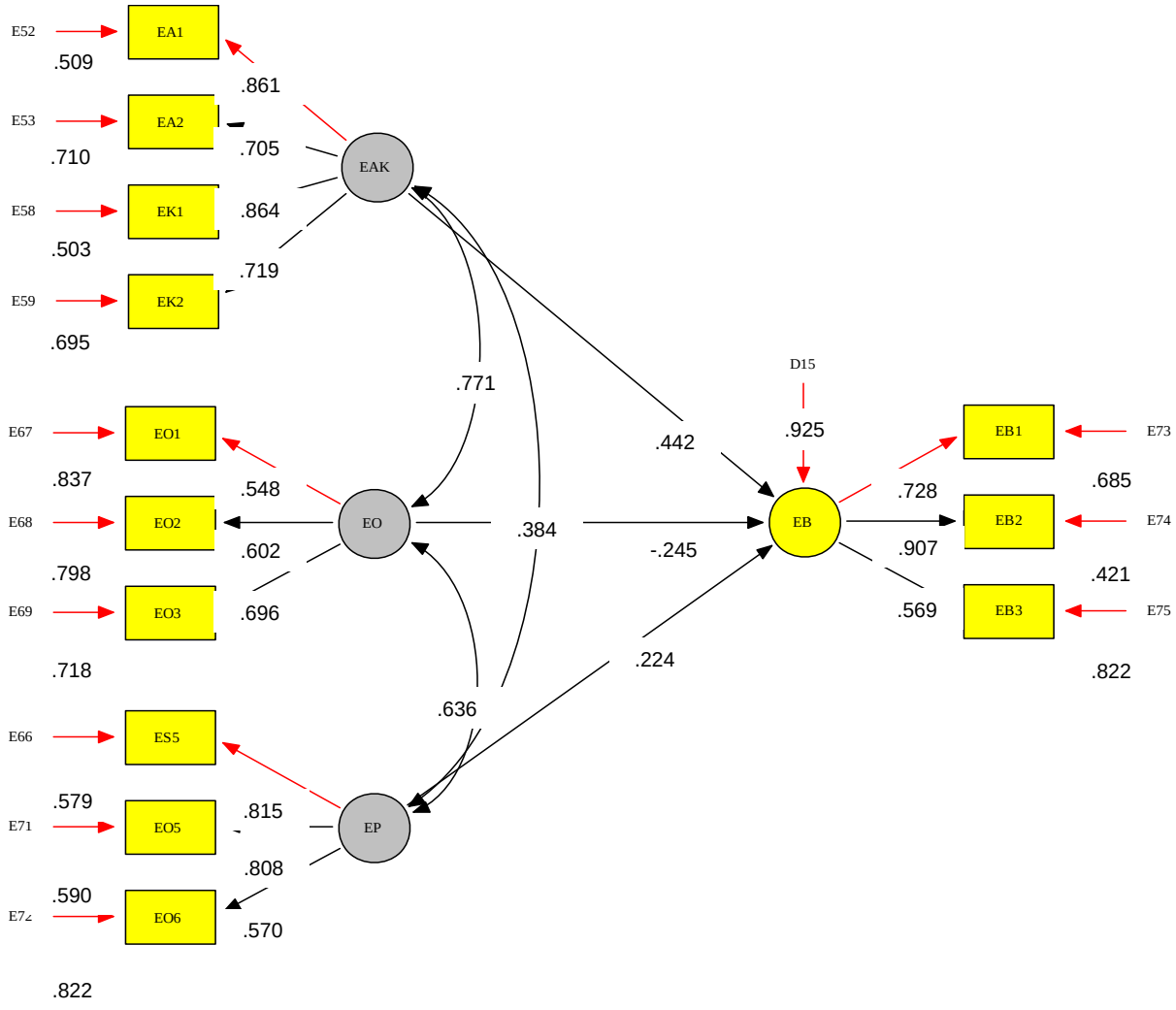


Figure 20. Embrace 4-factor final structural model (Attitudes & Knowledge combined into a single factor; Social Norms omitted).
AK = Intrapersonal Attitudes and Knowledge; O = Organizational Controls; P = Physician Influences; B = Behaviors.
Rho = .891; S-B χ^2 = 136.3025 (*df* = 59); CFI = .965; RMSEA = .048; R^2 = .144.
F15 = .442*AK -.245*OC + .224*Phy + .925 Disturbance

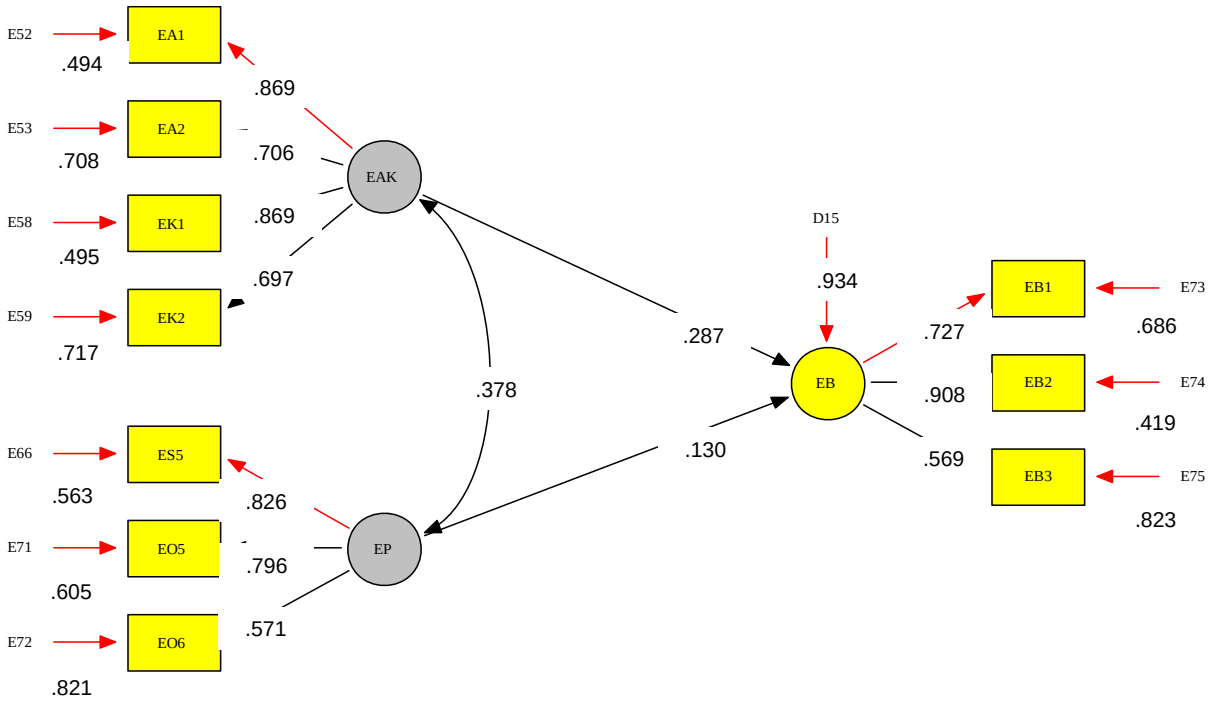


Figure 21. Embrace 3-factor final structural model (Attitudes & Knowledge combined into a single factor; Social Norms and Organizational Controls omitted).
AK = Intrapersonal Attitudes and Knowledge; P = Physician Influences; B = Behaviors.
Rho = .883; S-B χ^2 = 70.4106 (*df* = 32); CFI = .978; RMSEA = .046; R^2 = .127.
F15 = .287*AK + .130*Phy + .934 Disturbance

Review Models

Review baseline measurement model. Given that the normalized estimate for Mardia's coefficient for the Embrace 5-factor, 35-item baseline model was 70.67, the robust statistical analyses available in the EQS software were used for all model respecifications. Rho was .914 for the baseline mode. Three factor loadings for predictor variables were less than 4, and therefore unacceptable; acceptable predictor factor loadings ranged from .410 to .772. One factor loading for the outcome variables was less than .4, but the other five loadings on this factor ranged from .412 to .703. The CFI for this baseline measurement model was .732, and RMSEA was .073.

Review final structural models. Three series of model testing were conducted, with the first two rounds of analysis culminating in standardized coefficients that exceeded 1.0. These analyses revealed numerous highly correlated error terms and multiple items that crossloaded on factors other than those hypothesized. The third series of testing, however, merged Attitudes and Social Norms items into a single factor, and generated an acceptable 4-factor, 16-item model is presented in Figure 22. The reliability coefficient rho for this model was .897, and the normalized estimate for Mardia's coefficient was 53.43. Factor loadings for the predictor variables ranged from .515 to .852, and from .606 to .762 for the outcome variables. Correlations among the predictor factors ranged from .666 to .871. The regression coefficient for Attitude/Social Norms was .220, -.845 for Organizational Controls, and 1.064 for Knowledge. Using the Wald test recommendations, another model was evaluated after deleting the Attitude/Social Norms factor; this model is displayed in Figure 23.

Higher Order EBNC Model

Finally, I ran a confirmatory factor analyses testing the factorial validity of a second-order EBNC model, using the four ICER Model© behavioral factors as a measure of an EBNC. The normalized estimate for Mardia's coefficient was 64.52, so I used robust statistics to evaluate the model fit. Rho for the 5-factor, 13-item second-order model was .951. The CFI was .841, and RMSEA was .084. Factor loadings for the Identify variables ranged from .501 to .816, for Communicate variables from .537 to .807, for Embrace variables from .619 to .810, and for Review variables from .596 to .734. The factor loading between Identify and EBNC was .596, for Communicate 1.00 (as the disturbance term for Communicate had been constrained at the lower bound), for Embrace .823, and for Review .766.

When I constrained the variance of the Communicate disturbance term at 0.10, the model encountered no problems during optimization. Rho dropped to .893, the CFI was .827, and RMSEA was .087. Factor loadings for the Identify variables ranged from .506 to .814, for Communicate variables from .530 to .819, for Embrace variables from .619 to .811, and for

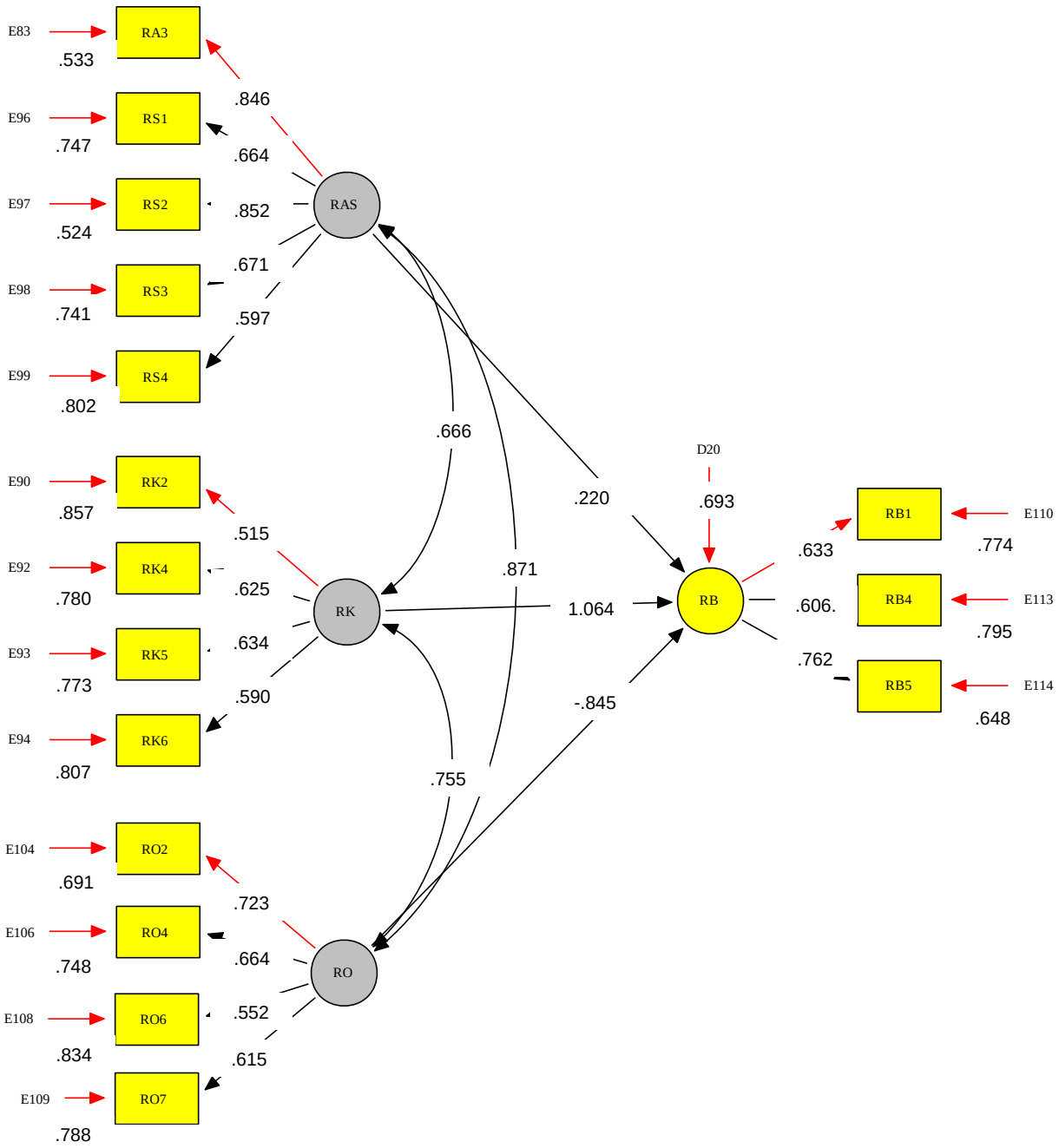


Figure 22. Review 4-factor final structural model (Attitudes & Social Norms combined into a single factor).
AS = Attitudes and Social Norms; K = Knowledge; O = Organizational Controls; B = Behaviors.
Rho = .897; S-B χ^2 = 298.0532 (*df* = 98); CFI = .912; RMSEA = .060; R^2 = .520.
F20 = 1.064*K - .845*OC + .220*AS + .693 Disturbance

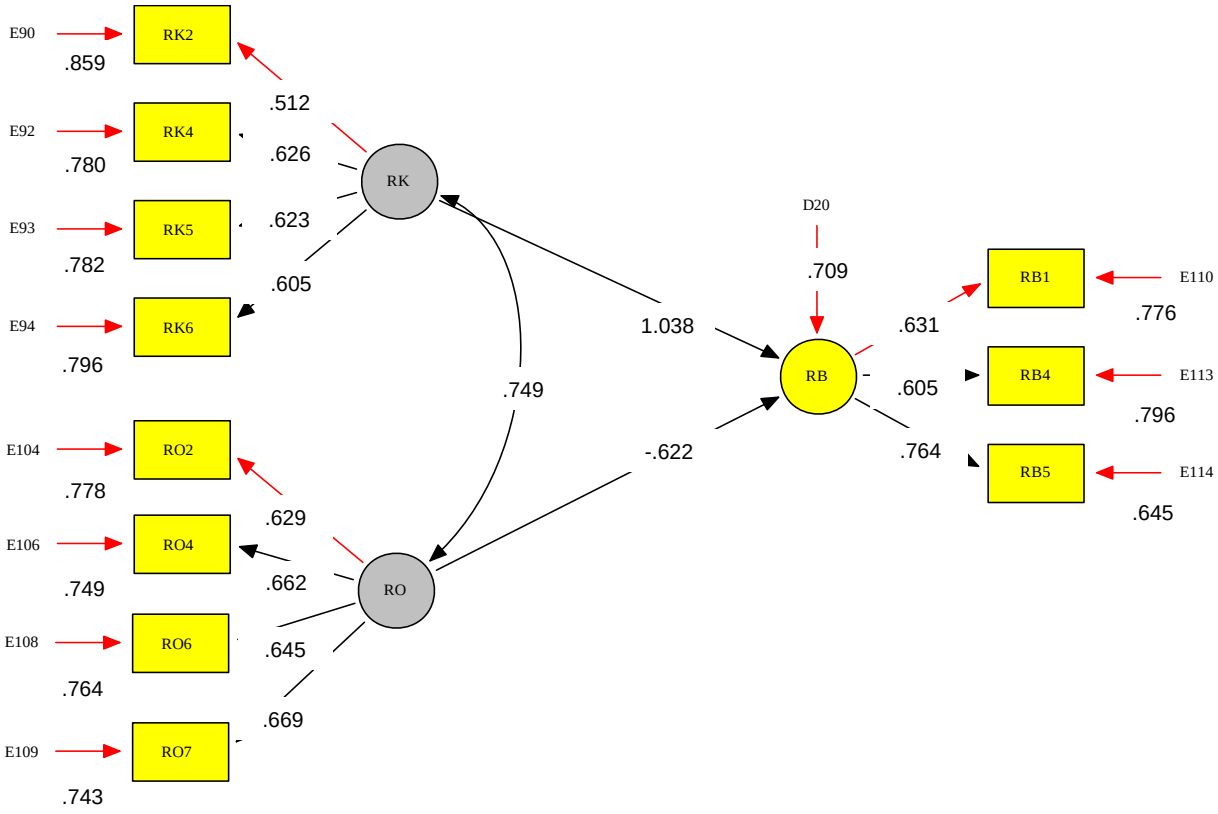


Figure 23. Review 3-factor final structural model (Attitudes & Social Norms combined into a single factor, but then omitted).
K = Knowledge; O = Organizational Controls; B = Behaviors.
Rho = .832; S-B χ^2 = 119.7672 (*df* = 41); CFI = .927; RMSEA = .059; R^2 = .497.
F20 = 1.038*K - .622*OC + .709 Disturbance

Review variables from .617 to .736. The factor loading between Identify and EBNC was .637, for Communicate .895, for Embrace .797, and for Review .812.

Table 5 presents a summary of the survey items that were retained in the final structural models.

Table 5. *Item Stems Retained in the Final Models of the ICER Model Measure of an Evidence-Based Nursing Culture*©

IDENTIFY # of items = 19								
A F1	V1 V2 V3 V88	Ia1 Ia2 Ia3 Ra8	• The research process used to create practice recommendations is trustworthy • The systematic review process used to create practice recommendations is trustworthy • The recommendations released by the EBP Comm are trustworthy • The findings of research studies conducted at my organization are trustworthy	**B** F5	V23 V24 V25 V26	Ib1 Ib2 Ib3 Ib4	• I read research articles in professional journals • I critique research articles • I critique guidelines before they are integrated into practice at my organization • I participate in a systematic reviews of the literature
K F2	V6 V7 V9 V11	Ik1 Ik2 Ik4 Ik6	• I know how to obtain research articles from professional journals • I know how to read and critique a research article • I know how to conduct a systematic review of the literature • I know how to develop a research protocol				
SN F3	V13 V14 V15	Is2 Is3 Is4	• My unit leaders understand the importance of best practice recommendations • My nursing director understands the importance of best practice recommendations • My CNO understands the importance of best practice recommendations				
OC F4	V17 V18 V19 V22	Is6 Io1 Io2 Io5	• Physicians & other interdisciplinary colleagues collaborate with nursing best practice recommendations • My organization has a process for prioritizing clinically relevant issues • My unit / team has a process for prioritizing clinically relevant issues • My hospital has enough resources (e.g., FTE's) to develop practice recommendations for clinically important issues				
COMMUNICATE # of items = 16								
A F6	V30 V31 V34	Ca1 Ca2 Ca5	• When the EBP Comm makes a best practice recommendation, I am confident that I will receive it • I am confident that the EBP Comm will respond to my questions and/or feedback about a best practice recommendation • The EBP recommendations communicated to me are applicable to my practice	**B** F10	V47 V48 V50	Cb1 Cb2 Cb4	• I receive practice recommendations developed by the EBP Committee • I carefully review best practice recommendations that I receive • I ask my EBP leaders about best practice recommendations that I do not understand
K F7	V36 V37 V42	Ck2 Ck3 Co1	• When I do not understand a new practice recommendation, I know who to contact to get help • Practice recommendations released by the EBP Committee are typically clear and understandable • I understand how best practice recommendations are communicated to me (e.g., face-to-face, e-mail, flyers)				
SN F8	V38 V39 V40	Cs1 Cs2 Cs3	• New practice recommendations are welcomed by nurses on my unit / team • Nurses on my unit / team share information with others in my group • Unit leaders encourage my questions until I can understand a new practice recommendation				
OC F9	V41 V43 V44 V46	Cs4 Co2 Co3 Co5	• Physician and other colleagues are informed about new nursing practices that overlap with their practice • Best practice recommendations are disseminated in a predictable manner • I like the mechanism my organization uses to communicate best practice recommendations to me • I have enough time to read and review new practice recommendations in order to understand them				

Note. Blue = Reverse-coded items; Green = Verbiage may need to be adjusted to suit local organization completing the scale

Table 5 (Continued). *Item Stems Retained in the Final Models of the ICER Model Measure of an Evidence-Based Nursing Culture*©

EMBRACE # of items = 17							
AK F22	V52 V53 V58 V59	Ea1 Ea2 Ek1 Ek2	• Using EBP recommendations helps to improve the care I provide • If the EBP Comm makes a best practice recommendation, I will change my practice • The EBP Comm's best practice recommendations can be integrated into my nursing practice • The EBP recommendations are easy to integrate into nursing practice	**B** F15	V73	Eb1	• I change my practice to integrate best practice recommendations for nursing practice
SN F13	V62 V63 V64 V65	Es1 Es2 Es3 Es4	• Nurses on my unit / team are eager to use new practice recommendations • My leaders are eager to help me use new practice recommendations • New practices for improving our nursing care are welcomed by my unit leaders • My nursing director is very supportive of helping my team achieve an evidence-based practice		V74 V75	Eb2 Eb3	• I change my practice when a new recommendation is released • If needed, I seek help for integrating the recommendation into my practice
OC F14	V67 V68 V69	Eo1 Eo2 Eo3	• The EHR promotes my use of best practice recommendations • Patient equipment needed to provide best practice is available • I have enough time to implement best practice recommendations without cutting corners				
Phy F21	V66 V71 V72	Es5 Eo5 Eo6	• Physicians & other interdisciplinary colleagues are receptive to changing practice in order to improve outcomes • Recommendations for best nursing practice are coordinated effectively with the practices of physicians and other disciplines • Physician preferences do not match nursing practice				
REVIEW # of items = 16							
AS F24	V83 V96 V97 V98 V99	Ra3 Rs1 Rs2 Rs3 Rs4	• New ideas for improving our nursing care are welcomed by my unit leaders • The nurses on my unit / clinical team share ideas with each other about our outcomes • My unit / team culture makes it feel safe to acknowledge practices that need to be improved • My unit / team gets excited when we are able to improve our performance • My unit/team collects data in order to measure outcomes that we are trying to improve	**B** F20	V110 V113	Rb1 Rb4	• I forward my questions or ideas for improving patient care to my leaders or the EBP Committee • I inform my unit / team leaders when I see inconsistencies in practice among nurses
K F17	V90 V92 V93 V94	Rk2 Rk4 Rk5 Rk6	• I think of questions or ways to improve nursing care • When I have an idea for improving patient care, I know how to get it to my EBP leaders • I am able to understand the graphs and reports about practices or outcomes that my team is trying to improve • I feel capable of helping my team interpret study findings that form the basis of practice recommendations		 V114	 Rb5	• I have participated in interpreting how research recommendations should affect our unit practice
OC F19	V104 V106 V108 V109	Ro2 Ro4 Ro6 Ro7	• My unit / clinical team has sufficient opportunities to review the quality of our nursing care • Practice recommendations derived from research conducted at my org are supported by senior leadership • Resources for analyzing data are available to me or my team • I have confidence that QR and EBP teams can accurately measure nursing outcomes after a new practice has been implemented				

Note. Blue = Reverse-coded items; Green = Verbiage may need to be adjusted to suit local organization completing the scale

CHAPTER 4

DISCUSSION

Each model of the four essential behaviors associated with an EBNC achieved acceptable/adequate or good fit (Hu & Bentler, 1999). The best-fitting final models achieved prior to employing the Wald test recommendations were, in descending order of the CFI and RMSEA goodness-of-fit indices, Communicate, Embrace, Identify, and Review. Two of these models, Identify and Communicate, used all of the four original four factors – Attitudes, Knowledge, Social Norms, and Organizational Controls – hypothesized to predict Behaviors. Two other models, Embrace and Review, merged two factors into a single construct. In the Embrace model, Attitudes and Knowledge represented a single construct, and in the Review model, Attitudes and Social Norms combined as a single construct. A new factor related to physician influence emerged in the Embrace model, a confluence enabled by having inadvertently included three physician-related items within Organizational Controls. The final ICER© structural models are summarized in Figure 24.

Another global perspective of an EBNC is attained by inspecting the most parsimonious version of the four behavioral models; i.e., the models generated after employing the complete set of Wald test recommendations. The final and most parsimonious ICER© structural models are summarized in Figure 25. The same order of model fit was achieved for these streamlined models as for the larger models. However, Knowledge emerged as the strongest of the three predictors for Identify Behaviors, along with Organizational Controls and Attitudes, in descending order. Attitudes were used solely to explain Communicate behaviors. Embrace behaviors were predicted by Attitudes/Knowledge and by Physician Influences. Finally, Review behaviors were predicted by Knowledge and Organizational Controls. Five of the eight factors

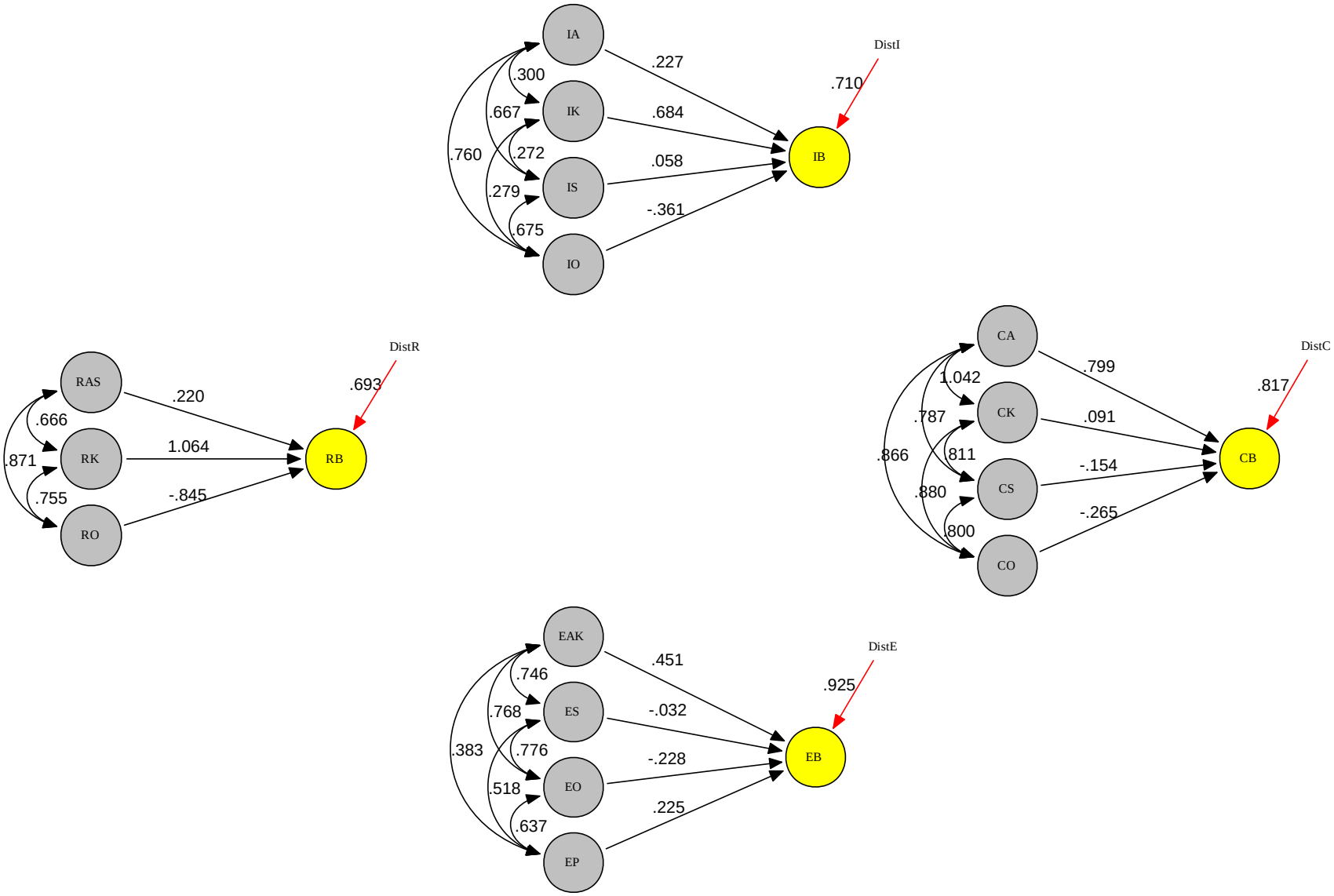


Figure 24. Predictors retained in the final ICER© structural models.

Note. I = Identify, C = Communicate, E = Embrace, R = Review; A = Attitudes, K = Knowledge, S = Social Norms, O = Organizational Controls, AK = Intrapersonal Attitudes & Knowledge, P = Physicians; ↻ = Standardized covariance, → = Regression coefficients; Dist = Disturbance Term

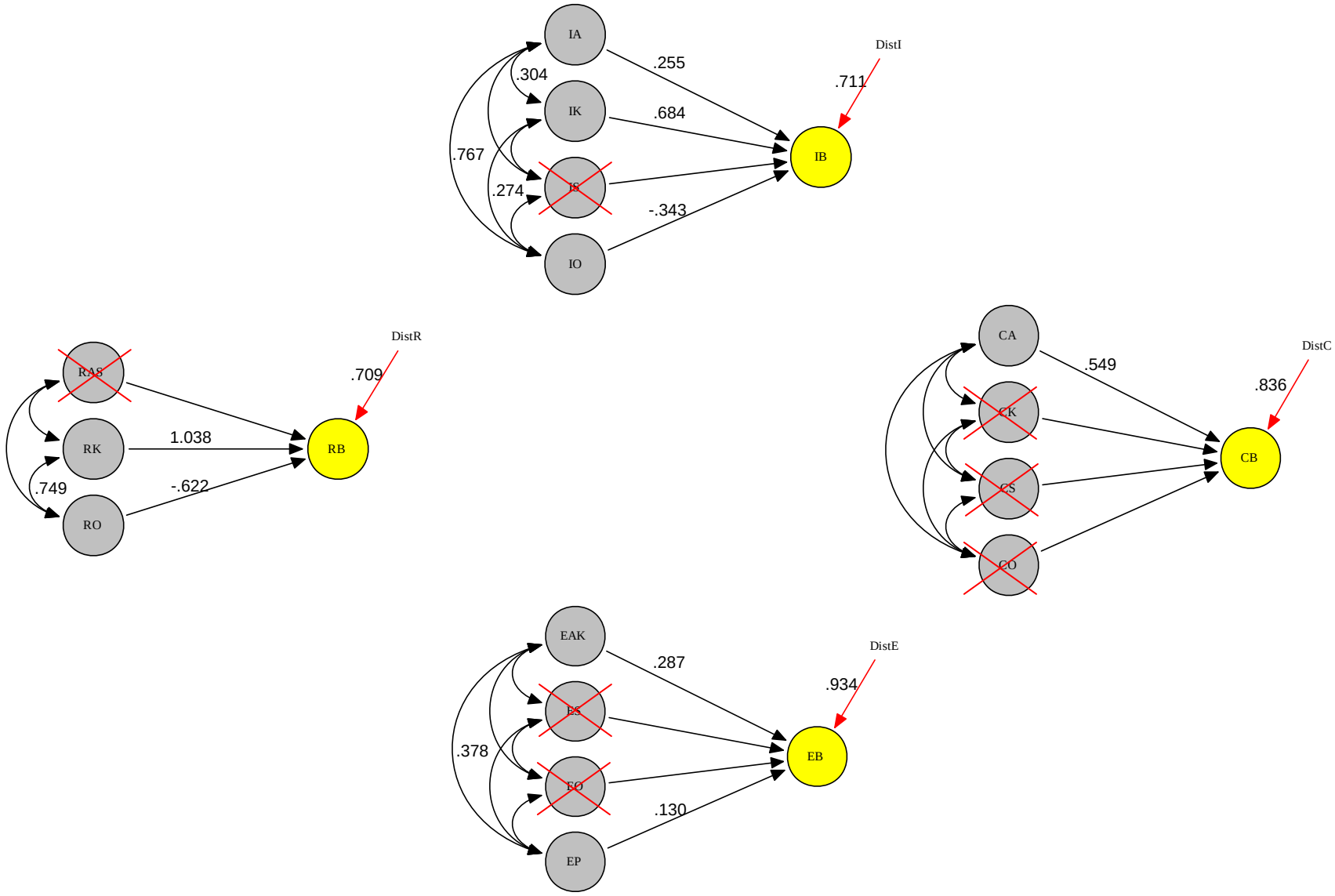


Figure 25. Predictors retained in the final and most parsimonious ICER© structural models.

Note. I = Identify, C = Communicate, E = Embrace, R = Review; A = Attitudes, K = Knowledge, S = Social Norms, O = Organizational Controls, AK = Intrapersonal Attitudes & Knowledge, P = Physicians; ↻ = Standardized covariance, → = Regression coefficients, X = Factors omitted using Wald test results; Dist = Disturbance Term

retained in these four ICER© Behaviors were Attitudes and/or Knowledge, two were Organizational Controls, and one was Physician Influence.

A third vantage point from which to appraise an EBNC is offered by the R^2 results. The proportion of behavioral variance accounted for was .520 in the Review model, .496 in the Identify model, .332 in the Communicate model, and a mere .144 in the Embrace model. I point out that the order in which these models accounted for behavioral variance was almost the opposite of the order of model fit. Perhaps the range of R^2 results is attributable to the level of consistency inherent within each behavioral model. That is, the specificity inherent in Identify and Review behaviors promotes their stability across a diversity of best practice topics; in contrast, Communicate and Embrace activities are likely to vary according to the subject matter. Under these conditions, responses would have incurred greater variation for Communicate and Embrace behaviors, and lesser variation for Identify and Review behaviors. Dynamic conditions within the participating healthcare organization may further explain the inconsistent R^2 results. That is, communication parameters, including message content and delivery, while disseminating new or updated practice recommendations have historically been driven in the participating healthcare organization by the distinct preferences of a shift, nursing unit, facility, and even the discipline affected by the message; moreover, they vary depending on the message source. Accordingly, the R^2 for Communicate and Embrace may have suffered from the shortfall of specificity within their observed variables and from amplified variation in respondent scores in contrast to the specificity and stability intrinsically associated with the Identify and Review survey items.

Having presented an overarching summary of the study findings, in the next section I summarize the notable findings for each of the ICER© behavioral models. I will then return to the discussion of two perplexing findings – the negative regression coefficients associated with Organizational Controls in all models and the omission of Social Norms in the most

parsimonious models – and consider their implications for the theoretical frameworks used in this study.

Summary of Models

Identify

The final 5-factor structural model used Attitudes, Knowledge, Social Norms, and Organizational Controls to predict Identify behaviors. Social Norms, however, was omitted in the subsequent 4-factor model. Both models achieved CFI and RMSEA fit indices that were acceptable (Hu & Bentler, 1999). The strongest predictor in both Identify models was Knowledge, with a regression coefficient of .684 in the 4-factor model. Attitudes also explained Identify behaviors, although the regression coefficient for this predictor was .255. Organizational Controls were negatively related, i.e., -.361, to the identification of best practice recommendations, an intriguing finding that will be examined below. However, the cognitive basis of Identify procedures is consistent with nursing culture at the participating organization where these behaviors prioritize the creation of new, or evaluation of existing or recently released, guidelines (e.g., De Bleser et al., 2006) and systematic reviews (e.g., Houser & Bokovoy, 2006), as well as the conduct of research (e.g., Titler et al., 2001), that collectively culminate in a nursing practice recommendation with local relevance (Chulay, 2006; Graham et al., 2006). In the face of a correlation of .767 between Attitudes and Organizational Controls, coupled with low correlations between each of these two predictors and Knowledge, the behaviors associated with crafting best practice recommendations emerge as a knowledge-based skill set that may be best accomplished by healthcare professionals with expert training.

Communicate

The baseline 5-factor structural model used Attitudes, Knowledge, Social Norms, and Organizational Controls to predict Communicate behaviors. Using the Wald test recommendations, three additional models were developed, in which Knowledge, Social Norms, and Organizational Controls were removed, respectively. All four models were well-fitted,

achieving CFI and RMSEA fit indices that were acceptable. Organizational Controls remained in the model through its third iteration, therein representing the strength of its association, and the regression coefficient was -.321. The most parsimonious model used Attitudes solely to explain Communicate Behaviors, with a significant regression coefficient of .549 in this 2-factor model. The survey items retained in this model highlight that effective communications related to the evidence-based agenda entail reciprocal communication of recommendations that are fully relevant to one's nursing practice.

Embrace

Attitudes and Knowledge merged as a single predictor of Embrace behaviors. Indeed, nursing behaviors are generally under the volition of the individual clinician, thereby influenced by one's attitudes. Yet, these behaviors also typically require an informed understanding of, and/or a specialized skill set associated with, innovative nursing practice recommendations. That is, engagement with best practice requirements is founded on both a choice and an ability to embrace. Thus, some team members cannot specialize in the Knowledge component whereas others specialize in the Attitude component; instead, their coexistence within an individual clinician is pivotal to embracing best practices. However, an unexpected finding was the association, and the magnitude of that association, exerted by physicians on nurses' Embrace of best practice recommendations. This factor emerged in the 5-factor model, and was retained in the subsequent two models. In fact, in the third and final iteration of the Embrace model, the regression coefficient for physician influence was almost half as strong as the regression coefficient for intrapersonal Attitudes/Knowledge. Social Norms and Organizational Controls were retained in the 5-factor model, but Social Norms was deemed redundant and removed in the second iteration of the model. Organizational Controls sustained a negative regression coefficient, although this factor was omitted from the model in its third iteration. A review of the survey items retained in the scale emphasize that nurses must be able to collaborate effectively with physicians and other interdisciplinary colleagues in order to

embrace best practices. These findings suggest that significant forward momentum can be achieved in the evidence-based agenda by incorporating persuasive principles in the communication procedures designed to enhance the motivation of RNs to readily and accurately integrate the best practice recommendations. Likewise, these findings validate the assertions that a research-based healthcare environment requires widespread organizational support (Redfearn et al., 2004) that includes effective interdisciplinary collaboration.

Review

The final Review structural model merged Attitudes and Social Norms as a single predictor factor, culminating in a 4-factor model. However, this merged construct was not retained in the parsimonious 3-factor model. Knowledge was the most powerful predictor of Review behaviors. These findings highlight that outcome evaluations require knowledge-based skill sets, as is the case with Identify behaviors. Organizational Controls was the other factor retained in the parsimonious model which also strongly predicted Review behaviors, albeit inversely. This negative relation and its implications for a healthcare organization committed to achieving an EBNC will be explored more fully below. However, these findings emphasize that the clinical priorities identified, and challenges experienced, by clinicians working at the point of care should be incorporated as part of the formal Review processes needed to actualize an EBNC.

EBNC

The procedures testing the validity of an EBNC using the four ICER Model© behaviors generated inadequate CFI and RMSEA goodness-of-fit results, 0.827 and 0.087, respectively. Likely sources of misspecification in both models include “omitted variables or factors…and omitted or extra causal paths or factor loadings” (Rindskopf, 1984, p. 112). For example, the inclusion of three physician-related items for Embrace Organizational Controls facilitated an unplanned opportunity to recognize the statistically unique influence of physician parameters on nursing behaviors. Further, the LM test results for the Review structural model documented that

enabling a correlated error term between two physician-related variables would substantially improve the model. Regrettably, I did not include items to evaluate physician influence within each of the other three behavioral categories. These findings and additional sources of model misspecification are considered below, encouraging further research to refine the understanding and measurement of an EBNC.

Intriguing Results

Organizational Controls

Organizational Controls were retained in the Identify, Communicate, and Review behavioral models, and in the Identify and Review most-parsimonious models. Yet, it is noteworthy that in each of these behavioral models, the Organizational Controls regression coefficient was negative. I emphasize that an inverse relation is not the same as a low mean score. Instead, as Organizational Control scores increased, scores for evidence-based nurse behaviors went down. That is, nurses' capacities to behave in accordance with the evidence-based agenda declined as Organizational Controls were allocated.

However, in the Embrace structural model, sufficient physician-related items had, unintentionally, been included to evaluate their influence separately from the other Organizational Control items. Intriguingly, the regression coefficient for the Physician factor was positive whereas the Organizational Control was negative. Future research should explore whether these findings hold true in the three other behavioral models. These findings also generate curiosity about whether the negative relation identified between Organizational Controls and behaviors have achieved greater magnitude than those established in this study had the positive relation between physician influences and behaviors been separated from the other Organization Control items. Non-physician Organizational Control items focused on the EHR, access to equipment, and time in the Embrace model; on the clinical relevance or importance of topics under review in the Identify model; time, measurement competence and resources, and support from senior leadership in the Review model; and on the use of

predictable and acceptable dissemination mechanisms and on sufficient time to review and understand the new recommendation in the Communicate model. Indeed, a fairly limited range of resources were assessed in these Organizational Control items. Thus, it will also be helpful to expand and/or increase the specificity of the nonphysician organizational predictors that might directly influence an evidence-based culture.

Nevertheless, the consistency of the negative association between Organizational Controls and each of the evidence-based Behaviors is troubling, and merits additional deliberation. Indeed, nurses may feel that the issues prioritized by the organization compete with their ability and/or the resources needed to be able to craft, disseminate, and evaluate evidence-based nursing practices. Practices and/or outcomes rigorously monitored by accrediting or governing agencies are characteristically related to nursing care, but the degree of their application varies by, and in some cases does not even apply to, specific service lines (e.g., cardiovascular, orthopedic, and medical services). For example, pressure ulcer prevention in the acute care setting is a hot topic nationally, but it is not considered a probable complication on the Birthing Unit; yet, the implementation of *passive descent* during labor and delivery, known to improve outcomes for both mother and baby, is not part of the national agenda. Again, fall prevention is another important national agenda, but it not viewed as a highly probable complication in the Intensive Care Unit; yet, the implementation of routine cognitive/delirium assessments, linked to improved short- and long-term outcomes for critically ill patients, is not a standard practice in many of these specialty units across the nation.

In reality, the negative regression coefficients between Organizational Controls and evidence-based nursing behaviors identified in this study may highlight that the priorities established at the national level and adopted and prioritized within the local healthcare organization, and the resources allocated to these priorities, may antagonize the practice issues perceived by nurses to be most relevant to *their* practices. The agenda to achieve best outcomes may be well-served by specifying priorities within a service line, and by incorporating

nurses' viewpoints and perspectives into a reexamination of these priorities. In fact, these perspectives have not gone unnoticed by nurses new to their profession:

> JHACO [*sic*] heavily regulates nursing and continuously adds more and more responsibilities for nurses. The more regulations they create the more difficult and stressful our "nursing" tasks become. It's getting ridiculous- all the paperwork we have to do and all the strings/ politics we have to deal with just to care for patients. Are the patients even the primary focus in health care? They should be. The people at JHACO [*sic*] should be required to work as floor nurses when and before making new regulations. (Pellico, Brewer, & Kovner, 2009, p. 198)

Further, and specifically regarding the Review behaviors and processes, two levels of appraisal should be emphasized in order to achieve an evidence-based nursing culture. The first level is the prevailing, formal, highly visible endeavor within a healthcare organization that involves the quality improvement and research teams. However, a second level of evaluation is already innately entrenched within the contact that occurs as nurses provide care to their patients, but it has received almost no formal attention. In fact, the items used to measure Knowledge, coupled with the strength of that factor's regression coefficient, substantiated that nurses felt capable of engaging in *thoughtful reflection* on their practice (e.g., Kitson, 2002; Mantzoukas, 2008) and communicating their comments and opinions to the formal Review team. Sadly, these same participants perceived the Review agenda sanctioned by the organization's senior leadership to be inconsistent with the Review behaviors necessary for achieving an EBNC.

Tucker et al.'s (2002) recommendation to incorporate a coordinator to investigate clinical challenges and to support the development of new practice recommendations seems particularly fitting as one option for resolving the challenges observed by study participants. Sackett (1983) proposed that when "experts" fail to be invigorated by younger, brighter, unencumbered minds, it is time for mandatory retirement. Indeed, much more emphasis should be placed on forwarding the thoughtful perspectives of and/or frustrations experienced by staff nurses to the formal Review team. In fact, if nurses could be granted sufficient time to review their practice, and if their frustrations could be framed as sources of potential improvement, the

Attitudes/Social Norms factor might conceivably reemerge as a significant predictor under those conditions.

Social Norms

Given its emphasis in the Theory of Planned Behavior, the failure of Social Norms to contribute significantly to ICER© behaviors was an unexpected finding, exemplified by its omission from each of the most-parsimonious models. Perhaps Social Norms was defined too narrowly, or even too broadly. For example, items addressing managerial and physician support were initially specified to load on Social Norms. In the analyses, however, managerial items were retained within Social Norms, but physician and interdisciplinary support was relocated to load on Organizational Controls. The unexpected finding that physician parameters significantly and uniquely contributed to nurses' Embrace behaviors inspires an evaluation of managerial support as a separate predictor in future studies. Three of the four items used to measure Embrace Social Norms focused on nursing leaders – their receptivity to and support for, and their eagerness to help nurses embrace, new recommendations. Is it possible that Social Norms failed to contribute to the model because the influence of nursing leadership on Embrace behaviors is not perceived by many RNs as important, or that it is perceived by many RNs to be nonexistent? At minimum, respondents in this study documented that their managers and senior nursing leaders offer nothing unique statistically to a nurse's ability to behave in accordance with the evidence-based agenda. Alternatively, one LM Test revealed that an Embrace item about nursing director support was significantly related to physician influence. Thus, the potential collinearity among a broad range of leadership influences should also be explored for its influence on or interference with a nurse's autonomy to embrace best practices. Further, respecifying social normative determinants of evidence-based nursing behaviors in forthcoming studies may help to uncover inconsistencies between staff and manager perceptions of the evidence-based agenda (e.g., Kovner & Rundall, 2006; Rycroft-Malone, 2008).

In fact, some of these conceptual themes have been referenced in the evidence-based nursing literature. For example, Estabrooks (2007a) emphasized the need for clinicians, managers, and researchers to coordinate their priorities. Under conditions of hospital restructuring, another study found that nurses with leaders having high levels of emotional intelligence described superior workgroup collaboration and teamwork with physicians than nurses working for leaders out of touch with their employees (Cummings, Hayduk, & Estabrooks, 2005). Reviewing measurement challenges associated with the science of implementing evidence into healthcare practice, Titler (2007) noted the importance of clinician autonomy, stating "culture (an independent concept [from that of context used in measures of research utilization]), defined as *freedom to make important patient care and work decisions*, is described by organization and system experts as autonomy (Becerra & Gupta, 2003; Scott et al., 2003)" (p. S55). Indeed, upon closer inspection, nurses typically provide care to patients autonomously, only rarely observing the care delivered to patients by their nursing peers.

Theoretical Frameworks

The Theory of Planned Behavior categorizes Knowledge as a Behavioral Control. During the literature review for this study, I categorized behavioral predictors into intrapersonal, interpersonal, and organizational determinants; I included knowledge and attitudes as the intrapersonal predictors, but specified them as separate factors. However, Knowledge did not load on the Organizational Controls factor in any of the behavioral models. In fact, Attitudes merged with Knowledge as single intrapersonal factor in the Embrace model and in an alternate Communicate model. Crano and Prislin (2006) suggested that an attitude

> … represents an evaluative integration of cognitions and affects experienced in relation to an object. Attitudes are the evaluative judgments that integrate and summarize these cognitive/affective reactions. These evaluative abstractions vary in strength, which in turn has implications for persistence, resistance, and attitude-behavior consistency (p. 347).

This definition supports blending attitudes and knowledge into a single intrapersonal factor that predicted Communicate behaviors in this study.

Another interesting deviation from the Theory of Planned Behavior was that Social Norms and Attitudes merged as a single predictor in the Review model, although it was not retained in the parsimonious model. However, the redundancy of Social Norms in predicting ICER© behaviors, and its omission from each of the parsimonious behavioral models, was troubling. These findings may suggest that the Theory of Planned Behavior has limited application for employees for whom behaviors are mandated by best practice recommendations and other policies and procedures established by the healthcare organization.

On the other hand, much of the research founded on the Theory of Planned Behavior has evaluated specific behaviors or behavioral intention. In fact, the improved R^2 associated with the specific behaviors inherent in the Identify and Review evaluations in comparison to the less specific behaviors evaluated in the Communicate and Embrace suggest that the measures developed in this study may fare better when the items can be modified to focus on specific, rather than general, evidence-based recommendations and behaviors.

Study Limitations

Several limitations associated with this study undoubtedly influenced the performance of the models. Negatively-stated items did not perform well. After reverse-coding all seven negatively-stated items, factor loadings for five of them ranged from .107 to .398. Only two of the negatively stated items performed well. The first of these achieved a factor loading of .517 in the Communicate model, but a similar positively stated item performed better and was retained in the final model. The other negatively stated item was retained in the Embrace structural model. Future iterations of the measure should consider restating these negatively stated items in the affirmative.

Further, the responses used self-report scales. Although it is common in healthcare research to measure clinician adherence (Dykes, 2003), self-report scales may overestimate actual behaviors (Donaldson et al., 2004).

Another challenge experienced in this study was the emergence of a regression coefficient for Attitudes/Social Norms in the Review structural models that fell outside reasonable limits, i.e., 1.064 in the 4-factor model, and 1.038 in the 3-factor model. Rindskopf (1984), in reviewing the influence of multicollinearity on structural model fit, suggests that "in many cases, combining the factor that appears to be problematic with another factor with which it correlates highly can solve the problem" (p. 116). Accordingly, I ran several series of Review models. I tested a 5-factor model using the four original factors (i.e., Attitudes, Knowledge, Social Norms, and Organizational Controls) to predict Behaviors. Using the LM Test results, I combined Social Norms and Organizational Controls into a single factor which along with Attitudes and Knowledge was used to predict Behaviors. However, the final standardized solutions for each of these models incurred a regression coefficient of 2.0 and 1.6, respectively, for the Knowledge construct. I highlight that Byrne (2006) has advocated the use of standardized solutions with coefficients larger than 1.00, including coefficients that exceed 2.00 (e.g., p. 220), when testing for the validity of a causal structure. Nevertheless, the Review model deserves additional respecification in future studies.

The response rate of 37.3% raises concerns about whether the sample of respondents represented the population of nurses at the participating organization and at other acute healthcare organizations. This response rate is not unlike that achieved in a recent study conducted at the participating organization in which SurveyMonkey convenience sampling surveys were used to evaluate communication parameters, and which achieved a response rate of 40.1% (Craighead, Dawson, Preston, & Claybrook, 2011). However, if the Human Resource Department at the participating organization can proffer the demographics associated with the 1,500 nurses who were invited to participate in this study, these descriptive data should be compared with the demographic findings reported by the study participants. Further, because most of the nurses working at the organization that hosted the study were female and Caucasian, the survey did not ask respondents about their sex and ethnicity in order to protect

the anonymity of participants. However, these descriptive details should be added to the survey in future research at the earliest opportunity.

Finally, having found receptivity within the nursing profession, recognizing that nurses significantly influence patient and organizational outcomes (e.g., mortality rates, length of stay; Dall, Chen, Seifert, Maddox, & Hogan, 2009; Estabrooks et al., 2005; Needleman & Buerhaus, 2003; Needleman et al., 2002; Pappas, 2008), and having needed to start somewhere, this study emphasized the measurement of an evidence-based nursing culture. However, additional scales need to be developed in the future to assess and represent a broader range of perspectives (e.g., physicians, patients/families, and other relevant stakeholders).

Applications for the EBNC Measure

More work is needed to fully understand an evidence-based nursing culture. Yet, the valid and reliable measures of the Identify, Communicate, Embrace, and Review behaviors developed in this study offer a solid foundation from which additional research can advance an understanding of an evidence-based nursing culture.

The measure developed in this study has immediate application. Test scores can be calculated by summing the responses from each set of related items from the scale (Ajzen, 2010; Ceccato et al., 2007). I highlight that the relatively small number of items required to measure predictors and behaviors is an appealing feature of this ICER Model Measure of an Evidence-Based Nursing Culture©. This measure can be used to test the efficacy of interventions designed to advance a specific ICER© behavior, or to assess the efficacy of allocating additional organizational resources to the evidence-based agenda (e.g., Alexander et al., 2007; Clancy & Cronin, 2005). The effectiveness of these and other types of interventions can be evaluated using the ICER© measure scale or subscales established in this study. For example, the social psychology literature is replete with opportunities to employ robust communication and persuasion strategies that can enhance Embrace behaviors. Hovland et al. (1953) offered an outline of considerations (i.e., source, target, message, and medium) for

crafting effective communications. These messages can be designed to influence attitudes using persuasive strategies that culminate in an effective and accurate embrace of recommended practices by clinicians (e.g., Petty & Cacioppo, 1986). Further, comparing these scores across demographic groups (e.g., specialty practice/role, education level, unit; McCloskey, 2008; McKenna, H. P. et al., 2004) can provide meaningful descriptive data about an organization's strengths and weaknesses within an evidence-based quest.

Future Research

Additional analyses that can be conducted using the data file from this study include randomly splitting the current sample to evaluate the reliability of the models in both samples. Attitudes and clinician experience and/or roles can also be tested for their potential to moderate perceptions about Organizational Controls. Reviewing ICER© measure score differences associated with demographic variation (e.g., unit or specialty, facility, education) also merits attention (Estabrooks et al., 2008; McCloskey, 2008; Titler et al., 2007).

However, Brannick (1995) admonishes that "it is probably better to spend time collecting better data than to fit existing data to ever larger numbers of models" (p. 212). He incorporates longitudinal data collection among several specific design-related solutions for understanding organizational behavior. Indeed, engaging in longitudinal research using paired sample data may aid the efficiency and accuracy of measuring progress toward achieving an evidence-based healthcare culture (Institute of Medicine, 2008) by reducing or controlling for sources of unsystematic variation. Further, the best-fitting models generated in this study can serve as a baseline of variables into which new survey items can be integrated. Increasing the scale's specificity, i.e., making minor modifications to item verbiage to focus on a specific project rather than on the general constructs assessed in this scale, may help to improve the scale's performance. Appendix K offers specific ideas for scale modification.

Future research should also include a more rigorous evaluation of the primary resources needed for successful ICERv behaviors, including work time, funding, and other tangible

resources committed to the evidence-based behavior, intellectual resources, electronic and technological supports, interdisciplinary collaboration, and creative/dynamic leadership (e.g., Fink et al., 2005; Turkel et al., 2005). Research to understand how individuals can be organized into highly efficient committees or teams organized by ICER© behaviors may have important implications for achieving an evidence-based nursing culture (e.g., Salas, Nichols, & Driskell, 2007; Salas, Weaver, DiazGranados, Lyons, & King, 2009).

Additional work will be required to confirm whether constructs that merged to represent a single factor are actually similar, or whether their convergence in this study resulted from inadequately crafted, or insufficiently distinct, variables. Subsequent research may also establish the discriminant or convergent validity of personality with the constructs associated with an evidence-based culture, and whether personality is predictive of evidence-based behaviors (e.g., Craighead, 2008; Teng, Hsu, Chien, & Chang, 2007).

Finally, scales should be developed for measuring an evidence-based culture from the perspective of physicians, organizational leadership, and patients and their families. Other ideas include assessing additional structural layouts, e.g., whether organizational resources moderate attitudes, and whether Communicate mediates the relation between practice recommendations crafted in the Identify processes and Embrace behaviors among bedside clinicians.

Conclusion

This study established a valid and reliable measure of the four essential behaviors associated with an evidence-based nursing culture (EBNC). The ICER Model Measure of an Evidence-Based Nursing Culture© makes an important and unique contribution to the evidence-based agenda by enabling the nursing profession to track and stimulate progress toward achieving an EBNC. The appeal of this measure is multifaceted. The ability to structurally model the modified Theory of Planned Behavior predictors of essential evidence-based behaviors facilitated a more comprehensive assessment of an EBNC than previously proposed

in the professional literature. The behavioral models achieved acceptable goodness-of-fit indices under conditions of either robust or parsimonious use of predictors. The specificity inherent within the measure enables individual or team of nurses to understand the relative strengths and weakness of the evidence-based quest within their organization, and to objectively assess the current progress toward, and stimulate the modifications and strategies necessary for, achieving an EBNC. These encouraging findings that inspire immediate use of the ICER Model© measure of an EBNC also motivate further research using the model to extend the understanding of an EBNC.

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Appendix A
e-Mail Invitation from WMC's Clinical Nurse Researcher to WMC Nurses
to Participate in the Pilot Evaluation

I would like to invite all nurses, clinical and non-clinical, to participate in a pilot research study at Wyoming Medical Center. We have an exciting opportunity to assist Janet Craighead, a Healthcare Researcher at Poudre Valley Health System, with her PhD dissertation. She is seeking volunteers to take her on-line survey. She is developing an instrument that will measure an evidence-based nursing culture. This survey may take up to 2 hours to complete. By completing this survey, you will be compensated 2 hours of education pay, and you will also meet your research competency for the 2011-2012 year. Please see the attached message for instructions. If you have any questions, please feel free to contact me through email or at ____.

Thank you for participating!
Name and contact information withheld for privacy

Appendix B
e-Mail Invitation to WMC Nurses to Participate in the Pilot Evaluation

I would like to invite you to participate in a pilot evaluation of a research study designed to establish a measure of an *evidence-based nursing culture*, something that has never been done before. This work is cutting-edge and extremely important in our quest to be an evidence-based profession. This study has received approval from the WMC IRB, and the project is fully supported by [the WMC Chief Nursing Office and the WMC Clinical Nurse Researcher] and the Research Council.

The primary study requires a large sample of respondents, and will be conducted at Poudre Valley Health System in Colorado. However, although this pilot evaluation requires a smaller sample size, it is a vital part of this research. If you choose to participate in this study, you will be asked to complete the survey twice, the first time to see how long it takes to complete the survey, and the second to provide feedback about survey items that you have marked as problematic.

This survey has nine sections that address the following topics:

1) your consent for participating in this survey,
2) demographic information,
3) identifying best practices,
4) communication about best practices,
5) using best practices,
6) measuring outcomes associated with practice,
7) nursing behaviors,
8) final demographic item, and
9) survey close-out.

Your greatest contribution to this pilot study is the feedback you provide to the survey items in Sections 3 through 7. These survey statements offer an extra bubble response labeled "Problematic: Will provide narrative".

1) When you take the survey the first time, if you would like to provide feedback about that survey statement, click the "Problematic: Will provide narrative" bubble dot.
2) After going through the survey once, the time will be automatically recorded by the survey software.
3) At that point, you will be forwarded to an additional survey page that lists the items to which you responded "Problematic". A free text box will be available in which you should describe how the item is problematic and/or offer a suggestion for improving the statement. You are also welcome to provide feedback about the survey in general.
4) If you experience any problems or have questions, please contact [the WMC Clinical Nurse Researcher].

Pick a good time to start. It may take as little as 45 minutes for you to complete the survey, or as long as 2 hours, depending on how much feedback you have to share. It is important that you complete the entire survey in one sitting. When you are ready, click on this hyperlink:

www.surveymonkey.com/ebncpilotsurvey

Thank you so much!

Janet E. Craighead, MS, RN
Study Investigator
Doctoral Candidate, Applied Social Psychology
Colorado State University, Fort Collins, CO

David MacPhee, PhD
Academic Co-Advisor
Professor, Human Development & Family Studies
Colorado State University, Fort Collins, CO

Appendix C
WMC Pilot Survey Content

Section One: Your Consent for Participating

Before you begin…I would like to offer details to you about participating in this survey.

- This survey is anonymous. The findings from this study will be used for professional publicity or publication, but your individual responses will not be identified in any way. In fact, the survey is administered using software that does not allow responses to be traced to an individual.
- Your participation with this study is entirely voluntary.
- This project has been approved by [the WMC Chief Nursing Office, the WMC Clinical Nurse Researcher], the Nurse Research Council, and the WMC IRB.
- No risks are foreseen for participating, although it will take as long as 2 hours to complete the survey.
- There are no direct benefits for participating, but the commitment of WMC nurses will be gratefully acknowledged in professional presentation(s) of the study findings.
- Completing and returning this survey confers your consent to this process.

Please check one of the bubbles below.

O I want to participate.

O I do not want to participate. Here is why: _____

If the respondent clicks the bubble dot to not participate, they are able to enter a free text response about why they wish to not participate. However, no response is required.

When these respondents clicks "Next Page", they are sent to a final survey page that states, "Sorry but you do not qualify for this survey."

Section Two: Your Demographic Information

Survey Questions	Responses	
1. What is your age bracket?	• 18-29 • 30-39 • 40-49 • 50-59 • 60-69 • 70 and over	
2. What is your job title or role?	• CNO or Director • CNS • Clinical Educator • Nurse Manager • Staff Nurse • Unit Supervisor • Other (please specify): _____	
3. What is your highest level of education?	• ADN / Diploma Nurse • Bachelors • Masters or higher • Other (please specify): _____	
4. Do you have a nursing certification?	• Yes • No	
5. How long have you been licensed as a nurse?	• I am not licensed as a nurse • New – 2 years • 3-5 years • 6-10 years • 11-15 years • 16-20 years • 21-25 years • 26-30 years • 31 years or more • Other (please specify): _____	
6. In what unit do you work most?	• The Birth Center • Diabetes Ed • ER • ICU • Medical • OPS • OR	• PACU • PCU • Pre-Hosp • Surgical • Other (please specify): _____
7. On what committees do you serve? a. Coordinating Council b. Nursing Leadership c. PPC d. QS e. Research Council f. Unit Chair Council	*For each item:* • Yes, currently a member • Yes, but NOT currently a member • Never been a member	
8. Did you attend the WMC Annual Research Workshop in February 2011?	• Yes • No	

Section Three: Identifying Best Practice Recommendations

The next four sections of the survey focus on best practice recommendations. This section asks you to express your opinions about the process of **IDENTIFYING** best practice recommendations.

There are no "right" answers, except the ones that most accurately reflect your opinion. Just be thoughtful and honest as you respond.

	Responses							
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree	Problematic; Will provide narrative
The research process used to create practice recommendations is trustworthy	O	O	O	O	O	O	O	O
I know how to obtain research articles from professional journals	O	O	O	O	O	O	O	O
The nurses on my unit respect the recommendations created by the PPC and the Research Council	O	O	O	O	O	O	O	O
My organization has a process for prioritizing clinically relevant issues	O	O	O	O	O	O	O	O
The systematic review process used to create practice recommendations is trustworthy	O	O	O	O	O	O	O	O
I know how to read and critique a research article	O	O	O	O	O	O	O	O
My unit leaders understand the importance of best practice recommendations	O	O	O	O	O	O	O	O
My unit / team has a process for prioritizing clinically relevant issues	O	O	O	O	O	O	O	O
The recommendations released by the PPC and the Research Council are trustworthy	O	O	O	O	O	O	O	O
I know how to conduct a systematic review of the literature	O	O	O	O	O	O	O	O
My nursing director understands the importance of best practice recommendations	O	O	O	O	O	O	O	O
Library resources (e.g., journal articles, lit search support) are available to me	O	O	O	O	O	O	O	O
Practice recommendations must be based on scientific evidence more than on clinical experience	O	O	O	O	O	O	O	O
I know how to contribute to a nursing research study (e.g., brainstorming a study design, collecting data)	O	O	O	O	O	O	O	O
My CNO understands the importance of best practice recommendations	O	O	O	O	O	O	O	O
My hospital has enough resources (e.g., FTE's) for identifying clinical priorities from the professional literature	O	O	O	O	O	O	O	O
Practice recommendations appear more credible to me if they include professional references	O	O	O	O	O	O	O	O
I know how to develop a research protocol	O	O	O	O	O	O	O	O
Keeping my practice consistent with that of other nurses on my unit is important to me	O	O	O	O	O	O	O	O
My hospital has enough resources (e.g., FTE's) to develop practice recommendations for clinically important issues	O	O	O	O	O	O	O	O
Physicians & other interdisciplinary colleagues collaborate with nursing best practice recommendations	O	O	O	O	O	O	O	O

Section Four: Communicating Best Practice Recommendations

This is the second of four sections in the survey that focus on best practice recommendations. This section asks you to express your opinions about the process of **COMMUNICATING** best practice recommendations.

	Responses							
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree	Problematic; Will provide narrative
When the PPC and the Research Council makes a best practice recommendation, I am confident that I will receive it	O	O	O	O	O	O	O	O
I understand the EBP recommendations when I read them	O	O	O	O	O	O	O	O
New practice recommendations are welcomed by nurses on my unit / team	O	O	O	O	O	O	O	O
I understand how best practice recommendations are communicated to me (for example, face-to-face, e-mail, flyers)	O	O	O	O	O	O	O	O
I am confident that the PPC and the Research Council will respond to my questions and/or feedback about a best practice recommendation	O	O	O	O	O	O	O	O
When I do not understand a new practice recommendation, I know who to contact to get help	O	O	O	O	O	O	O	O
Nurses on my unit / team share information with others in my group	O	O	O	O	O	O	O	O
Best practice recommendations are disseminated in a predictable manner	O	O	O	O	O	O	O	O
I feel overloaded with new practice recommendations	O	O	O	O	O	O	O	O
Practice recommendations released by the PPC and the Research Council are typically clear and understandable	O	O	O	O	O	O	O	O
Unit leaders encourage my questions until I can understand a new practice recommendation	O	O	O	O	O	O	O	O
I like the mechanism my organization uses to communicate best practice recommendations to me	O	O	O	O	O	O	O	O
I am interested in information that will help me improve the care I give my patients	O	O	O	O	O	O	O	O
Physician and other colleagues are informed about new nursing practices that overlap with their practice	O	O	O	O	O	O	O	O
I would choose a different method with which practice recommendations are communicated to me	O	O	O	O	O	O	O	O
The EBP recommendations communicated to me are applicable to my practice	O	O	O	O	O	O	O	O
I have enough time to read and review new practice recommendations in order to understand them	O	O	O	O	O	O	O	O

Section Five: Embracing Best Practice Recommendations

This section of the survey asks you to express your opinions about the process of **EMBRACING or USING** best practice recommendations.

Remember that **there are no "right" answers**, except the ones that most accurately reflect your opinion. Just be thoughtful and honest as you respond.

	Responses							
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree	Problematic; Will provide narrative
Using EBP recommendations helps to improve the care I provide	O	O	O	O	O	O	O	O
The PPC and the Research Council best practice recommendations can be integrated into my nursing practice	O	O	O	O	O	O	O	O
Nurses on my unit / team are eager to use new practice recommendations	O	O	O	O	O	O	O	O
The electronic chart promotes my use of best practice recommendations	O	O	O	O	O	O	O	O
If the PPC and the Research Council makes a best practice recommendation, I will change my practice	O	O	O	O	O	O	O	O
The EBP recommendations are easy to integrate into nursing practice	O	O	O	O	O	O	O	O
My leaders are eager to help me use new practice recommendations	O	O	O	O	O	O	O	O
Patient equipment needed to provide best practice is available	O	O	O	O	O	O	O	O
EBP is flexible enough to let me individualize the care to my patients	O	O	O	O	O	O	O	O
There are occasions when an EBP recommendation should *not* be used with a specific patient	O	O	O	O	O	O	O	O
New practices for improving our nursing care are welcomed by my unit leaders	O	O	O	O	O	O	O	O
I have enough time to implement best practice recommendations without cutting corners	O	O	O	O	O	O	O	O
It is important to me to continually improve my practice	O	O	O	O	O	O	O	O
I can deviate from using a recommendation for individual patients as long as I document why	O	O	O	O	O	O	O	O
My nursing director is very supportive of helping my team achieve an evidence-based practice	O	O	O	O	O	O	O	O
I have enough time to document the care I give my patients	O	O	O	O	O	O	O	O
I am more likely to change my practice when reference citations are included with a practice recommendation	O	O	O	O	O	O	O	O
Physicians and other interdisciplinary colleagues are receptive to changing practice in order to improve outcomes	O	O	O	O	O	O	O	O
Recommendations for best nursing practice are coordinated effectively with the practices of physicians and other disciplines	O	O	O	O	O	O	O	O
I am more likely to change my practice when a practice recommendation summarizes *why* I should do so	O	O	O	O	O	O	O	O
Physician preferences do not match nursing practice	O	O	O	O	O	O	O	O

Section Six: Reviewing Best Practice Recommendations

This section of the survey asks you to express your opinions about the process of **REVIEWING THE OUTCOMES** associated with best practice recommendations.

	Responses							
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree	Problematic; Will provide narrative
Integrating EBP recommendations into my practice improves patient and/or nursing outcomes	O	O	O	O	O	O	O	O
I am thoughtful about the quality of my own clinical performance	O	O	O	O	O	O	O	O
The nurses on my unit / clinical team share ideas with each other about our outcomes	O	O	O	O	O	O	O	O
My unit / clinical team has sufficient opportunity to exchange ideas about our outcomes	O	O	O	O	O	O	O	O
My EBP leaders are interested in hearing about my ideas for improving patient care	O	O	O	O	O	O	O	O
I think of questions or ways to improve nursing care	O	O	O	O	O	O	O	O
My unit / team culture makes it feel safe to acknowledge practices that need to be improved	O	O	O	O	O	O	O	O
My unit / clinical team has sufficient opportunities to review the quality of our nursing care	O	O	O	O	O	O	O	O
New ideas for improving our nursing care are welcomed by my unit leaders	O	O	O	O	O	O	O	O
I am too busy to think of questions or ways to improve nursing care	O	O	O	O	O	O	O	O
My unit / team gets excited when we are able to improve our performance	O	O	O	O	O	O	O	O
Even when I identify ways to improve care, there is not enough time to do anything with those ideas	O	O	O	O	O	O	O	O
Self-review / critique is important to improving my nursing care	O	O	O	O	O	O	O	O
When I have an idea for improving patient care, I know how to get it to my EBP leaders	O	O	O	O	O	O	O	O
My unit/team collects data in order to measure outcomes that we are trying to improve	O	O	O	O	O	O	O	O
Practice recommendations derived from research conducted at my organization are supported by senior leadership	O	O	O	O	O	O	O	O
Inconsistent practice among nurses compromises patient outcomes	O	O	O	O	O	O	O	O
I am able to understand the graphs and reports about practices or outcomes that my team is trying to improve	O	O	O	O	O	O	O	O
My unit/team enjoys participating in research and/or quality studies	O	O	O	O	O	O	O	O
Practice recommendations derived from research conducted at my organization are supported by physicians	O	O	O	O	O	O	O	O
Our professional practice is based more on experience than on research evidence	O	O	O	O	O	O	O	O
I feel capable of helping my team interpret study findings that form the basis of practice recommendations	O	O	O	O	O	O	O	O
The PPC and the Research Council evaluates outcome changes after making a new best practice recommendation	O	O	O	O	O	O	O	O

Resources for analyzing data are available to me or my team	O	O	O	O	O	O	O	O
Outcomes will be improved as a result of using best practice recommendations	O	O	O	O	O	O	O	O
I know about one or more practices that we need to improve on my unit	O	O	O	O	O	O	O	O
Physicians are receptive to feedback from nursing's quality or research evaluations	O	O	O	O	O	O	O	O
I have confidence that our Quality and Safety Committee, which partners with the Quality Department, the PCC, and the Research Council, can accurately measure nursing outcomes after a new practice has been implemented	O	O	O	O	O	O	O	O
The findings of research studies conducted at my organization are trustworthy	O	O	O	O	O	O	O	O

Section Seven: Your Activities Associated with Best Practice Recommendations

There are just two more sections of the survey to complete.

This section asks about your **ACTIVITIES** and **BEHAVIORS** associated with best practice recommendations. Notice that the responses have changed from a measure of agreement to a measure of the frequency in which you engage in certain activities.

	Responses							
	Never	1-2 x / year	Several x / year	1-2 x / month	Several x / month	Several x / week	Daily	Problematic; Will provide narrative
I read research articles in professional journals	O	O	O	O	O	O	O	O
I receive practice recommendations developed by the PPC and the Research Council	O	O	O	O	O	O	O	O
I change my practice to integrate best practice recommendations for nursing practice	O	O	O	O	O	O	O	O
I forward my questions or ideas for improving patient care to my leaders or the PPC and the Research Council	O	O	O	O	O	O	O	O
I critique research articles	O	O	O	O	O	O	O	O
I carefully review best practice recommendations that I receive	O	O	O	O	O	O	O	O
I change my practice when a new recommendation is released	O	O	O	O	O	O	O	O
I notice that certain nurses seem to have better outcomes than others	O	O	O	O	O	O	O	O
I critique guidelines before they are integrated into practice at my organization	O	O	O	O	O	O	O	O
I have questions about the best practice recommendations that I receive	O	O	O	O	O	O	O	O
If needed, I seek help for integrating the recommendation into my practice	O	O	O	O	O	O	O	O
I notice that certain units seem to have better outcomes than others	O	O	O	O	O	O	O	O
I participate in a systematic reviews of the literature	O	O	O	O	O	O	O	O
I ask my EBP leaders about best practice recommendations that I do not understand	O	O	O	O	O	O	O	O
I see colleagues not using EBP recommendations	O	O	O	O	O	O	O	O
I inform my unit / team leaders when I see inconsistencies in practice among nurses	O	O	O	O	O	O	O	O
I participate in developing an EBP recommendation	O	O	O	O	O	O	O	O
I talk with my colleagues about the best practice recommendations	O	O	O	O	O	O	O	O
If I see colleagues not using an EBP recommendation, I ask them about it	O	O	O	O	O	O	O	O
I have participated in interpreting how research recommendations should affect our unit practice	O	O	O	O	O	O	O	O
I participate in developing a research study protocol	O	O	O	O	O	O	O	O
I inform my patients about their plan of care	O	O	O	O	O	O	O	O

I think about my outcomes, and consider whether they can be improved	O	O	O	O	O	O	O	O
I participate in research studies (e.g., brainstorming a study design, data collection)	O	O	O	O	O	O	O	O
I invite my patients to modify the plan of care based on their preferences and values	O	O	O	O	O	O	O	O
If I deviate from a recommended practice, I document my rationale in the patient record	O	O	O	O	O	O	O	O

Sections Eight and Nine: Survey Close-Out

Please review each of the following statements, and rank-order how you think you might fit with these evidence-based activities.

"I think I could best help, as part of a team effort, to:…	**1st Choice**	**2nd Choice**	**3rd Choice**	**Last Choice**	**No response**
…develop best practice recommendations based on the best evidence available."	O	O	O	O	O
…communicate best practice recommendations to the clinicians who will use them."	O	O	O	O	O
…integrate/use practice recommendations as I care for patients and families."	O	O	O	O	O
…measure outcomes associated with clinical practice	O	O	O	O	O

That's it – you're done with the first survey!
It's time to move on to the second phase of the project.

Post-Survey Feedback

Now that you have completed the survey once, this next section is designed for you to provide feedback about the survey in general, and about the survey statements that you marked "Problematic".

Let's get started. If you have any comments to offer about the survey in general, please enter them in the box below.

In this next section, you will revisit the survey statements that you marked "Problematic". You will see eight text boxes below. Above each text box is room for approximately 15 survey statements, but ONLY the statements that you marked problematic are displayed. In the text box, please provide feedback about EACH of those problematic statements.

Your feedback should:

1) briefly describe why/how the statement was problematic, and
2) offer a suggestion that improves the statement.

Problematic survey statements located here

Text Box #1

Problematic survey statements and associated text boxes #2 - #7 inserted here

Problematic survey statements located here

Text Box #8

That's it – you're done!

Thank you so very much for participating in this research study, and for contributing to our understanding of an evidence-based nursing culture.

If you have questions or comments, please contact:

Janet Craighead
Janet.Craighead@colostate.edu

Appendix D
Follow-Up e-Mail to WMC Nurses Participating in the Pilot Study

Almost one week ago, I invited nurses at WMC to participate in a pilot evaluation of a research study designed to develop a scale with which an *evidence-based nursing culture* can be measured. This work is cutting-edge and extremely important in our quest to be an evidence-based profession. This study has received approval from the WMC IRB, and the project is fully supported by [the WMC Chief Nursing Office, the WMC Clinical Nurse Researcher] and the Nurse Research Council.

If you have not yet completed the on-line survey, please take this opportunity to do so. If you choose to participate, you will be asked to complete the survey twice, the first time to see how long it takes to complete the survey, and the second to provide feedback about survey items that you have marked as problematic.

This survey has nine sections that address the following topics:

1) your consent for participating in this survey,
2) demographic information,
3) identifying best practices,
4) communication about best practices,
5) using best practices,
6) measuring outcomes associated with practice,
7) nursing behaviors,
8) final demographic item, and
9) survey close-out.

Your greatest contribution to this pilot study is the feedback you provide to the survey items in Sections 3 through 7. These survey statements offer an extra bubble response labeled "Problematic: Will provide narrative".

1) When you take the survey the first time, if you would like to provide feedback about that survey statement, click the "Problematic: Will provide narrative" bubble dot.
2) After going through the survey once, the time will be automatically recorded by the survey software.
3) At that point, you will be forwarded to an additional survey page that lists the items to which you responded "Problematic". A free text box will be available in which you should describe how the item is problematic and/or offer a suggestion for improving the statement. You are also welcome to provide feedback about the survey in general.
4) If you experience any problems or have questions, please contact [the WMC Clinical Nurse Researcher].

Pick a good time to start. It may take as little as 45 minutes for you to complete the survey, or as long as 2 hours, depending on how much feedback you have to share. It is important that you complete the entire survey in one sitting. When you are ready, click on this hyperlink:

www.surveymonkey.com/ebncpilotsurvey

Thank you so much!

Janet E. Craighead, MS, RN
Study Investigator
Doctoral Candidate, Applied Social Psychology
Colorado State University, Fort Collins, CO
David MacPhee, PhD
Academic Co-Advisor
Professor, Human Development & Family Studies
Colorado State University, Fort Collins, CO

Appendix E
e-Mail Invitation to PVHS Nurses to Participate in the Study

I would like to invite you to participate in a survey that has been developed to establish a measure of an *evidence-based nursing culture*, something that has never been done before. This work is cutting-edge and extremely important in our quest to be both an evidence-based profession and an evidence-based organization.

This study has received approval from the PVH and MCR Nursing Research Committees and by the PVHS IRB. The project is fully supported by Kay Miller and Donna Poduska, the CNOs at PVHS, and you are welcome to complete the survey either on- or off-duty. However, you may NOT accrue overtime as a result of working on the survey.

If you choose to participate, at the end of the survey you will be offered the opportunity to take part in a drawing to win one of eight Apple iPads and Amazon Kindles.

It will take between 25 and 45 minutes for you to complete the survey, so pick a good time to start. It is important that you complete the entire survey in one sitting. When you are ready, click on this hyperlink:

www.surveymonkey.com/ebncsurvey

Thank you so much!

Janet E. Craighead, MS, RN
Study Investigator
Doctoral Candidate, Applied Social Psychology
Colorado State University, Fort Collins, CO
David MacPhee, PhD
Academic Co-Advisor
Professor, Human Development & Family Studies
Colorado State University, Fort Collins, CO

Appendix F
PVHS Survey Content

Section One: Your Consent for Participating

Before you begin…I would like to offer details to you about participating in this survey.

- This survey is anonymous. The findings from this study will be used for professional publicity or publication, but your individual responses will not be identified in any way. In fact, the survey is administered using software that does not allow responses to be traced to an individual.
- Your participation with this study is entirely voluntary.
- This project has been approved by the PVHS IRB.
- No risks are foreseen for participating, although it will take between 25 and 45 minutes to complete the survey.
- There are no direct benefits for participating, but the commitment of PVHS nurses will be gratefully acknowledged in professional presentation(s) of the study findings.
- Completing and returning this survey confers your consent to this process.

Please check one of the bubbles below.

O I want to participate.

O I do not want to participate. Here is why: _____

If the respondent indicated that they did not want to participate, they were able to enter a free text response about why they wished to not participate. However, no response was required.

When these respondents clicked "Next Page", a final survey page displayed that stated, "Sorry but you do not qualify for this survey."

Section Two: Your Demographic Information

Survey Questions	Responses
1. What is your age bracket?	• 18-29 • 30-39 • 40-49 • 50-59 • 60-69 • 70 and over
2. What is your job title or role?	• Clinical Educator • CNO or CNO Director • CNS • ENS • Nurse Manager • PCC/CC • Staff nurse • Other (please specify) _____
3. What is your highest level of education?	• ADN / Diploma Nurse • Bachelors • Masters or higher • Student (please specify degree) _____ • Other (please specify) _____
4. Do you have a nursing certification?	• Yes • No
5. How long have you been licensed as a nurse?	• I am not licensed as a nurse • New – 2 years • 3-5 years • 6-10 years • 11-15 years • 16-20 years • 21-25 years • 26-30 years • 31 years or more • Other (please specify) _____
6. What FTE do you work?	• Relief • 0.5 or less • 0.6 • 0.7 • 0.8 • 0.9 • 1.0
7. At which facility do you work most?	• MCR • Mountain Crest • PVH • Other (please specify) _____

8. In what unit do you work most?	• PVH Birthing Center • MCR Cardiac • PVH Cardiac Rehab • CGSP & GIs • MCR CV Services / Cath Lab • PVH Diabetes / Wound / ET • ED • Float / Resource / Agency • MCR Case Managers, Trauma-Hospitalists-DP/UM • PVH ICU, General (ICU) • MCR ICU, Cardiac (CICU) • MCR ICU, Surgical (SICU/Trauma) • IV Team • PVH LSR • Medical • PVH MedSurg • Mountain Crest • MCR Mother & Family • PVH Neuro • PVH NICU • PVH Oncology, IP • PVH Oncology, Outpt Infusion & Radiation • Operating Room • PVH Ortho • MCR Post-Trauma Ortho/Spine • PVH Peds Plus • Surgical & PostTrauma • Radiology • SAC / PACU / ODSC / Preadmit • PVH TeleWest • PVH Women / Family Support Team • PVH Women's Care • Other (please specify) _____
9. On what committees do you serve? a. EBP Committee b. Nursing Research Committee c. Quality Improvement d. Unit-level Practice & Quality Committee	*For each item:* • Yes, currently a member • Yes, but NOT currently a member • Never been a member
10. Have you attended all or any part of an EBP (evidence-based practice) "Summit" at PVH? a. Summit One (November 2010) b. Summit Two (February 2011) c. Summit Three (June 2011)	*For each item:* • Yes • No

Section Three: Identifying Best Practice Recommendations

The next four sections of the survey focus on best practice recommendations. This section asks you to express your opinions about the process of **IDENTIFYING** best practice recommendations.

There are no "right" answers, except the ones that most accurately reflect your opinion. Just be thoughtful and honest as you respond.

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	Responses						
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree
The research process used to create practice recommendations is trustworthy	O	O	O	O	O	O	O
I know how to obtain research articles from professional journals	O	O	O	O	O	O	O
The nurses on my unit respect the recommendations created by the EBP Committee	O	O	O	O	O	O	O
My organization has a process for prioritizing clinically relevant issues	O	O	O	O	O	O	O
The systematic review process used to create practice recommendations is trustworthy	O	O	O	O	O	O	O
I know how to read and critique a research article	O	O	O	O	O	O	O
My unit leaders understand the importance of best practice recommendations	O	O	O	O	O	O	O
My unit / team has a process for prioritizing clinically relevant issues	O	O	O	O	O	O	O
The recommendations released by the EBP Committee are trustworthy	O	O	O	O	O	O	O
I know how to conduct a literature review	O	O	O	O	O	O	O
I know how to conduct a systematic review of the literature	O	O	O	O	O	O	O
My nursing director understands the importance of best practice recommendations	O	O	O	O	O	O	O
Library resources (e.g., journal articles, lit search support) are available to me	O	O	O	O	O	O	O
Practice recommendations must be based on scientific evidence more than on clinical experience	O	O	O	O	O	O	O
I know how to contribute to a nursing research study (e.g., brainstorming a study design, collecting data)	O	O	O	O	O	O	O
My Chief Nursing Officer understands the importance of best practice recommendations	O	O	O	O	O	O	O
My hospital has enough resources (e.g., FTE's) for identifying clinical priorities from the professional literature	O	O	O	O	O	O	O
Practice recommendations appear more credible to me if they include professional references	O	O	O	O	O	O	O
I know how to develop a research protocol	O	O	O	O	O	O	O
Keeping my practice consistent with that of other nurses on my unit is important to me	O	O	O	O	O	O	O
My hospital has enough resources (e.g., FTE's) to develop practice recommendations for clinically important issues	O	O	O	O	O	O	O
Physicians & other interdisciplinary colleagues collaborate with nursing best practice recommendations	O	O	O	O	O	O	O

Section Four: Communicating Best Practice Recommendations

This is the second of four sections in the survey that focus on best practice recommendations. This section asks you to express your opinions about the process of **COMMUNICATING** best practice recommendations.

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	Responses						
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree
When the EBP Committee makes a best practice recommendation, I am confident that I will receive it	O	O	O	O	O	O	O
I understand the EBP recommendations when I read them	O	O	O	O	O	O	O
New practice recommendations are welcomed by nurses on my unit / team	O	O	O	O	O	O	O
I understand how best practice recommendations are communicated to me (for example, face-to-face, e-mail, flyers)	O	O	O	O	O	O	O
I am confident that the EBP Committee will respond to my questions and/or feedback about a best practice recommendation	O	O	O	O	O	O	O
When I do not understand a new practice recommendation, I know who to contact to get help	O	O	O	O	O	O	O
Nurses on my unit / team share information with others in my group	O	O	O	O	O	O	O
Best practice recommendations are disseminated in a predictable manner	O	O	O	O	O	O	O
I feel overloaded with new practice recommendations	O	O	O	O	O	O	O
Practice recommendations released by the EBP Committee are typically clear and understandable	O	O	O	O	O	O	O
Unit leaders encourage my questions until I can understand a new practice recommendation	O	O	O	O	O	O	O
I like the mechanism my organization uses to communicate best practice recommendations to me	O	O	O	O	O	O	O
I am interested in information that will help me improve the care I give my patients	O	O	O	O	O	O	O
Physician and other colleagues are informed about new nursing practices that overlap with their practice	O	O	O	O	O	O	O
I would choose a different method with which practice recommendations are communicated to me	O	O	O	O	O	O	O
The EBP recommendations communicated to me are applicable to my practice	O	O	O	O	O	O	O
I have enough time to read and review new practice recommendations in order to understand them	O	O	O	O	O	O	O

Section Five: Embracing Best Practice Recommendations

This section of the survey asks you to express your opinions about the process of **EMBRACING or USING** best practice recommendations.

Remember that **there are no "right" answers**, except the ones that most accurately reflect your opinion. Just be thoughtful and honest as you respond.

	Responses						
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree
Using EBP recommendations helps to improve the care I provide	O	O	O	O	O	O	O
The EBP Committee's best practice recommendations can be integrated into my nursing practice	O	O	O	O	O	O	O
Nurses on my unit / team are eager to use new practice recommendations	O	O	O	O	O	O	O
The EHR promotes my use of best practice recommendations	O	O	O	O	O	O	O
If the EBP Committee makes a best practice recommendation, I will change my practice	O	O	O	O	O	O	O
The EBP recommendations are easy to integrate into nursing practice	O	O	O	O	O	O	O
My leaders are eager to help me use new practice recommendations	O	O	O	O	O	O	O
Patient equipment needed to provide best practice is available	O	O	O	O	O	O	O
EBP is flexible enough to let me individualize the care to my patients	O	O	O	O	O	O	O
There are occasions when an EBP recommendation should *not* be used with a specific patient	O	O	O	O	O	O	O
New practices for improving our nursing care are welcomed by my unit leaders	O	O	O	O	O	O	O
I have enough time to implement best practice recommendations without cutting corners	O	O	O	O	O	O	O
It is important to me to continually improve my practice	O	O	O	O	O	O	O
I can deviate from using a recommendation for individual patients as long as I document why	O	O	O	O	O	O	O
My nursing director is very supportive of helping my team achieve an evidence-based practice	O	O	O	O	O	O	O
I have enough time to document the care I give my patients	O	O	O	O	O	O	O
I am more likely to change my practice when reference citations are included with a practice recommendation	O	O	O	O	O	O	O
Physicians and other interdisciplinary colleagues are receptive to changing practice in order to improve outcomes	O	O	O	O	O	O	O
Recommendations for best nursing practice are coordinated effectively with the practices of physicians and other disciplines	O	O	O	O	O	O	O
I am more likely to change my practice when a practice recommendation summarizes *why* I should do so	O	O	O	O	O	O	O
Physician preferences do not match nursing practice	O	O	O	O	O	O	O

Section Six: Reviewing Best Practice Recommendations

This section of the survey asks you to express your opinions about the process of **REVIEWING THE OUTCOMES** associated with best practice recommendations.

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	Responses						
	Strongly disagree	Moderately disagree	Disagree	Neither agree nor disagree	Agree	Moderately agree	Strongly agree
Integrating EBP recommendations into my practice improves patient and/or nursing outcomes	O	O	O	O	O	O	O
I am thoughtful about the quality of my own clinical performance	O	O	O	O	O	O	O
The nurses on my unit / clinical team share ideas with each other about our outcomes	O	O	O	O	O	O	O
My unit / clinical team has sufficient opportunity to exchange ideas about our outcomes	O	O	O	O	O	O	O
My EBP leaders are interested in hearing about my ideas for improving patient care	O	O	O	O	O	O	O
I think of questions or ways to improve nursing care	O	O	O	O	O	O	O
My unit / team culture makes it feel safe to acknowledge practices that need to be improved	O	O	O	O	O	O	O
My unit / clinical team has sufficient opportunities to review the quality of our nursing care	O	O	O	O	O	O	O
New ideas for improving our nursing care are welcomed by my unit leaders	O	O	O	O	O	O	O
I am too busy to think of questions or ways to improve nursing care	O	O	O	O	O	O	O
My unit / team gets excited when we are able to improve our performance	O	O	O	O	O	O	O
Even when I identify ways to improve care, there is not enough time to do anything with those ideas	O	O	O	O	O	O	O
Self-review / critique is important to improving my nursing care	O	O	O	O	O	O	O
When I have an idea for improving patient care, I know how to get it to my EBP leaders	O	O	O	O	O	O	O
My unit/team collects data in order to measure outcomes that we are trying to improve	O	O	O	O	O	O	O
Practice recommendations derived from research conducted at my organization are supported by senior leadership	O	O	O	O	O	O	O
Inconsistent practice among nurses compromises patient outcomes	O	O	O	O	O	O	O
I am able to understand the graphs and reports about practices or outcomes that my team is trying to improve	O	O	O	O	O	O	O
My unit/team enjoys participating in research and/or quality studies	O	O	O	O	O	O	O
Practice recommendations derived from research conducted at my organization are supported by physicians	O	O	O	O	O	O	O
Our professional practice is based more on experience than on research evidence	O	O	O	O	O	O	O
I feel capable of helping my team interpret study findings that form the basis of practice recommendations	O	O	O	O	O	O	O
The EBP Committee evaluates outcome changes after making a new best practice recommendation	O	O	O	O	O	O	O
Resources for analyzing data are available to me or my team	O	O	O	O	O	O	O
Outcomes will be improved as a result of using best practice recommendations	O	O	O	O	O	O	O
I know about one or more practices that we need to improve on my unit	O	O	O	O	O	O	O

Physicians are receptive to feedback from nursing's quality or research evaluations	O	O	O	O	O	O	O
I have confidence that QR and EBP teams can accurately measure nursing outcomes after a new practice has been implemented	O	O	O	O	O	O	O
The findings of research studies conducted at my organization are trustworthy	O	O	O	O	O	O	O

Section Seven: Your Activities Associated with Best Practice Recommendations

There are just two more sections of the survey to complete.

This section asks about your **ACTIVITIES** and **BEHAVIORS** associated with best practice recommendations. Notice that the responses have changed from a measure of agreement to a measure of the frequency in which you engage in certain activities.

	Responses						
	Never	1-2 x / year	Several x / year	1-2 x / month	Several x / month	Several x / week	Daily
I read research articles in professional journals	O	O	O	O	O	O	O
I receive practice recommendations developed by the EBP Committee	O	O	O	O	O	O	O
I change my practice to integrate best practice recommendations for nursing practice	O	O	O	O	O	O	O
I forward my questions or ideas for improving patient care to my leaders or the EBP Committee	O	O	O	O	O	O	O
I critique research articles	O	O	O	O	O	O	O
I carefully review best practice recommendations that I receive	O	O	O	O	O	O	O
I change my practice when a new recommendation is released	O	O	O	O	O	O	O
I notice that certain nurses seem to have better outcomes than others	O	O	O	O	O	O	O
I critique guidelines before they are integrated into practice at my organization	O	O	O	O	O	O	O
I have questions about the best practice recommendations that I receive	O	O	O	O	O	O	O
If needed, I seek help for integrating the recommendation into my practice	O	O	O	O	O	O	O
I notice that certain units seem to have better outcomes than others	O	O	O	O	O	O	O
I participate in a systematic reviews of the literature	O	O	O	O	O	O	O
I ask my EBP leaders about best practice recommendations that I do not understand	O	O	O	O	O	O	O
I see colleagues not using EBP recommendations	O	O	O	O	O	O	O
I inform my unit / team leaders when I see inconsistencies in practice among nurses	O	O	O	O	O	O	O
I participate in developing an EBP recommendation	O	O	O	O	O	O	O
I talk with my colleagues about the best practice recommendations	O	O	O	O	O	O	O
If I see colleagues not using an EBP recommendation, I ask them about it	O	O	O	O	O	O	O
I have participated in interpreting how research recommendations should affect our unit practice	O	O	O	O	O	O	O
I participate in developing a research study protocol	O	O	O	O	O	O	O
I inform my patients about their plan of care	O	O	O	O	O	O	O
I think about my outcomes, and consider whether they can be improved	O	O	O	O	O	O	O
I participate in research studies (e.g., brainstorming a study design, data collection)	O	O	O	O	O	O	O
I invite my patients to modify the plan of care based on their preferences and values	O	O	O	O	O	O	O
If I deviate from a recommended practice, I document my rationale in the patient record	O	O	O	O	O	O	O

Sections Eight and Nine: Survey Close-Out

Please review each of the following statements, and rank-order how you think you might fit with these activities.

"I think I could best help, as part of a team effort, to:…	**1st Choice**	**2nd Choice**	**3rd Choice**	**Last Choice**
…Ddevelop best practice recommendations based on the best evidence available."	O	O	O	O
…Ccommunicate best practice recommendations to the clinicians who will use them."	O	O	O	O
…Iintegrate/use practice recommendations as I care for patients and families."	O	O	O	O
…Mmeasure outcomes associated with clinical practice	O	O	O	O

Here's how you can enter a drawing to win one of eight Apple iPads and Amazon Kindles.

- Please hit the print icon in the upper right corner of your computer screen.
- This page of the survey will print on your default printer, or you may change the printer settings to use a different printer.
- Fill in your:
  - Name: _____
  - Nursing Unit: _____
  - Facility (MCR or PVH): _____
  - Unit phone number: _____
- Place this paper in a large acrylic ballot box marked "Nursing Research" located:
  - at MCR in the PCS Office,
  - at Mountain Crest in the Staff Lounge, and
  - at PVH, in the cafeteria.
- A drawing will be held during the month of September or shortly thereafter, and a total of eight Apple iPads and Amazon Kindles will be given away.
- Your name and contact information will not be recorded anywhere, and it will be used ONLY for any purpose of the drawing.

That's it – you're done!

Thank you so very much for participating in this research study, and for contributing to our understanding of an evidence-based nursing culture.

If you have questions or comments, please contact:

Janet Craighead
Janet.Craighead@colostate.edu

Appendix G
Follow-Up e-Mails to PVHS Nurses

Note: This e-mail will be sent out with a red-envelope.

A little over a week ago, I invited all nurses at MCR, Mountain Crest, and PVH to participate in a research survey designed to develop a scale with which an *evidence-based nursing culture* can be measured. This study is truly important to our evidence-based agenda at PVHS.

If you have not yet completed the on-line survey, please take this opportunity to do so as the survey will be closed in about one week. The study has received approval from the PVH and MCR Nursing Research Committees and by the PVHS IRB. The project is fully supported by Kay Miller and Donna Poduska, the CNOs at PVHS, and you are welcome to complete the survey either on- or off-duty. However, you may NOT accrue overtime as a result of working on the survey.

If you choose to participate, at the end of the survey you will be offered the opportunity to take part in a drawing to win one of eight Apple iPads and Amazon Kindles.

It typically takes between 25 and 45 minutes to complete the survey, so pick a good time to start. It is important that you complete the entire survey in one sitting. When you are ready, click on this hyperlink:

www.surveymonkey.com/ebncsurvey

Thank you so much!

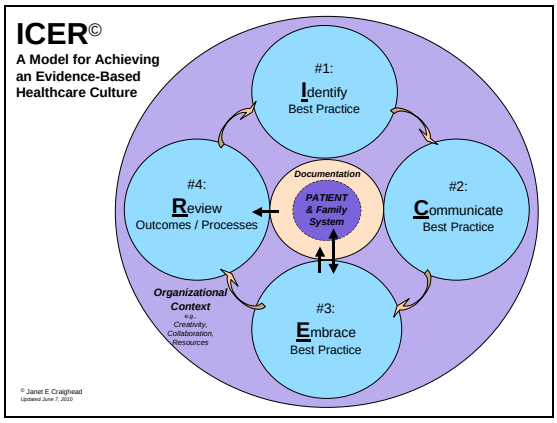
Janet E. Craighead, MS, RN
Study Investigator
Doctoral Candidate, Applied Social Psychology
Colorado State University, Fort Collins, CO
David MacPhee, PhD
Academic Co-Advisor
Professor, Human Development & Family Studies
Colorado State University, Fort Collins, CO

Appendix H
Posters and Flyers for Recruiting Nurse Participants at PVHS

NURSING RESEARCH!!!

The ICER Model©

Measure of an Evidence-Based Nursing Culture



Research Survey: August 8 – 28, 2011

Who

- All **nurses** at: PVH
  MCR
  Mountain Crest

What

- This **research study** advances the *science* of the nursing profession
- Take a SurveyMonkey **survey**

Why

- Responds to an EBP mandate from the Institute of Medicine (2008)
- Supports the Magnet (2008) agenda

Benefits & Incentives

- An acknowledgement of the commitment and participation of nurses at PVHS to this body of research will be made upon publication of the study findings
- Upon completing the survey, you may submit your entry in a drawing for **four Apple iPads & four Amazon Kindles**

Acknowledgements

- This project has received the full endorsement of *(the PVH and MCR Chief Nursing Officers)*
- This project has been approved by: PVH NRC
  MCR NRC
  PVHS IRB
  CSU IRB
- This study is funded in-part by the PVHS Foundation
- This study is being conducted by Janet Craighead with the support of a team of professors at CSU

Appendix I
Abstract for Informing Nurses at PVHS Meetings about the Study

Research Study:

THE ICER MODEL© MEASURE OF AN EVIDENCE-BASED NURSING CULTURE

Janet E. Craighead, MS, RN
Doctoral Candidate
Department of Psychology
Colorado State University
Fort Collins, Colorado

Abstract

The magnitude of emphasis on evidence-based practice (EBP) within the healthcare industry is articulated in the Institute of Medicine's (IOM) agenda that by 2020, 90% of clinical decisions will be supported by accurate and up-to-date clinical information that reflects the best available evidence. In contrast, medical practice based on best evidence may be as low as 25-50% and even lower within the nursing profession. The contribution of measures to fully achieving an EBP culture is supported in the IOM's call for the development of measures to "track and stimulate progress" of the EBP quest and in the Magnet Recognition Program® emphasis on empirical outcomes as the foundation of their model. Yet, no sufficiently comprehensive scales are available. Hence, the objective of this study is to develop a reliable and valid measure of the intrapersonal (attitudes and knowledge), interpersonal (social norms), and organizational predictors of the behaviors necessary for achieving an *evidence-based nursing culture*. Survey statements have been developed to represent these predictors and outcomes. Following pilot testing at a medical center, the survey will be disseminated electronically to approximately 1500 nurses working at a large health system. Structural equation modeling analyses conducted on the survey responses will be used to establish a scale with acceptable internal structure and psychometric properties. The scale established in this study offers a diverse range of applications that include evaluating the accuracy and efficiency of interventions designed to promote an evidence-based nursing culture.

Timeline

- The survey hyperlink will be sent out via an e-mail on August 8, 2011
- A reminder e-mail will be sent approximately 1½ weeks after the survey starts
- The survey will be closed approximately 3 weeks after it starts

Support for this Study

- Fully endorsed by: Kay Miller, MCR CNO
Donna Poduska, PVH CNO
- Approved by: MCR NRC
PVH NRC
PVHS IRB (Institutional Review Board)
CSU IRB
- Funded in-part by: The PVHS Foundation
- Study importance: EBP Mandate from the Institute of Medicine (2008)
Supports Magnet's emphasis on measurement & empirical outcomes
- Study Team: Study conducted by Janet Craighead w/ the support of a team of CSU professors

Appendix J
Incentive Drawing Procedures:
Honoring the PVHS Nurses who Participated in this Research Study

Conducting the Drawing

The PVHS Volunteer Offices maintained the entries throughout and following the data collection period. *(Name withheld for privacy)*, PVH Director of Volunteer and Guest Services, will manage the incentive drawing. The incentive drawing may be used as an opportunity to publicize and promote nursing research by, for example, holding the drawing at a forthcoming PVHS conference or meeting, or posting a notice on VIC about the study and the incentive winners; and retired nurses and academic researchers currently working as PVHS Volunteers will be invited to support the drawing activities.

Drawing Procedures

The first, third, fifth, and seventh names drawn will be awarded an Amazon Kindle, and the second, fourth, sixth, and eighth names drawn will be awarded an Apple iPad.

Eligibility

All nurses who complete the study survey and who submit an original printout of the last page of the survey on which their complete and legible contact information is written are eligible for the incentive awards. No qualifying nurses are excluded from the drawing other than the study investigator; nurses who have reviewed and/or supported the study protocol, and who otherwise fulfill the criteria for incentive eligibility, will not be excluded.

Drawing Date

The drawing will take place at the close of the PVH Nursing Research Committee meeting on Monday, October 17, 2011 at 11:45am.

Delivering the Awards

To be proposed by *(name withheld for priacy)*. However, a written statement will be delivered to recipients indicating that the awards are provided by the research grant, and not by PVHS, and thus the devices are not serviced by PVHS.

Shredding the Entries

Following the drawing, all documents submitted into the study drop boxes will be placed in a PVHS confidential materials box for shredding.

Planning for Adverse Circumstances

In the unlikely event that the PVHS data collection is successfully completed, but the incentive drop boxes are destroyed or stolen, or the securely maintained incentive applications are inadvertently destroyed, the incentive drawing will still occur. However, the pool from which the winners will be drawn will include all MCR and PVH nurses who were invited to participate in the study.

Appendix K

Proposed Changes to General Themes and Variables in the ICER Model© Measure of an EBNC

Factor	Item	Proposed Change
General		Omit references to "EBP Committee"
		Should behavior items use verbiage for self or for social norms

Ra	V82	My EBP leaders are interested in hearing about my ideas for improving patient care
		• R Meas Model #19: Tried CrLing V82 on A (orig) and S
		  • Ra2 V82 = .086 * F16 + .692 * F18
		  • V82 loaded decidedly on SN's
		• Nurses seemed to emphasize the leadership component, rather than their own ideas
		• Thus, emphasize the object of interest at the beginning of the statement, rather than at the end

Ca	V32	I feel overloaded with new practice recommendations • This item did not perform well • Are the overload complaints targeted at general workload, not new workload? • Does this support the notion that nurses <u>want</u> to engage in best practices
Ca	V33	From: I am interested in information that will help me improve the care I give my patients To: I am interested in reviewing information that will help me improve the care I give my patients
Ca	V35	From: The EBP recommendations communicated to me are applicable to <u>my</u> practice To: New practice recommendations communicated to me are applicable to <u>my</u> practice
C	New	I understand the recommendations that are communicated to me by the EBP Committee
Ek	V61	From: I can deviate from using a practice recommendation for individual patients as long as I document why To: I should deviate from using a practice recommendation for individual patients when there is sufficient justification, <u>*or*</u> If I deviate from a practice recommendation, I must document the rationale
Eb	V78	I inform my patients about their plan of care • This item did not perform well psychometrically, but it provides a useful barometer about opportunities to integrate patient/family preferences and values into the plan of care • Retain this item in future surveys
Rk	V91	From: I am too busy to think of questions or way to improve nursing care To: I think of questions or ways to improve nursing care • Consider reloading this item from Knowledge to Resview Org Control, using it as a measure of time and/or intellectual resource • This item did not qualify to crossload from F17/K to F19/OC (see Review 5F Measurement Model #10 LM Test results), but this may have been associated with negative stems not performing well, in general, at least in this sample
Rb		Add an item about nominating topics to my leadership about ways to improve outcomes