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The effectiveness of four translation strategies on nurses' adoption of an evidence -based bladder protocol

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**The Effectiveness of Four Translation Strategies on
Nurses' Adoption of an Evidence-Based Bladder Protocol**

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**Dissertation submitted to the School of Nursing at
West Virginia University in partial fulfillment of the requirements
for the degree of**

Doctor of Philosophy in Nursing

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**Morgantown, West Virginia
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**Keywords: Translation strategies; Nurses' adoption behaviors; Nurses' attitudes;
Evidence-based protocol
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ABSTRACT

The Effectiveness of Four Translation Strategies on Nurses' Adoption of an Evidence-Based Bladder Protocol

Jamey S. Frasure

Background: Mixed evidence exists regarding the effective use of the use of the four translation strategies of educational materials, educational meetings, reminders, and audit and feedback on the adoption and implementation of interventions by nurses. Many clinical practice guidelines for the care of the stroke patient advocate for bladder training, but evidence-based bladder protocols for the stroke patient are not available. The best available bladder protocol identified was a prompted voiding algorithm from the Registered Nurses' Association of Ontario. Review of the literature reported 32 – 79% of hospitalized stroke patients suffer from urinary incontinence. Strong support for prompted voiding demonstrated the reduction of urinary incontinence in patients with cognitive and physical deficits. There was no evidence relevant to nurses' attitudes toward using and participating in research and their influences on the implementation of the stroke clinical practice guidelines. Additionally, there was no study located that investigated the effective use of the four translation strategies on nurses' adoption of a bladder protocol when providing care to stroke patients.

Purpose: The primary purpose of this study was to examine the effects of an intervention consisting of the four translation strategies of educational materials (clinical practice guideline), educational meetings, reminders, and audit and feedback on nurses' adoption of an evidence-based bladder program for stroke patients in an acute care setting. The second purpose was to evaluate the difference in incontinence episodes of stroke patients before and after nurses received the intervention. The third purpose of the protocol was to evaluate the influence of nurses' attitudes and the demographic characteristics on the adoption and the use of the evidence-based bladder program after receiving the intervention.

Methodology: A time-series design, using 8 one-week time points before the intervention and 16 one-week time points after the intervention, was used to obtain the required sample, $n = 29$. The nurse and medical record samples were convenience samples from a 40-bed neuroscience acute care unit affiliated with a 695-bed academic medical center. To meet the design requirements, data were collected over an extended period of time and an intervention was introduced during the time period. The intervention consisted of the use of the four translation strategies of educational materials (prompted voiding algorithm), educational meetings (staff education), reminders (e-mail messages and bulletin board updates), audit (chart review form data) and feedback (e-mail messages and bulletin board updates). The purpose of the intervention was to teach and encourage nurses to adopt a prompted voiding algorithm for stroke patients. The Research Utilization Survey was used to evaluate the influence of nurses' attitudes and demographic characteristics on the adoption and the use of the evidence-based bladder program after receiving the intervention.

Results: Data supported the degree of change as a two-fold increase in the nurses' adoption of an evidence-based bladder protocol, but there was no statistical difference in the incontinence episodes pre- and post-intervention. The increased research utilization and attitude scores were not statistically significant. Nurses' level of basic nursing education was positively associated with the adoption and the use of the evidence-based bladder protocol.

Conclusions: This study was the first to provide empirical support for the influence of the combination of these four translation strategies and nurses' attitudes toward research on adoption of evidence-based practice in a time-series design study; thus, the combined use of the four translation strategies did have an impact on nurses' adoption of evidence-based practice.

DEDICATION

In memory of my father, James Lloyd Davis (1934-1999)

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TABLE OF CONTENTS

LIST OF TABLES	viii
LIST OF FIGURES	ix
CHAPTER 1: INTRODUCTION	1
Problem Statement	4
Significance of the Study	5
Theoretical Framework	6
Supporting Theories and Models	14
Model of Investigation	20
Research Questions	24
Summary of Literature	25
Organization of the Dissertation	26
CHAPTER 2: REVIEW OF THE LITERATURE	27
The Four Translation Strategies	27
Nurses' Attitudes toward Research Utilization	69
Summary of the Review of the Literature Evidence	78
Summary of the Literature Gap	80
CHAPTER 3: METHODOLOGY	81
Study Design	81
Setting and Sample	82
Intervention	84

Measurement of Concepts.....	90
Procedure	95
Confidentiality	96
Data Analysis.....	96
CHAPTER 4: RESULTS.....	102
Introduction.....	102
Characteristics of the Sample.....	102
Descriptive Data of Theoretical Variables.....	105
Findings for the Research Questions	109
Additional Results.....	118
Summary.....	119
CHAPTER 5: DISCUSSION.....	120
Study Findings Related to Previous Research	120
Recommendations for Nursing Research.....	135
Strengths and Limitations	137
Conclusion	138
REFERENCES	140
APPENDIX A: DATA COLLECTION FORM	151
APPENDIX B: QUESTIONNAIRES.....	154
CURRICULUM VITAE	164

LIST OF TABLES

Table 1	22
Table 2	28
Table 3	41
Table 4	49
Table 5	87
Table 6	104
Table 7	106
Table 8	108
Table 9	112
Table 10	114
Table 11	117
Table 12	118

LIST OF FIGURES

Figure 1.....	8
Figure 2.....	19
Figure 3.....	82
Figure 4.....	85
Figure 5.....	88
Figure 6.....	111

CHAPTER 1: INTRODUCTION

This dissertation describes a research study that examined the use of translation strategies and nurses' attitudes to increase the use of evidence-based practice among neuroscience nurses in the acute care setting. The first chapter presents an introduction about the use of four translation strategies to promote nurses' adoption of an evidence-based bladder protocol. Three major theoretical models used to study diffusion of innovations are presented with a supporting process model. The Conceptual Model for the Spread and Sustainability of Innovations in Service Delivery and Organization was the model chosen as the theoretical framework. Information on the change agent's role which has implications for the model is also described. Additionally, the statement of purpose, significance of the study, and the research questions are presented.

Translation science is the scientific study of methods that affect adoption of evidence-based practice by health care providers on the individual and organization levels to improve patient outcomes and operational decision making (Titler, 2004a). The use of evidence-based practice relies on the clinician's expertise, along with the best available external clinical evidence from research and/or evidence-based theories, opinions from expert leaders, evidence from the patient's assessment, and data about patient preferences. Best evidence is clinically relevant research, often from the basic sciences of medicine, but especially from patient-centered clinical research (Sackett, Rosenberg, Gray, Haynes, & Richardson, 1996). In addition, evidence-based practice is the deliberate use of the best available evidence for making decisions about the care of individual patients. Research utilization is the use of research in clinical practice and is only one of many components underpinning evidence-based practice and translation science (Frasure, 2008).

A recent review and synthesis (Frasure, 2006) evaluated evidence of the effectiveness of the four translation strategies of educational materials, educational meetings, reminders, and audit and feedback. Evidence demonstrated that all four strategies were effective in improving patient outcomes by targeting provider behavior. In most studies, these strategies were used in combination with each other or in combination with other strategies.

Educational materials are defined as the distribution of published or printed recommendations for clinical care. Educational meetings include lectures, workshops, conferences, or inservices for health care providers (HCPs). Reminders involve information intended to prompt a HCP to perform or avoid some action relevant to individual patient care. Audit and feedback denote summaries and reports of clinical performance of health care over a time period (Grimshaw et al., 2004).

Evidence from a recent meta-analysis indicated educational materials alone had a modest effect ($> 5\%$ and $\leq 10\%$) on guideline implementation; educational meetings had a small effect ($\leq 5\%$); audit and feedback had a modest effect; and reminders, the most commonly studied single strategy, had a moderate effect ($> 10\%$ and $\leq 20\%$). Other important findings from the same meta-analysis were: (a) the grouping of educational materials and reminders appeared to be more effective than materials only; (b) educational meetings and reminders appeared more effective than meetings alone; and (c) the combination of educational materials, meetings, and reminders were possibly more effective than combined use of educational materials and meetings (Grimshaw et al., 2004). Much of the research on these four strategies focused on evidence-based practice change by physicians. This study evaluated the effectiveness of these four strategies in the adoption by nurses of an evidence-based bladder protocol in the acute care phase of the stroke patient.

The primary translation strategy of this study, the clinical practice guideline, was one of many educational materials used. Clinical practice guidelines are systematically developed statements intended to guide health care practitioners' decisions about the best care for specific clinical conditions. Many clinical practice guidelines for the care of the stroke patient were available, but none contained specific bladder protocol guidelines (Duncan et al., 2005; Teasell, Foley, Salter, & Bhogal, 2007). Health care providers are under increased pressure to streamline care and decrease costs by using clinical practice guidelines. In addition, guidelines have the potential to encourage effective interventions and discourage ineffective interventions (Grimshaw et al., 2004).

In a systematic review by Estabrooks and colleagues, out of six determinants of research utilization only one had a positive association, namely individual beliefs and attitudes (Estabrooks, Floyd, Scott-Findlay, O'Leary, & Gushta, 2003). Furthermore, Champion and Leach noted that nurses' attitudes were important predictors of behavior (Champion & Leach, 1989). When targeting dissemination and implementation strategies to improve patient care and outcomes, nurses' attitudes toward research utilization in practice must be considered.

Purpose of the Study

The primary purpose of the study was to examine the effects of an intervention consisting of the four translation strategies of educational materials (clinical practice guideline), educational meetings, reminders, and audit and feedback on nurses' adoption of an evidence-based bladder protocol for stroke patients in an acute care setting (Frasure, 2006). The second purpose was to evaluate the difference in incontinence episodes of stroke patients before and after nurses received the intervention. The third purpose of the study was to evaluate the influence of nurses'

attitudes and demographic characteristics on the adoption and the use of the evidence-based bladder protocol after receiving the intervention.

Problem Statement

There was mixed evidence in support of the use of the four translation strategies of educational materials, educational meetings, reminders, and audit and feedback on the adoption and implementation of interventions by nurses. Many clinical practice guidelines for the care of the stroke patient advocate for bladder training, but evidence-based bladder protocols for the stroke patient were not available. The best available evidence-based bladder protocol identified was a prompted voiding algorithm (RNAO, 2005). The protocol was chosen because it provided a level of evidence for each intervention and was previously used with cognitively impaired patients. Review of the literature found and reported that 32 – 79% of hospitalized stroke patients suffered from urinary incontinence (Brittain, Peet, Potter, & Castleden, 1999). Strong support for prompted voiding demonstrated the reduction of urinary incontinence in patients with cognitive and physical deficits (Gross, 2003). Unfortunately, there was no evidence relevant to nurses' attitudes toward using and participating in research and their influences on the implementation of the stroke clinical practice guidelines, in general. Additionally, there was no study identified that investigated the effective use of the four translation strategies on nurses' adoption of a bladder protocol when providing care to stroke patients.

For this time-series study, the intervention of the four translation strategies on the adoption of an evidence-based bladder protocol was tested. Educational meetings were designed to provide nurses with the information and evidence to support the use of stroke clinical practice guidelines and bladder protocol. Audit and feedback were employed to collect data about the adoption of the bladder protocol and data were reported back to the nurses in a timely manner.

In addition to the clinical practice guidelines, weekly electronic mail (e-mail), and bulletin board updates were distributed throughout the intervention phase. This study also examined the relationship of nurses' attitudes toward research and the adoption of a bladder protocol.

Significance of the Study

There is a strong association between stroke complications and poor outcomes, suggesting that complications act as barriers to recovery (Langhorne et al., 2000). Urinary incontinence in stroke patients is a significant problem and there is a need to know how nurses can consistently intervene in the acute care setting. Patient outcomes, quality of life, and health care costs of the stroke patient can be compromised by complications from infection, skin breakdown, and falls that may occur while tending to elimination needs (Fischer et al., 2005). Falls can potentially result in bodily injury and even death (Hendrich, Nyhuis, Kippenbrock, & Soja, 1995).

Findings from this study should provide information about the effectiveness of the four translation strategies and how to plan future evidence-based practice change. The primary objective of adopting the use of research into health care is to improve patient outcomes (Estabrooks, Wallin, & Milner, 2003). In this study, improved patient outcomes and quality of life are the projected consequences of the adoption of research findings. Also, by understanding the influences of nurses' attitudes on implementation of evidence-based practice, the most successful strategies can be employed in future research.

In order to adequately evaluate translation strategies, the best possible design was used to control for confounding variables. The time-series design provided strong evidence when a true experiment was not feasible. By examining multiple time periods, large fluctuations in the data can be explained and the data have the potential to be more accurate than the before-after design

(Shojania & Grimshaw, 2005). The following discussion of the theoretical framework and the influence of the study concepts help to further define the study design.

Theoretical Framework

Successful translation of evidence into practice requires a strong evidence base, a well-defined intervention and implementation strategy that accounted for the structure, culture, and capacity of an organization (Fraser, 2004). For that reason, a conceptual translation science model had to be supported by the strongest available evidence. Using Greenhalgh and colleagues' systematic review for selecting a sound conceptual model was congruent with the principles of translation science (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004).

Greenhalgh et al. (2004) developed the meta-narrative review method to organize the vast and complex literature relevant to the diffusion of innovations. The rigorous process required six phases comprised of planning, searching, mapping, appraising, synthesizing, and recommending. A unifying conceptual model was a consequence of the synthesis of theoretical and empirical findings. In the recommending phase, the researchers encouraged others to use and test the Conceptual Model for the Spread and Sustainability of Innovations in Service Delivery and Organization (Greenhalgh et al.'s model), Figure 1. The following description of the model was organized by the eight constructs in the model (Greenhalgh, Robert, Bate, Macfarlane, & Kyriakidou, 2005; Greenhalgh et al., 2004).

Greenhalgh et al.'s Model

As depicted in Figure 1, the eight model constructs are innovation, adoption and assimilation, diffusion, dissemination, system antecedents for innovation, system readiness, implementation process, consequences, and linkages of the constructs. Adoption of an innovation occurs by diffusion and dissemination. System antecedents set the stage for system

readiness which directly influences adoption, leading to implementation which in turn creates consequences (Greenhalgh et al., 2004). Also illustrated in Figure 1 are the outer context, linkage among the components of the model, resource system, knowledge purveyors, and change agency. The eight constructs and the linkage of the constructs are explained in the subsequent sections.

Figure 1.

Conceptual model for the spread and sustainability of innovations in service delivery and organization (Greenhalgh et al. 2004).

Innovation

Innovation is a novel set of behaviors or interventions directed at improving patient outcomes, efficiency, health care costs, and implementation of the users' experiences in a coordinated manner (Greenhalgh et al., 2005; Greenhalgh et al., 2004). The key attributes of an innovation that may explain the variance in the adoption rate are relative advantage, compatibility, low complexity, trialability, observability, potential for reinvention, fuzzy boundaries, risk, task issues, nature of knowledge, and technical support (Rogers, 2003). Further discussion of each of these attributes follows.

Relative advantage is an attribute of innovation when potential adopters see an advantage or incentive for change to be considered or adopted. Compatibility is another attribute of innovation when potential adopters' yearn for an individual and collective history. Simplified innovations are low in complexity and enhance the adoption rate. A sense of trialability or allowing potential adopters to feel less threatened by change is provided by temporary innovations, such as a pilot study. When an innovation is visible to others and the enthusiasm can potentially increase among the adopters, observability is present (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

Potential for reinvention is the modification of the innovation to suit the adopters' needs. A fuzzy boundary, the soft periphery that facilitates reinvention, encompasses the hard core or the irreducible elements of an innovation (Denis, Hebert, Langley, Lozeau, & Trottier, 2002). The adopters' perceived degree of uncertainty over the outcome of the innovation is risk. If the risk is high, adoption is less likely to occur. Task issues, on the other hand, are the degree of relevancy of an innovation to an adopter's work and the potential of improving task performance. Nature of knowledge (tacit/explicit) is when the innovation's use is codified and

transferred from one context to another to encourage adoption. Having access to technical support can facilitate the assimilation of an innovation (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

Adoption and Assimilation

Adoption of an innovation can be lengthy at times as it involves the process of change, requiring sequential steps, and the resistance to adoption is a form of resistance to change. Adoptive behavior occurs when needs, motivation, values, goals, skills, learning style, and social networks are acknowledged. Motivation, values, and learning style identify the general psychological antecedents or the individual traits associated with the propensity to try to use innovations. Values, skills, and goals are context-specific psychological antecedents or innovations that meet an existing need of the adopter. Adoption of an innovation moves back and forth between initiation, development, and implementation (Greenhalgh et al., 2005; Greenhalgh et al., 2004). The influence of social networks (management, service users, and stakeholders) can facilitate assimilation of the innovation. Assimilation happens along with adoption, both involving the complex and nonlinear process of the “soft periphery” elements.

Diffusion and Dissemination

Diffusion, the spread of an innovation in an unplanned and informal manner, is the opposite of dissemination, which is the spread of an innovation in a planned and formal manner. The various influences which exist along the continuum are social networks, homophily, peer opinion, marketing, expert opinion, champions, boundary spanners, and change agents. Social networks are people embedded in a group with others who share common interests, while homophily describes adopters who have similar socioeconomic, educational, professional, and cultural backgrounds. People who have influences on the beliefs and actions of their colleagues

characterize peer opinion, so marketing needs to use interpersonal channels to promote an innovation. The expert opinion of one who possesses a high-stature position, typically an academic with a national or international reputation is important as well. Key individuals in a social network who are willing to support an innovation are champions. Boundary spanners are people who have strong ties both inside and outside of an organization who are willing to link the organization to the outside relevant to the innovation. Additionally, a change agent is an individual who influences innovation decisions in the direction guided by the change agency. The change agency is a third party agency outside of the organization receiving the change. The change agent's goals are usually aligned to the change agency (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

System Antecedents for Innovation

System antecedents for innovation are an organization's capacity to embrace and implement any innovation and are sorted into the three categories of structure, absorptive capacity for new knowledge, and receptive context for change. Structure defines the ways an organization assimilates innovations as dictated by the organization's size, maturity, and ability to functionally differentiate and focus on specialized professional knowledge. Formalization, differentiation, decentralization, and slack resources are also attributes that describe structure. The absorptive capacity is the ability for an organization to assimilate innovations and is delineated by the attributes of preexisting knowledge/skills base, ability to find, interpret, recodify, and integrate new knowledge, and the enablement of knowledge sharing via internal and external networks. Lastly, receptive context for change is the organization's ability to embrace new ideas and change, and encompasses the attributes of leadership and vision, good

managerial relations, risk-taking climate, clear goals and priorities, and high-quality data capture (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

System Readiness

System readiness refers to the willingness of an organization to adopt a specific innovation. Determinants for system readiness are tension for change, innovation-system fit, power balances, assessment of implications, dedicated time/resources, and monitoring and feedback. When a current work condition is intolerable, tension for change occurs. Innovation-system fit reflects an innovation corresponding with existing values, norms, strategies, goals, skill mix, and technology. If supporters of an innovation outnumber the challengers of an innovation, a power balance takes place. Assessment of implications defines the process of assessing and anticipating the effects of an innovation to promote assimilation. The allocation of resources to encourage assimilation constitutes dedicated time and resources. Finally, monitoring and feedback demonstrate the organization's ability to monitor and evaluate the impact of an innovation (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

Implementation Process

Implementation process is defined as the early usage behaviors following the adoption decision, and key components of system readiness are especially relevant to the implementation process. Other propositions that are integral to implementation are decision-making entrusted to frontline teams, hands-on approach by leaders and managers, human resource issues, dedicated resources, internal communication, external collaboration, reinvention, and feedback on the program. The ability of an organizational structure to be adaptive and flexible can be gauged by decision-making devolved to frontline teams. A hands-on approach by leaders and managers promotes implementation and routinization when top and middle management are supportive.

Human resource issues require early and widespread involvement of staff at all levels of the organization. Internal communication, if effective, can increase the likelihood of successful implementation of an innovation. For complex innovations to succeed, external collaboration is also considered necessary. When an innovation is adapted to the local context initially and feedback data are presented at a rapid pace to keep the adopters engaged and making decisions about adopting new practice behaviors, reinvention is more likely to occur. If feedback is done proficiently, the impact of an innovation can be maximized (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

Consequences

Consequences are the effects of the implementation process. Every innovation has negative or positive consequences. The diffusion literature lacks attention to consequences, and few studies have systematically documented the negative consequences observed by adopters or organizations that have resulted from unsuccessful innovations (Greenhalgh et al., 2005).

Consequences, negative or positive, need to be monitored and reported to the adopters to guide the decision of whether to adopt or reject an innovation. Positive consequences might serve as motivators for the adopters while transparency in reporting negative consequences enhances trust (Rogers, 2003).

Linkage of the Constructs

Linkage of the constructs is represented by two large arrows in Figure 1. The arrows characterize the iterative flow between the design and implementation stages. The design stage involves the constructs on the left-side of the model and encompasses resource system, knowledge purveyors, and change agency. The linkage activities of the design stage are shared meanings and mission, effective knowledge transfer, user involvement in specification, and

promotion of a user-led innovation. The implementation stage involves the constructs on the right-side of the model of system and encompasses readiness for improvement, adopter, assimilation, and implementation process. The linkage activities of the implementation stage are communication and information, user orientation, product augmentation, and project management support. Linkage is vital to the success of the change agent. The underpinning concepts of linkage must aim to achieve a shared conception of the total system by promoting a common language and a common sense of mission by the adopters (Greenhalgh et al., 2005; Greenhalgh et al., 2004). To add clarity to the theoretical framework, supporting theories and models are presented in the following section.

Supporting Theories and Models

The following section provides a description of supporting models (Rogers' Model of Diffusion of Innovations, Havelock's Linkage Model, Estabrooks' Conceptual Model, and A Model for Change to Evidence-Based Practice). The supporting models were consistent with Greenhalgh et al.'s Model and offered concrete implementation strategies that were not apparent in the more abstract and complex model. Estabrooks' Conceptual Model was used to better understand nurses' attitudes toward research

Rogers' Model of Diffusion of Innovations

Because Greenhalgh et al.'s model is derived from a systematic review of the literature on the diffusion and spread and sustainability of innovations, the model incorporates the concepts of innovation and diffusion from Rogers' model. When studying rural sociology, Rogers used deduction and induction to develop the concept of diffusion for describing the passive adoption of innovations. Diffusion is part of the adoption process, but planned dissemination expedites change. The key attributes of an innovation that influence the adoption

rate are relative advantage, compatibility, ease of use, trialability, and observability. No matter what the discipline, adoption is less likely if an innovation makes a task more difficult (Rogers, 2003).

Havelock's Linkage Model

Greenhalgh et al.'s model relies on the diffusion and sustainability of innovations. The model incorporates the concepts of diffusion and dissemination into the change process. The change agent is integral to planned dissemination, but the role is not defined by Greenhalgh et al.'s model. Havelock's work focuses on the change agent's role and the skills needed to relate to people as an integral part of the success of a project. The linkage model has evolved over time by deduction and induction sequentially in an iterative process (Walker & Avant, 2005). Change agents are discussed throughout the diffusion of innovation literature, but the actual responsibilities are not clearly defined. Greenhalgh et al. (2005) were unable to explore the role of the change agent because there were no studies that met the inclusion criteria. No matter what position the agent holds, the dissemination process cannot be successful without knowledge and support. In many planned change theories, the process of change is detailed and formatted in a step-by-step approach. A high level of detail about the process is needed, but the best method for holding the interest of the stakeholders is unknown. The change agent's ability to relate to adopters is an integral part of the success of the project (Havelock, 1995). A savvy change agent must create a team to help foster a sense of urgency and importance in the new process. If the sense of urgency remains low then none of the potential adopters feel compelled to change behaviors (Kotter, 1996).

The change agent could come from inside or outside the system. Havelock (1995) views the change agent in four possible situations. The change agent might be starting without a prior

relationship to the group, reestablishing a previously good affiliation or a tentative affiliation, or redefining an existing affiliation. Depending on the orientation of the change agent, the initial impressions could already be formed or the formation could be pending. The change agent needs to make every effort to start in a positive direction. If the change agent is known to the system and the relationship is not ideal, then the change agent needs to find a way to establish a relationship that promotes the change process. An important quality of the relationship between the change agent and the potential adopters is reciprocity. Openness and realistic expectations are vital to forging a working group. Confrontation and differences are part of the process and it is therefore best to have an open system that involves all relevant parties when the need arises (Havelock, 1995).

Estabrooks' Conceptual Model

Estabrooks' conceptual model of research utilization provides the empirical evidence for understanding nurses' attitudes toward using research in practice (Estabrooks, 1999a). As in Havelock's model, an iterative process of deduction and induction was used for theory development (Walker & Avant, 1995). The survey instrument was developed using standard procedures and theoretical concepts of research utilization found in the literature. Data were analyzed by structural equation modeling and resulted in four concept identifiers: (a) direct research utilization is the application of research findings by nurses where direct use of the findings is used in giving patient care, (b) indirect research utilization is the use of research findings by nurses to change thinking or opinions about how to approach certain patient care situations, (c) persuasive research utilization is the use of research findings by nurses to persuade others who are usually in decision-making positions to make changes in conditions, policies, or practice relevant to nurses, patients, or the health of individuals or groups, and (d) overall

research utilization is the use of research findings in any way, in any aspect of the work as a registered nurse (Estabrooks, 1999a). In the Greenhalgh et al. model (2004), attitudes are an attribute of the construct of adoption. In order to understand nurses as the adopters, it is necessary to understand nurses' attitudes toward using and participating in research and the effect on the adoption of evidence-based practice (Rogers, 2003). Therefore, nurses' attitudes as defined by Estabrooks was the opinion expressed along a continuum of negative to positive, and was the definition used in this study (Estabrooks, 1997).

A Model for Change to Evidence-Based Practice

The main objective of planned change theories is to alter social systems (Tiffany & Lutjens, 1998). Planned change refers to deliberately engineered change occurring in groups, as in the process model for change to evidence-based practice (Larrabee, 2009; Rosswurm & Larrabee, 1999), in addition to other models that have been tested. The revised Model for Evidence-Based Practice Change (Larrabee, 2009) exemplifies engineering change with the following steps: (a) Step 1: assess the need for change in practice, (b) Step 2: locate the best evidence, (c) Step 3: critically analyze the evidence, (d) Step 4: design practice change, (e) Step 5: implement and evaluate change in practice, and (f) Step 6: integrate and maintain change in practice.

The main distinction between these two models is Greenhalgh et al.'s model is not regarded as a process model for guiding evidence-based practice change while Rosswurm and Larrabee's model is a process model for guiding change (Larrabee, 2009; Rosswurm & Larrabee, 1999). Therefore, the planned change model developed by Rosswurm and Larrabee (1999) and Larrabee (2009) served as a guide for the process model of adopting evidence-based practice. The process is an iterative process as seen throughout Greenhalgh et al.'s model, especially in

adoption and assimilation. Overlap also occurs with Greenhalgh et al.'s model in other constructs. Assessment is inherent in Step 1 of Larrabee's model and also in the Greenhalgh et al.'s model in the construct of system antecedents. Step 1 (Larrabee, 2009) and Step 3 align with Greenhalgh et al.'s construct of system readiness in the process of selecting an innovation for adoption. Larrabee's Step 4 and Greenhalgh et al.'s construct of innovation are paramount to the design of the practice change. Implementation is a construct in both models and a proposition of Step 4 in the planned change model. The concepts of monitoring and giving feedback to the adopters are also found in Larrabee's model Step 6 and in Greenhalgh et al.'s construct of consequences (Greenhalgh et al., 2005; Rosswurm & Larrabee, 1999). Overall, there are many linkages between the two models.

Linkages of the Four Translation Strategies to Greenhalgh et al.'s Model

The focal point of this study was the use of the four translation strategies of educational materials, educational meetings, reminders, and audit and feedback in the adoption of an innovation. The innovation was a bladder protocol for stroke patients. The strategies were used as an intervention to encourage nurses to adopt an evidence-based continence program, shown in Figure 2. The primary conceptual model tested by Greenhalgh et al. (2004) for the Spread and Sustainability of Innovations in Service Delivery and Organization addressed system readiness factors influencing adoption, implementation, and dissemination of an innovation.

Figure 2.
Model of investigation

Educational Materials

The stroke clinical practice guideline (constituting the educational materials) presented in educational meetings provided nurses with the necessary information to consider the adoption of the bladder protocol. Educational materials were vital to the dissemination process.

Educational Meetings

Structured educational meetings provided nurses with the necessary information to consider the adoption of the bladder protocol. The combination of educational materials and educational meetings were vital to the dissemination process. In the model, dissemination directly influenced adoption of the innovation.

Reminders

All staff members were sent e-mail updates as reminders of the intervention during the implementation of the innovation. The unit bulletin board was updated weekly with bar graphs or pie charts to provide visual representation of the progress of the intervention.

Audit and Feedback

Audit results and feedback, two attributes of system readiness and implementation, were disseminated at a rapid pace to keep the nurses engaged and making decisions about adopting new practice behaviors. Collecting and presenting relevant data for change in system readiness was needed to build a strong case for change. Since change creates a feeling of unpredictability, the stakeholders need to believe that there is strong evidence for the innovation. In addition to the evidence, the nurses need to see the benefit of the innovation (Rogers, 2003).

Model of Investigation

The model of investigation (Figure 2) for this study consisted of nurse attitudes from Estabrooks' model, nurse demographic characteristics, and the six constructs of innovation,

dissemination, system readiness, adoption, implementation, and consequences from Greenhalgh et al.'s model. The proposed model of investigation was limited to these six constructs from Greenhalgh et al.'s model and the nurses' attitudes constructs because both models were systematically and rigorously tested during and after the development phase in previous studies.

Theoretical Definitions

Theoretical definitions for the model of investigation are described in Table 1. For consistency, the theoretical definitions were the same as Greenhalgh et al.'s definitions (Greenhalgh et al., 2005; Greenhalgh et al., 2004). The theoretical definition for nurses' attitudes toward research was derived from Estabrooks's research (1997).

Table 1

Study concepts, definitions, and indicators

Concept	Theoretical Definition	Operational Definition	Empirical Indicator
Innovation	Novel set of behaviors or interventions directed at improving patient outcomes, efficiency, health care costs, and implementation of the users' experiences in a coordinated manner (Greenhalgh et al., 2005; Greenhalgh et al., 2004).	Systematically developed statements intended to guide health care practitioners' decisions about the best care for specific clinical conditions (Grimshaw, 2004).	Bladder protocol
Dissemination	Spread of an innovation in a planned and formal method (Greenhalgh et al., 2005; Greenhalgh et al., 2004).	Educational materials and meetings to provide information and updates	Meeting attendance
Nurses' attitudes toward research	Opinions expressed along a continuum of negative to positive (Estabrooks, 1997)	Research Utilization Survey (Estabrooks, 1999)	Attitude scores
System readiness	Willingness of an organization to adopt a specific innovation (Greenhalgh et al., 2005; Greenhalgh et al., 2004).	Collecting and presenting relevant data about change	Audit (monitoring)
Adoption/assimilation	The process of change requiring sequential steps and can be lengthy at times. Assimilation involves the complex and nonlinear process of soft	Use of the bladder protocol	Investigator developed chart review form for nurses' adoption

	periphery elements (Greenhalgh et al., 2005; Greenhalgh et al., 2004).		behavior scores
Implementation	Early usage behaviors following the adoption decision (Greenhalgh et al., 2005; Greenhalgh et al., 2004).	Innovation becomes routine as indicated by data collection form. Visualization of protocol serves as reminders.	Adoption summaries (feedback) E-mail reminders
Consequences	The effects of the implementation process (Greenhalgh et al., 2005; Greenhalgh et al., 2004).		Continence episodes

Relationships

The model of investigation incorporated six (innovation, dissemination, system readiness, adoption, implementation, and consequences) of the eight constructs from Greenhalgh et al.'s model (2004). The intervention consisted of the innovation (an evidence-based bladder protocol), dissemination (meeting attendance), system readiness (audit data), and implementation (adoption summaries and e-mail reminders). Measures of adoption/assimilation and consequences were evaluated for change after the intervention. The relationships of adoption rate, nurse demographic characteristics, and nurses' research attitude scores were also investigated.

Research Questions

Research questions guiding this study were:

1. What was the difference in the scores of nurses' adoption rates before and after the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback to promote the adoption of an evidence-based bladder protocol during the acute care phase of the stroke patient?
2. What was the difference in the rate of incontinence episodes of stroke patients before and after the intervention?
3. What were the differences in the nurses' research utilization and research attitudes scores before and after the intervention consisting of combined use of education materials, educational meetings, reminders, and audit and feedback?
4. Were there relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitude scores?

Summary of Literature

There was fair evidence to support audit and feedback, educational materials, educational sessions, and reminders were effective strategies for changing provider behavior and increasing adoption of evidence-based practice. Many studies were designed with translation strategies being used in combination with each other. Because of the combinations, it was not possible to know which variable was the mediating variable. Overall, multifaceted strategies were more effective than single strategies, possibly due to the frequency of occurrence of more than one strategy in the studies.

After rating and collating the evidence of each strategy, the entire body of literature received an overall rating of fair evidence. The translation strategies improved important health outcomes and concluded that the benefits outweighed the harm. In the four strategies reviewed, there was a rare case when harm outweighed the risk when deciding to use one or more of the strategies. Therefore, those pursuing practice and outcome improvements should consider using a combination of these four strategies when attempting to change nurses' behavior.

In a systematic review by Estabrooks and colleagues, out of six determinants of research utilization, only one had a positive association, individual beliefs and attitudes (Estabrooks, Floyd et al., 2003). Furthermore, Champion & Leach noted that nurses' attitudes are important predictors of behavior (Champion & Leach, 1986). Even though there were reviews about research utilization in general, limited literature critically analyzes the concepts that comprise nurses' attitudes toward using and participating in research. Furthermore, underlying concepts being measures by each instrument were likely to be different because there was not a specific theory to guide research utilization (Estabrooks, Wallin et al., 2003). Investigating nurses'

attitudes toward research utilization can only be beneficial if results are used to increase the use and sustainability of evidence in practice.

Organization of the Dissertation

In the remaining chapters, Chapter 2 presents a review of the literature relevant to the four translation strategies and nurses' attitudes toward practice and research. This literature addresses the evidence, strongest to weakness, to support the use of the four translation strategies. The influence of nurses' attitudes toward research will also be discussed.

Chapter 3 outlines the methodology for the study. This includes discussion of the research sample, setting, procedures, instruments, and dependent and independent variables. Chapter 4 presents the findings of the study and the statistical analyses. A discussion of the findings and their significance is offered in Chapter 5. The reference list and appendices follow the final chapter.

CHAPTER 2: REVIEW OF THE LITERATURE

The purpose of this literature review was to present a synopsis of the evidence in studies that examined nurses as participants and the effectiveness of four translation strategies of educational materials, educational meetings, reminders, and audit and feedback as discussed in a recent systematic review (Grimshaw et al., 2001). In addition to the translation literature, key studies about nurses' attitudes toward research utilization in practice were reviewed for the purposes of targeting dissemination and implementation strategies to improve patient care outcomes. The four translation strategies were used to organize the translation literature.

The Four Translation Strategies

Inclusion criteria were randomized control trials (RCTs), systematic reviews, and research studies in which nurses were participants and these translation strategies were investigated. RCTs provided the most reliable evidence since the design was considered the most rigorous and provided the necessary level of evidence for this review. Nursing research studies that evaluated the effectiveness of the four translation strategies (educational materials, educational meetings, reminders, and audit and feedback) discussed in Grimshaw et al. (2004) were the focus in Table 2. The table summarized the effectiveness of studies that used the four translation strategies in reverse chronological order. The following section provides the description of the literature search and review process.

Table 2

Summary of the effectiveness of studies using four professional practice strategies: educational materials, educational meetings (sessions), reminders, and audit and feedback in reverse chronological order

Studies evaluating one strategy

Study	Strategy	Study Characteristics <ul style="list-style-type: none"> • Design • Statistical analyses • Rationale for study • Targeted behavior • Study population 	Results of the Effectiveness of Strategies
Clarke* (2006)	Educational Meetings (Edmeet)	<ul style="list-style-type: none"> • Quasi-experimental, before-and-after • Central tendency, Wilcoxon signed rank test • Improve patient management • Triage health patients in emergency departments • 10 full-time triage nurses, 177 mental health patients 	<ul style="list-style-type: none"> • On a Likert scale (1-4), post-intervention, five nurses indicated they were most comfortable with anxiety (mean 3.4) and least comfortable with personality issues and aggressive presentations (mean 2.6) • Percentage of patients triaged as “emergent” did not change, but “not urgent” was significantly reduced (30%) • Waiting times: pre- and post-intervention = 8.7 to 7.6 hours
Kelley (2002)	Reminders* (Rem)	<ul style="list-style-type: none"> • Quasi-experimental • Descriptive, chi-square test, and <i>t</i>-tests • Improve management • Preventive services (Pap smear) • Convenience sample of 9 female nurse 	<ul style="list-style-type: none"> • Stat sign relationship of pre- and post-intervention by assessing the documented discussion of cervical cancer screening with and without reminder $\chi^2=42.9$, $p=.001$ • Stat sign relationship between age and prevalence of

		practitioners and 87 eligible patients	documentation of cervical cancer screening, $\chi^2=5.5$, $p=.04$. Greater documentation on younger patients <ul style="list-style-type: none"> • Rem strategy not effective in increasing awareness of the importance of obtaining a PAP smear
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Studies that simultaneously evaluated two strategies

Feldman (2005)	Educational Materials (Edmat) clinical practice guideline (CPG) and info. cards, Rem*	<ul style="list-style-type: none"> • RCT-control, basic and augmented interventions • Multivariate regression models • Improve patient management • Home care management of heart failure(HF) patients • Nurses randomized to groups, 628 HF patients 	<ul style="list-style-type: none"> • Adjusted probabilities for patient self-management indicators had statistically significant effect ($p = .002$ and $.023$ for basic and augmented interventions, respectively) on patient recognition of HF medications • Marginally significant differences ($p \leq .10$) between the augmented and control groups in diet and weight management • Marked 6.2 point (15.3%) improvement in the mean KCCQ of patients receiving basic intervention, 5.2 point (12.9%) improvement for augmented vs. patients receiving usual care • Basic intervention group scored significantly higher ($p = .003$) than control group on EuroQoL scale (48.9 vs. 39.3, respectfully)
McDonald (2005)	Edmat (CPG), Rem*	<ul style="list-style-type: none"> • RCT-control, basic and augmented interventions • Regression-adjusted effects on the strategies on patients' pain related outcomes • Patient education and advice 	<ul style="list-style-type: none"> • Impact on patient outcomes-reduction in reported pain levels were not statistically significant $p=0.13$ across 3 groups even though the basic intervention group experienced significantly lower pain at rest levels than usual care, $p = 0.03$

		<ul style="list-style-type: none"> • To increase adherence to pain assessment and management guidelines to improve outcomes of eligible cancer patients • 336 nurses from a large urban home care agency 	
Roelands (2004)	Edmat*– (CPG) Edmeet	<ul style="list-style-type: none"> • Quasi-experimental • MANOVA, <i>t</i>-test, chi-square test • Improve patient management • Shared-decision making about assistive device (AD) use in home care • 116 nurses (sites randomly selected), and 140 clients 	<ul style="list-style-type: none"> • In nurses no interaction effects were found, only a main effect of time on the attitude regarding introduction of ADs were found ($F(1,47) = 6.533, p = 0.014$) • Investigator-developed instrument showed attitude scores decreased between pre-test and post-test in the intervention and control group. Internal consistency reliability for the attitudes' subscales was ($\alpha = 0.76$). • Home care workers, no main or interactive effects • Clients showed the need for increased use of ADs in the areas of dressing (96.6%, $N = 87$), maintenance of the house (94.9%, $N = 138$), eating (93.0%, $N = 43$), preparing a meal (88.7%, $N = 124$), and washing (80.3%, $N = 122$)
Moore (2003)	Edmat (printed resources), Edmeet*	<ul style="list-style-type: none"> • Cluster randomized trial • Mean differences in weight, STATA to account for within and between cluster variation • Improve patient management • Improve management of obesity 	<ul style="list-style-type: none"> • 231 baseline questionnaire, 192 post-strategy-odds ratio providing correct response was higher in 4/5 questions, but only 2 were statistically significant, $p=.02$ and $.001$ • 12 months post training intervention group was 1 kg heavier than control, $p = 0.5$

		<ul style="list-style-type: none"> • 44 general practices with 843 patients 	<ul style="list-style-type: none"> • Training package was not effective
Zanetti (2003)	Rem*, CPG	<ul style="list-style-type: none"> • RCT, evaluator-blinded • Two-sided Wilcoxon rank sum test and chi-square, Wald test • Improve patient management in the OR • Reduce incidence of surgical site infections • 273 cardiac surgery cases 	<ul style="list-style-type: none"> • Intraop redosing was significantly more frequent in the reminder group than the control, adjusted odds ratio, 3.31;95% confidence interval, 1.97 to 5.56; $p<.001$ • 6 months preceding study 129 of 480, 27%; $p<.001$ • Rate of surgical site infection-reminder 4%, control 6%, $p=.42$. Pre-study 10%, $p=.02$ • Possible spillover effect on the control group • Formally declined redosing 19 cases
Cannon (2000)	Edmat (CPG) and Rem*	<ul style="list-style-type: none"> • RCT • ANOVA • Improve management • General management, screening • 4 senior research clinicians, 78 patients in a mental health clinic were randomly assigned 	<ul style="list-style-type: none"> • Computer reminders compared to manual resulted in higher screening rate for mood disorder, $p=.008$, group effect 0.30 (medium effect), and higher rate of complete documentation, $p<.001$, group effect 2.83 (large effect)

Studies that simultaneously evaluated three strategies

Kinsman (2007)	Audit Edmat* (CPG) Edmeet	<ul style="list-style-type: none"> • Quasi-experimental, retrospective before-and-after medical record audit (12 weeks before and 12 weeks after) • Independent sample t-test, chi-square test • Improve patient management • Use of CPG with AMI patients 	<ul style="list-style-type: none"> • Mean age of cases meeting the criteria and having a thrombolytic ordered was significantly less than when a thrombolytic was not ordered (64.0 years [SD±13.8] vs. 71.9 years [SD±12.4]; $p=0.008$) • No significant difference in the type of AMI and treatment time, or between hospitals patterns of
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		<ul style="list-style-type: none"> • 170 confirmed AMI cases 	<p>thrombolytic delivery</p> <ul style="list-style-type: none"> • Transportation did not influence ordering of thrombolytic by χ^2 analysis (70% vs. 62%; $p=.304$) or time to delivery when compared by independent t-test (70.2min vs. 50.7 min; $p=.453$)
Hanson (2005)	Audit & Feedback (A&F), Edmat, Edmeet*	<ul style="list-style-type: none"> • Quasi-experimental, controlled before-after • Chi-square test • Improve patient management • Palliative care in nursing homes • Nine nursing homes with 1169 residents 	<ul style="list-style-type: none"> • Increased hospice enrollment from 4% to 6.8% post-intervention ($p=.01$) • Increased pain assessments from 18% to 60% ($p<.001$) • Orders for nonpharmacologic pain treatments increased from 15 to 35% ($p<.001$) • Residents discussions about end-of-life increased from 4% to 17% ($p <.001$) • No significant changes in control sites ($p\leq.05$)
Horner (2005)	A&F*, Edmat (CPG & toolkit) Edmeet	<ul style="list-style-type: none"> • Quasi-experimental, pretest-posttest design • Chi-square test • Improve pain management processes • Pain management in nursing homes • 265 nursing home residents from nine facilities 	<ul style="list-style-type: none"> • Residents in pain who underwent pain assessments increased from 8% to 29% ($p<0.001$) • Residents receiving non-pharmacological pain treatments increased from 31% to 42% ($p= 0.010$), but pain medication use did not change
Karlsten (2005)	A&F*, Edmat (brochure), Edmeet	<ul style="list-style-type: none"> • Quasi-experimental, pretest-posttest design • Chi-square test • Improve pain management processes • Pain management in postoperative patients • 9 general and orthopaedic surgery units 	<p>The increase in pain assessment was statistically significant when the audits of 2000, 2001/2 are compared, $\chi^2 (1, N = 474) = 24.69, p < 0.01$</p>

Baier (2004)	A&F*, Edmat (CPG) Edmeet	<ul style="list-style-type: none"> • Quasi-experimental, pretest-posttest design • Two-sided <i>t</i>-tests, weighted two-sided <i>t</i>-tests (facility level) • Improve pain management processes • Pain management in nursing homes • 17 nursing homes 	<ul style="list-style-type: none"> • Aggregate level-three nonpharmacological process measures demonstrated significant improvement, $p<.001$. Four remaining pharmacologic process measures, 1 measure demonstrated a trend toward improved adherence for residents with daily, moderate, or severe pain, $p=.06$ • Facility level-12 to 15 nursing homes improved significantly in nonpharmacologic process measures. Pharmacologic measures, 1 to 2 nursing homes improved. Outcome measure-proportion of residents with pain declined, $p=.03$. Study group pain prevalence less than non-study facilities, $p=.003$
Seers (2004)	A&F*, Edmat, Edmeet	<ul style="list-style-type: none"> • RCT • Chi-square test, ANOVA, <i>t</i>-tests, • General management • Post-operative pain management • 4 wards were randomized to strategy or control groups 	<ul style="list-style-type: none"> • Baseline- the control wards had significantly more pain at rest since surgery, $p=0.009$ • Control wards had significantly worse pain since surgery at rest, $p=0.023$ • 3 months after strategy- no significant differences in pain level or drug use between the intervention and control groups • Over the study, pain control improved on the control wards from baseline; pain at rest since surgery $p=0.012$, and pain on movement since surgery $p=0.042$
Swoboda (2004)	Edmeet, A&F, Rem*	<ul style="list-style-type: none"> • Three phase quasi-experimental • Central tendency, multiple logistic 	<ul style="list-style-type: none"> • Electronically monitored entries into a patient room with 251,526 for 420 days (10,080 hrs and 3,549

		<p>regression</p> <ul style="list-style-type: none"> • Infection control • Hand hygiene • Health care workers, all staff and visitors on an intermediate care unit 	<p>patient days)</p> <ul style="list-style-type: none"> • Phase I to phase II-hand hygiene improved 37% (odds ratio, 1.38; 95% confidence interval, 1.04-1.83) • Phase III-(odds ratio 1.41; 95% confidence interval, 1.07-1.84) • Overall rate of nosocomial infections significantly decreased when combining phases II and III, the association between nosocomial infection and individual phase was not significant, $p=.13$
Spitler (2004)	Edmat* (CPG), Edmeet, Rem	<ul style="list-style-type: none"> • Quasi-experimental, pretest-posttest design • Chi-square test and t-test • Compare outcomes of interdisciplinary team vs. PCP • Improved diabetes control (HbA_{1c}, LDL, HTN) • 15 MDs, 1 DO, 4 PA's, 4 NP's, ambulatory care clinic for 20,000 patients 	<ul style="list-style-type: none"> • Mean HbA_{1c} for the team group was significantly lower than the PCP group, $p=.0034$ • Mean LDL were not significantly different. • Mean DBP was significantly lower for the PCP group, $p=.043$
Cretin (2001)	Edmat* (CPG), Edmeet, Rem	<ul style="list-style-type: none"> • Blended quality improvement, case studies, and epidemiologic methods • Logistic regression • Improve patient management • CPG targeting low back pain • 4 VA facilities, physicians, nurses, physical therapy 	<ul style="list-style-type: none"> • Physical therapy referrals were decreased from 10.7% to 7.2% with no trends at the comparison sites • Interactions to predict the probability of referral resulted in significant coefficients on the post implementation ($p<.05$) • Interaction terms suggesting that the observed trend was related to guideline implementation

Studies that simultaneously evaluated four strategies

Abbott (2006)	A&F, Edmat* (CPG), Edmeet, Rem	<ul style="list-style-type: none"> • Quasi-experimental, time-series • Student's <i>t</i>-test, MANCOVA • Improve patient management • Adoption of a ventilator-associated pneumonia (VAP) CPG • 106 ventilated patients (≥ 48 hours) 	<ul style="list-style-type: none"> • VAP rate initially decreased (14.44) to below the benchmark level (14.70) and went up (21.56) during the 4th quarter. Most ICU VAP rates decreased and remained below the benchmark level • Pre- and post-intervention hand washing before patient contact ($t=-4.183$, $p=.000$). Appropriate use of gloves pre- and post-intervention ($t=-5.200$, $p=.000$). Fail to show any effects of the intervention • MANCOVA-no statistically significant differences in HOB elevation, oral care, empty condensate from vent tubing, hand washing, or glove use
Berenholtz (2004)	Audit, Edmat (CPG), Edmeet*, Rem	<ul style="list-style-type: none"> • Quasi-experimental, prospective cohort study in a surgical intensive care (ICU) with a concurrent control ICU. • Poisson regression model and Student's <i>t</i>-tests with a two-sided α level of .05. • Infection control • 22,785 patient days and 19,905 catheter days were included in the study SICU and in the control 21, 964 patient days and 17, 383 catheter days were included. 	<ul style="list-style-type: none"> • Catheter related bloodstream infection rate (CRBSI) in the study ICU decreased from 11.3/1,000 catheter days in the first quarter of 1998 to 0/1,000 catheter days in the fourth quarter of 2002 • CRBSI in the control ICU was 5.7/1000 catheter days in the first quarter of 1998 and 1.6/1000 catheter days in the fourth quarter of 2002 ($p=.56$)

Systematic Reviews

Jamtvedt (2006)	A&F	<ul style="list-style-type: none"> • 30 RCTs added since 2003 • Total of included studies was now 118 • See Jamtvedt (2003) 	<ul style="list-style-type: none"> • Adjusted Risk Differences (RD's) of non-compliance with desired practice varied from 0.16(16% increase in non-compliance) to 0.70(70% decrease in non-compliance) • Median = 0.05, inter-quartile range = 0.03 to 0.11 • Adjusted risk ratio varied from 0.71 to 18.3 (median = 1.08, inter-quartile range = 0.99 to 1.30) • Effects of audit and feedback are small to moderate. • Single strategies are as effective as multifaceted strategies • Absolute effects are more likely to be larger when baseline adherence to recommended practice was low
Jamtvedt (2003) See Jamtvedt (2006)	A&F	<ul style="list-style-type: none"> • 85 RCT-reported objectively measured professional practice in a health care setting or outcomes • 2 independent reviewers meta-regression, visual and qualitative analyses • Risk of bias <ul style="list-style-type: none"> -10 studies had low risk -14 trials had a high risk -61 were moderate risk • 43 trials –randomization clearly hidden or cluster randomization used • Follow-up of health professionals <ul style="list-style-type: none"> -50 had adequate follow-up 	<ul style="list-style-type: none"> • Adjusted Risk Differences (RD's) of non-compliance with desired practice varied from 0.09 (a 9% increase in non-compliance) to 0.71 (a 71% decrease in non-compliance) • Median = 0.07, inter-quartile range = 0.02 to 0.11 • One factor that appears to predict the effectiveness of audit and feedback across studies was baseline non-compliance with recommended practice. • Effects of audit and feedback are small to moderate. • Single strategies are as effective as multifaceted strategies • Absolute effects are more likely to be larger when baseline adherence to recommended practice was low

		<ul style="list-style-type: none"> -7 inadequate follow-up, 29 not clear • Trials outcomes <ul style="list-style-type: none"> -45 blindly assessed -7 not blindly assessed -43 not clear 	
Fellowes (2004)	Edmeet	<ul style="list-style-type: none"> • RCT, CBA of communication skills training in cancer health care professionals • 2 independent reviewers • Of 2824 references, 3 RCTs involving 347 health professionals were included <ul style="list-style-type: none"> -Randomization differed across studies -Strategies differed in timing and intensity -Results are limited in all 3 studies to 2-3 months post-training 	<ul style="list-style-type: none"> • Training programs assessed by these trials appear to be effective in improving some areas of cancer care professionals' communication skills • Unknown whether this training would be effective if taught by others, nor the comparative efficacy of these programs
Lewin (2001)	Edmeet	<ul style="list-style-type: none"> • RCT, CCT, ITS of strategies for health care providers that promote patient-centered care • 2 independent reviewers used a standard form • 14 studies randomized health care providers then collected patient-level data <ul style="list-style-type: none"> - 3 did not adjust for potential unit of analysis error - 3 studies presented outcome measures as within-group differences - Small sample sizes 	<ul style="list-style-type: none"> • 17 studies met the inclusion criteria, 15-RCT, 2-CCT (1 was CBA). There was fairly strong evidence to suggest that some strategies promote patient-centered care in clinical consultations may lead to significant increases in the patient-centeredness of consultation processes • 12 of 14 studies showed improvement in some of these outcomes. There was also some evidence that training health care providers in patient-centered approaches may impact positively on patient satisfaction with care

		<ul style="list-style-type: none"> - 7 studies evaluated multi-faceted strategies - Intensity of strategies varied across studies - Wide range of patients • Only 2 studies included provides other than physicians • Only 3 studies assessed outcomes in the 4 predetermined categories 	
Thomson O'Brien (2001)	Edmeet	<ul style="list-style-type: none"> • RCT, quasi-experimental examining effect of continuing education on clinical practice of health professionals or health care outcomes • 2 independent reviewers • Methods were poorly reported <ul style="list-style-type: none"> -7 protection against bias was high -24 protection was moderate -8 studies unit of analysis was not appropriate 	<ul style="list-style-type: none"> • 10 comparisons-moderately large effects in 6 and small effects in 4 • When combining workshops and didactic presentations there were 4 moderately large in 12 comparisons and small effects in 7 comparisons • 7 comparisons of didactic presentations- no statistically significant effects with the exception of 1 out of 4 outcome measures in 1 study
Lancaster (2000)	Edmeet	<ul style="list-style-type: none"> • RCT-strategies were training of health care professionals in smoking cessation • Data extraction in duplicate • Reporting of randomization was variable <ul style="list-style-type: none"> -all studies used cluster randomization -all but one used correct unit of analysis or discussed affect of clustering of patient outcomes on results 	<ul style="list-style-type: none"> • 8 studies that compared patient smoking behavior between trained professionals and controls • 6 found no effect of strategy • Training health professionals to provide smoking cessation strategy had a measurable effect on professional performance, no strong evidence that it changed smoking behavior

* Primary strategy

A thorough search of the literature published in the past 10 years was performed with most of the emphasis on the literature published since 2000. The Cochrane Databases, PubMed, MEDLINE, and CINAHL were searched using the following terms: nursing audit, nursing practice evidence-based, nursing practice research based, clinical nursing research, quality of care research or quality assurance, quality improvement, reminder systems, education continuing, patient outcomes, practice guidelines, and teaching materials. There was a yield of 419 hits from the terms listed. Abstracts were scanned to determine the studies that met the inclusion criteria. Types of articles selected for review were systematic reviews and quantitative studies that examined the adoption of research evidence by health care professionals, specifically nurses, to improve patient outcomes. Relevant references from each article were identified, retrieved, and reviewed. The search strategy identified 24 eligible articles, after screening 450 abstracts or titles. Research articles in which nurses were participants were retrieved and the title or abstract referred to the strategies of interest.

Of the 24 articles reviewed, 5 were systematic reviews, 1 was a cluster randomized trial, 5 were RCTs, 12 were quasi-experimental, and 1 was a blend of quality improvement, case studies, and epidemiologic methods. Strategies were targeted at the group level of health care providers and patient outcomes were used as the measurement of performance of the strategies that were studied. Some of the studies deliberately used the terminology from a database in The Cochrane Library, the Cochrane Effective Practice and Organization of Care Group (EPOC), which prepares and maintains systematic reviews. EPOC has the primary purpose of providing current information to health professionals to improve practice and the delivery of health services to have a positive effect on patient outcomes (Mowatt, Grimshaw, A., & Mazmanian, 2001). Examples of interventions (strategies) that might be used to improve nurses' practice

included educational meetings (educational inservices or workshops). If educational materials (written materials) were distributed at an educational meeting, then educational materials would be an additional strategy utilized to encourage a practice change.

Studies that used a single translation strategy were rare. Because most translation studies used multifaceted strategies, it was difficult to determine which strategy was the most effective or provided the strongest evidence. Some researchers were quite clear about their intent of testing a primary strategy, but other researchers used a multifaceted approach and weighed all of the strategies equally. Heterogeneity of the samples and the interventions was high in the retrieved literature, so meta-analysis was not an option. Settings included home care, acute care, ambulatory care, nursing homes, and community health centers. In the studies, most of the patient populations were quite diverse, as well as the strategies evaluated. Because of the variety, outcomes used to determine the effectiveness of the strategies also varied.

The U.S. Preventive Services Task Force Recommendations hierarchy was developed to assist in the process of reviewing and rating evidence for clinical practice (Harris et al., 2001). This recommendation hierarchy classification was modified to apply to translation strategies as seen in Table 3 (Frasure, 2006). The modified definitions for the rating scale (A, B, C, D, and I) were used to make recommendations about the strength of the evidence and the effectiveness of the four translation strategies on increasing provider adoption of evidence-based practice. The following sections present the evidence and ratings for each of the four translation strategies described in this review of the literature.

Table 3

Rating recommendations for translation strategies

Recommendation	Definition
A	Good evidence that the strategy improves important patient outcomes and concludes that benefits substantially outweigh harms
B	Fair evidence that the strategy improves important patient outcomes and concludes that benefits outweigh harms
C	Fair evidence that the strategy can improve patient outcomes but concludes that the balance of the benefits and harms was too close to justify a general recommendation
D	Fair evidence that the strategy was ineffective or that harms outweigh benefits
I	Evidence that the strategy was ineffective, was lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined

Modified from Harris et al. (2001). Current methods of the US Preventive Services Task Force: A review of the process (online). Retrieved March 9, 2006 from <http://www.ahrq.gov>

Educational Materials

Educational materials and specifically clinical practice guides (CPGs) were frequently one of the strategies used in translation research. Five studies focused on the effective use of educational materials as the primary translation strategy to change provider behavior (Abbott, Dremsa, Stewart, Mark, & Swift, 2006; Cretin, Farley, Dolter, & Nicholas, 2001; Kinsman, Tori, Endacott, & Sharp, 2007; Roelands, Van Oost, Stevens, Depoorter, & Buysse, 2004; Spitler et al., 2004). Systematic reviews related to nurses' use of educational materials were not found, therefore the strongest evidence was provided by two studies that investigated the effectiveness of multifaceted translation strategies. Studies in this section of the review were organized first by the strength of the evidence, strongest to the weakest, and then chronologically.

Randomized control trial design. In a RCT (Cannon & Allen, 2000), researchers investigated the effectiveness of educational materials (CPG) as a secondary strategy and reminders (computer and manual reminders) as a primary strategy. The aim was to increase clinicians' use of a CPG as a means to improve mood disorder screening. Participants were one clinical psychologist, one registered nurse, one social worker, and one addiction therapist working in an outpatient clinic for patients with posttraumatic stress disorder. Results indicated that the use of the computer reminder mechanism was more effective than the paper checklist mechanism in increasing the clinicians' use of the CPG. Comparing computer reminders to manual reminders resulted in a higher screening rate for mood disorders, $p = .008$, with a medium effect of .30, and higher rate of complete documentation, $p < .001$, with a large effect of 2.83. Because of the rigor, the use of the RCT design strengthened the internal validity. Conversely, the experimental design was weakened by the exclusion of a no-reminder control condition because of an institutional mandate to implement the CPG. Use of computerized reminders strengthened the CPG treatment fidelity by giving consistent and regular feedback to the participants. The paper checklist was the standard practice to promote compliance, but that did not appear to influence nurses' adoption of the reminder. Generalizability was limited since the study was conducted in one setting using four clinician participants.

Cluster randomized trial design. A cluster randomized trial investigated the effectiveness of educational meetings (nutritional training program) and educational materials (dietary and activity prescriptions). The aim was to improve the use of educational meetings for general practitioners and nurses as a means to decrease the weight of obese patients treated in primary care practices. Participants were 231 staff members in 44 practices in northern England. Results indicated that the use of educational meetings was effective in increasing the general practice

staff's knowledge of obesity and patient teaching strategies. The use of educational meetings was not successful in sustaining patients' weight loss at 12 months posttraining, the intervention group was 1 kilogram heavier than the control group, $p = .5$. The cluster randomized design strengthened the internal validity by decreasing contamination between treatment arms. The high attrition rate of the patients limited the power to evaluate the effectiveness of the training package, thus, threatening internal validity. Treatment fidelity was strengthened by administering the same dose and intensity of education to all of the study sites. The external validity was supported by the use of an educational strategy based on previous nutritional training programs (Moore et al., 2003).

Quasi-experimental design. Four quasi-experimental design studies investigated educational materials, specifically CPGs as the primary translation strategy (Abbott et al., 2006; Kinsman et al., 2007; Roelands et al., 2004; Spitler et al., 2004). First, in a quasi-experimental pretest-posttest design, Roelands et al. (2004) investigated the effectiveness of educational materials (CPG) and educational meetings (training program). The aim was to improve home care nurses' use of a CPG as a means to enhance shared decision making about assistive devices. Participants were 116 home care nurses and home care workers and 140 clients with disabilities from a defined region of Belgium. Results indicated that use of a CPG as promoted in educational meetings was effective in increasing home care nurses' and home care workers' self-reported practices of applied intervention methods (informing, exploring, evaluating, counseling, modeling, illustrating, giving feedback, and training). Clients demonstrated the need for increased use of assistive devices in the areas of dressing (96.6%, $N = 87$), maintenance of the house (94.9%, $N = 138$), eating (93.0%, 43), preparing a meal (88.7%, $N = 124$), and washing (80.3%, $N = 122$). The internal validity was strengthened by the use of two random samples

selected independently, home care nurse and care worker departments. It was not feasible to randomly select care givers to participate in the study. Treatment fidelity was strengthened by high compliance of home care nurses and care workers after being trained to use the intervention methods. A threat to the internal validity was the use of self-reporting or over reporting the desired behaviors from the home care nurses and workers (Roelands et al., 2004).

Second, in a quasi-experimental pretest-posttest design, Spitler et al. (2004) investigated the effectiveness of educational materials (CPG), educational meetings (eight one-hour sessions), and the use of reminders (diabetic care record and blue stickers). The aim was to improve primary care providers' adherence to a diabetes CPG as a means to target patient outcomes. Participants were 16 physicians, 4 physician assistants, and 4 nurse practitioners working in a United States Air Force ambulatory care clinic. Results about the use of the educational meetings and reminder mechanisms were inconclusive because of these mixed results. When increasing the primary care physician's use of the diabetes CPG, as well as for the interdisciplinary team, the mean diastolic blood pressure was significantly lower for the primary care group, $p = .043$, the mean LDL were not significantly different, and the mean HbA_{1c} for the interdisciplinary team group was significantly lower than the primary care group, $p = .0034$. The internal validity was strengthened by both the use of a comparison group and the use of a random numbers table to randomly select 118 out of 354 patient charts for review. However, the retrospective chart review design limited the ability to control for confounding variables. Conducting the research at a military facility decreased the generalizability because of the homogeneity of the patient population, though treatment fidelity was strengthened by the regimented environment (Spitler et al., 2004).

Third, an observational prospective quasi-experimental design, Abbott et al. (2006) investigated the effectiveness of educational materials (CPG, self-learning tools, and storyboards), educational meetings (group and individual meetings), reminders (e-mail), and audit and feedback. The aim was to increase nurses' and physicians' use of a CPG to improve ventilator-associated pneumonia (VAP) rates. Participants were physicians and nurses working in the ICUs of two geographically close medical centers in southwestern United States. Results indicated that use of the educational materials, educational meetings, reminders, and audit and feedback were effective in increasing the use of the CPG, but the adoption rate was slower than expected and the practice did not continue after the study was completed. Initially, the VAP rate decreased (14.44) to below the benchmark level (14.70) but went up (21.56) during the fourth quarter of the first year of the study. In the second year, the overall VAP rates in both hospitals decreased and remained below the benchmark level. The internal validity was strengthened by the use of the prospective study design and the inclusion of five ICUs from two hospitals. The lack of treatment fidelity was revealed when the study team could not determine the cause of the change. External validity was compromised by all of the confounding variables caused by the interaction of history and treatment effects for 106 ventilated patients (Abbott et al., 2006).

Finally, a quasi-experimental retrospective before-after medical record audit by Kinsman et al. (2007) investigated the effectiveness of educational material (CPG) when used with educational meetings about acute myocardial infarction (AMI). The aim was to improve interdisciplinary team use of the CPG as a means to improve thrombolytic administration. Participants were ambulance officers, nurses, and physicians from a region in Australia who were involved in the early management of an AMI. When evaluating the administration of thrombolytic drugs, results indicated the mean age of cases meeting the criteria and having a

thrombolytic ordered was significantly less than when a thrombolytic was not ordered, $p = .008$. There was no significant difference in the type of AMI and treatment time, or between hospital patterns of thrombolytic delivery. Transportation did not influence the ordering of thrombolytic, $p = .304$, and time to delivery, when compared, was not significant, $p = .453$. The internal validity was strengthened by the before-after design, but was compromised by the lack of both a control group and randomization. The retrospective design did not allow for treatment fidelity to be built into the study and monitored. Data about the health care team was not discussed (Kinsman et al., 2007).

Evaluation design. In a blended quality improvement, case study, and epidemiologic method, Cretin et al. (2001) investigated the effectiveness of educational materials (CPG), an educational meeting (workshop), and reminders (pocket cards and posters). The aim was to improve providers' use of a low back pain CPG as a means to decrease patient referrals to physical therapy or chiropractic services. Participants were physicians, nurses, and physical therapists at four military facilities in the United States. Results indicated that use of educational meetings and the reminder mechanisms were effective in increasing the use of the CPG by physicians, nurses, and physical therapists, as well as decreasing patient referrals (10.7% to 7.2%) for physical therapy or chiropractic services outside of the unit multidisciplinary team. Four sites were selected for comparison, but none of the sites used the same implementation strategies. The weak study design and inconsistent implementation strategies, compromising the treatment fidelity, limit the internal and external validity (Cretin et al., 2001).

Synthesis of Educational Materials

Evidence from an internally valid RCT (Cannon & Allen, 2000) and a cluster randomized trial (Moore et al., 2003) moderately supports the effectiveness of educational materials in

combination with other translation strategies to improve patient outcomes in outpatient care. Multifaceted strategies were more effective than the use of a single strategy (Abbott et al., 2006; Kinsman et al., 2007; Roelands et al., 2004; Spitler et al., 2004) in achieving desired outcomes. However, Abbott et al. (2006) could not determine if the results were directly related to the translation strategies and Kinsman et al. (2007) and Moore et al. (2003) found no improvement in patient outcomes. Further evidence is needed, especially utilizing stronger study designs. A systematic review would be useful in the evaluation of educational materials as a translation strategy, but the heterogeneity of the studies would make the systematic review process a challenge.

According to the hierarchy rating recommendations (page 41), there was fair evidence that educational materials were an effective translation strategy for increasing adoption by providers of evidence-based practice (Abbott et al., 2006; Cannon & Allen, 2000; Cretin et al., 2001; Moore et al., 2003; Roelands et al., 2004; Spitler et al., 2004). Furthermore, educational materials were an effective translation strategy for improving patient outcomes (Abbott et al., 2006; Cannon & Allen, 2000; Cretin et al., 2001; Kinsman et al., 2007; Roelands et al., 2004; Spitler et al., 2004). Therefore, the recommendation rating of (B) was assigned.

Educational Meetings

Four systematic reviews from the Cochrane Databases investigated the effectiveness of educational meetings as a translation strategy in study samples with nurses as participants (Fellowes, Wilkinson, & Moore, 2004; Lancaster, Silagy, & Fowler, 2000; Lewin, Skea, Entwistle, Zwarenstein, & Dick, 2001; Thomson O'Brien et al., 2001). Also, one cluster randomized trial design and three quasi-experimental studies used educational meetings as the primary translation strategy (Berenholtz et al., 2004; Clarke, Brown, Hughes, & Motluk, 2006;

Hanson, Reynolds, Henderson, & Pickard, 2005; Moore et al., 2003). As seen in Table 4, the criteria from The Joanna Briggs Institute for Evidence-Based Nursing and Midwifery was used to critically appraise the systematic reviews (JBIEBNM, 2000). Studies in this section of the review were organized first by the strength of the evidence, strongest to the weakest, and then chronologically. Overlap of the studies with multiple strategies was unavoidable.

Table 4

Critical Appraisal of a Systematic Review as adapted from JBIEBNM (2000)

Review Question	Is the review question clearly and explicitly stated?	
Inclusion Criteria	How were studies selected?	
Critical Appraisal	Was the validity of studies assessed appropriately?	
Data Synthesis	How were the studies combined?	
Similarity of Studies	<p>Were the populations of the different studies similar?</p> <p>Was the same intervention evaluated by the individual studies?</p> <p>Were the same outcomes used to determine the effectiveness of the intervention being evaluated?</p> <p>Were reasons for differences between studies explored?</p>	
Reporting of Findings	<p>Are review methods clearly documented?</p> <p>Is the review question clearly and explicitly stated?</p> <p>Was the search strategy reported?</p> <p>Was the inclusion criteria reported?</p>	

	Was the criterion for appraising studies reported? Were the methods used to combine studies reported?	
Conclusions & Recommendations	Is a summary of findings provided? Are specific directives for new research proposed? Were the recommendations supported by the reported data?	

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Systematic review design. In the first systematic review by Thomson O'Brien et al. (2001), the aim was to assess the effects of educational meetings on professional practice and health care outcomes. Selected studies were RCTs and nonequivalent group designs in which allocation to a group was by nonrandom process other than participant preference. Thirty-two studies were included with a total of 36 comparisons. Two reviewers followed the inclusion criteria, assessed the quality of each study, and extracted the data. The quality of each study that met the inclusion criteria was assessed per the EPOC module requirements. Disagreements were resolved by discussion between the two reviewers. Studies were assigned a quality rating (high, moderate, low) based on study design, blinded outcome assessment, and completeness of follow-up. The main results were calculated in natural units and calculated as either absolute or relative postintervention differences. Symbols were used to represent statistical significance (X) and nonsignificance (O). Participants were qualified health professionals or were involved in postgraduate training. Educational meetings, conferences, lectures, workshops, seminars, and symposia were the interventions. Outcomes used to determine the effectiveness of the intervention being evaluated were health professional practice behaviors or patient outcomes (Thomson O'Brien et al., 2001).

There was considerable heterogeneity of the results that was best explained by the differences in the interventions. For 10 interactive workshops, there were moderate or moderately large effects in 6 comparisons and small effects in 4 comparisons. Interventions that combined workshops and didactic presentations had moderate or moderately large effects in 12 comparisons (11 were statistically significant) and small effects in 7 comparisons (1 was statistically significant). In seven didactic presentations, there were no statistically significant effects with the exception of one out of four outcome measures in one study. The reviewers

concluded that interactive workshops can result in moderately large changes in professional practice, but didactic sessions alone are unlikely to alter practice (Thomson O'Brien et al., 2001).

Second, Lewin et al. (2005) investigated the effects of educational meeting (training) interventions for health care providers that encourage patient-centered techniques in clinical consultations. Included in the review were RCTs, controlled clinical trials, controlled before-after studies, and interrupted times-series studies of interventions for health care providers that promoted patient-centered care in clinical consultations. Of 5260 titles and abstracts, 135 were selected for further review. Seventeen studies met the inclusion criteria, 15 were RCTs and 2 were controlled clinical trials. Two reviewers independently assessed the retrieved articles and disagreements were resolved by discussion. When necessary, other members of the review team were asked for their expert opinion. Data were organized into four comparison groups: a) patient-centered training for providers compared with no intervention, b) patient-centered training for providers plus patient-centered materials for patients compared to no intervention or to condition-specific materials for provider and patient, c) patient-centered training plus condition or behavior specific training compared with no training intervention, and d) patient-centered training for providers and patient-centered materials for patients, plus condition or behavior specific materials compared for both groups examined. Studies were further sorted into the pertinent areas of consultation processes, patient satisfaction, health care behaviors, and health status and well-being. Participants included any type of health care provider. Interventions evaluated by the individual studies incorporated research directed at health care providers and data intended to promote patient-centered clinical care, but not social support care (Lewin et al., 2001).

Outcomes used to determine the effectiveness of the intervention being evaluated were grouped into four categories, the review including studies displaying considerable heterogeneity among interventions, clinical conditions, comparisons, and outcomes. There was some evidence that training health care providers in patient-centered care may have a positive impact on patient satisfaction. The reviewers' recommendations were supported by the reported data, but noted there was difficulty in quantifying the effects of training health care providers (Lewin et al., 2001).

The primary aim of the third review by Lancaster et al. (2005) was to assess the effectiveness of educational meetings (training) for health care professionals who deliver smoking cessation interventions to patients and to assess the effectiveness of these reminders. Randomized controlled trials were the only studies that were considered. The unit of randomization was a health care practitioner or practice and studies having health care professionals in at least two groups. Two independent reviewers extracted data from published reports. A third reviewer was used to resolve differences. Six of eight studies demonstrated no effect of training on cessation rates. The largest study found a significant effect of training on sustained abstinence at one year, $p < .001$. In three trials, reminders increased the intervention frequency, but only one study showed a significant improvement in smoking cessation rates. Trained professionals were 1.5-2.5 more likely to counsel patients about smoking. All trials were conducted in primary care settings and directed toward opportunistic interventions and reported cessation as the primary patient outcome. The two types of outcomes measured were process variables and rates of cessation. There were enough data on the effects of training physicians, pharmacists, and nurses, but further research was needed to target the development of innovative approaches to smoking cessation. Results showed that training had a measurable effect on health

care professionals' performance, but there was no strong evidence that smoking behavior changed (Lancaster et al., 2000).

The fourth systematic review by Fellowes et al. (2003) had the objective of assessing whether educational meetings (communication skills training) for health professionals was effective in changing health professionals' behavior with respect to communication with cancer patients. Selected studies were RCTs or controlled before-after studies of communication skills training in health care professionals measuring changes in behaviors using validated scales. Of 2824 references, 3 trials met the inclusion criteria, including the RCT criteria. Baseline measurements were used to compare the three groups before training. Three reviewers assessed the outcomes of each study for validity and reliability. The populations of the different studies, health care providers, were similar. Nurses were the samples of two of the studies and physicians were the sample of one of the studies. After communication skills training, health care providers were videotaped while interviewing cancer patients. The length of time for videotaping varied among the studies. Results of the three trials were compared. In the first trial, participants had significantly different changes in rates of leading questions $p < .05$, focused questions $p < .005$, open questions $p < .05$, and empathy $p = .005$, from baseline to follow-up. There was only one significant difference observed in the second trial that trained physicians controlled the follow-up interview more than untrained physicians, $p < .005$. The third trial found trained nurses used more emotional speech than untrained counterparts. Communication behaviors varied among the three groups and differences between the studies were not explored. The systematic review found that training programs assessed by these trials appear to be effective in improving some areas of cancer care communication skills. The systematic review was supported by a summary of findings in tables and text, and

recommendations and proposals for specific directives for new research were provided (Fellowes et al., 2004).

Cluster randomized trial design. As discussed with educational materials, the primary purpose of Moore et al. (2005) was to investigate educational meetings as a strategy to enhance the adoption of evidence-based care of the obese patient, so the evidence of this study was considered relevant to educational materials and educational meetings. Results indicated that the use of educational meetings was effective in increasing the general practice staff's knowledge of obesity and patient teaching strategies. The use of educational meetings was not successful in sustaining patients' weight loss at 12 months posttraining; the intervention group was 1 kilogram heavier than the control group, $p = 0.5$. Many of the studies with the primary purpose of CPG implementation also used educational meetings as a strategy in the study (Abbott et al., 2006; Cretin et al., 2001; Kinsman et al., 2007; Moore et al., 2003; Roelands et al., 2004; Spitler et al., 2004).

Quasi-experimental design. Three quasi-experimental design studies investigated educational meetings as the primary translation strategy (Berenholtz et al., 2004; Clarke et al., 2006; Hanson et al., 2005). The first quasi-experimental controlled before-after design study by Hanson et al. (2005) investigated the effectiveness of educational meetings (educational and strategy sessions), educational materials (unspecified), and audit and feedback (performance data). The aim was to increase use of palliative care as a means to increase hospice referrals, pain management, and advanced care planning in nurses and other health care providers. Participants were 41 leadership team members working in nursing homes in southeastern United States. Seven nursing homes were used in the pretest-posttest design and two nursing homes were the control sites. Results indicated that use of the translation strategies was effective in

increasing health care providers' use of palliative care measures, as demonstrated by increased hospice enrollment from 4% to 6.8% postintervention, $p = .01$; increased pain assessments from 18% to 60%, $p < .001$; increased orders for nonpharmacologic pain treatments from 15 to 35%, $p < .001$; and increased residents' discussions about end-of-life from 4% to 17%, $p < .001$. No significant differences were found between the intervention and control sites at baseline and at six months after the intervention. Internal validity was enhanced by the use of the traditional time-series design of quality improvement with the addition of randomly selected concurrent controls to protect against the threat of history. Treatment fidelity was strengthened by the use of educational meetings with a structured curriculum for members from all sites. The use of a study manual was not acknowledged, but would have added rigor by reducing variance in the treatment administration. Internal validity and external validity were threatened by local hospice providers delivering on-site educational meetings to the individual sites.

In the second quasi-experimental prospective cohort study in a surgical intensive care (ICU) with a concurrent control ICU, Berenholtz et al. (2004) investigated the effectiveness of an educational meeting (educational intervention), educational materials (CDC guidelines and central catheter insertion cart), reminders (checklists), and audit and feedback (nurses auditing the physicians' performance and offering feedback). The aim was to increase nurses' and physicians' use of evidence-based infection control practices as a means to improve the catheter-related bloodstream infection rate (CRBSI). Participants were nurses and physicians working in hospital ICUs in northeastern United States. Results indicated that use of the translation strategies were effective in increasing the use of CDC infection control guideline with nurses and physicians, as well as decreasing the CRBSI from 11.3/1,000 catheter days in the first quarter of 1998 to 0/1,000 catheter days in the fourth quarter of 2002. The CRBSI in the control ICU was

5.7/1000 catheter days in the first quarter of 1998 and 1.6/1000 catheter days in the fourth quarter of 2002, $p = .56$. The use of a control ICU strengthened the internal validity while the lack of randomization weakened the internal validity. One of the interventions that strengthened treatment fidelity was the use of a checklist by nurses to track physician adherence to catheter insertion guidelines (Berenholtz et al., 2004).

Third, a quasi-experimental design with measures before-after the intervention by Clarke et al. (2006) investigated the effectiveness of educational meetings. The aim was to improve nurses' triaging of mental health patients in the emergency department, assess the adequacy of an assessment scale, and decrease patients' waiting times. Participants were 10 full-time triage nurses working in an emergency department in Canada. Results indicated that the use of educational meetings was effective in increasing the overall confidence levels of the triage nurses, "not urgent" patient classifications were significantly reduced (30%), and the average length of stay for patients in the emergency department was decreased from 8.7 to 7.6 hours per visit. To strengthen the internal validity, interrater reliability (.70) was established between the research nurse and the triage nurses who attended an educational meeting. Limitations to the study were the threats to internal validity from the small sample size and the threat of history from influences of unrelated controversies in the community and media that may have diverted the triage nurses' attention at the time of this study. In the chaotic environment of the emergency department, treatment fidelity could be enhanced by the use of a study manual as a resource for the triage nurses (Clarke et al., 2006).

Synthesis of Educational Meetings

Evidence from internally valid systematic reviews (Fellowes et al., 2004; Lancaster et al., 2000; Lewin et al., 2001; Thomson O'Brien et al., 2001) and a cluster randomized trial (Moore et

al., 2003) strongly supports the effectiveness of educational meetings in changing the behaviors of health care providers. Five out of seven studies concluded there was some evidence that training health care providers had a positive impact on patient outcomes, but there was difficulty in quantifying the effects of educational meetings on health care providers (Berenholtz et al., 2004; Clarke et al., 2006; Fellowes et al., 2004; Hanson et al., 2005; Lewin et al., 2001). The quasi-experimental evidence on educational meetings also supported the findings of the more rigorous studies (Berenholtz et al., 2004; Clarke et al., 2006; Hanson et al., 2005). When the RCT design is not feasible, the controlled before-after design or the time-series design should be considered to control for changes that might have occurred at the time of the study (Abbott et al., 2006; Hanson et al., 2005; Kinsman et al., 2007; Shojania & Grimshaw, 2005).

There was good evidence that educational meetings were an effective translation strategy for increasing adoption by providers of evidence-based practice (Berenholtz et al., 2004; Clarke et al., 2006; Fellowes et al., 2004; Hanson et al., 2005; Lancaster et al., 2000; Lewin et al., 2001; Moore et al., 2003; Thomson O'Brien et al., 2001). Furthermore, educational meetings were an effective translation strategy for improving patient outcomes (Berenholtz et al., 2004; Clarke et al., 2006; Hanson et al., 2005; Lewin et al., 2001). Therefore, the recommendation rating of (A) was assigned.

Reminders

For the translation strategy of reminders, no systematic reviews were found, but nine studies that investigated this strategy were analyzed (Abbott et al., 2006; Cannon & Allen, 2000; Cretin et al., 2001; Feldman, Murtaugh, Pezzin, McDonald, & Peng, 2005; Kelley, Daly, Anthony, Zauszniewski, & Stange, 2002; McDonald, Pezzin, Feldman, Murtaugh, & Peng, 2005; Spitler et al., 2004; Swoboda, Earsing, Strauss, Lane, & Lipsett, 2004; Zanetti, Flanagan, Cohn,

Giardina, & Platt, 2003). RCTs were used in three of these studies (Feldman et al., 2005; McDonald et al., 2005; Zanetti et al., 2003). Studies in this section of the review were organized first by the strength of the evidence, strongest to the weakest, and then chronologically.

Randomized control trial design. Three RCTs investigated reminders as the primary translation strategy. First, Cannon and Allen (2000), previously reviewed under educational materials, studied reminders and educational materials using a RCT design. Random assignment was used to determine the groups, divided between computer reminders and manual reminders. Results revealed higher screening rates for mood disorders in the computer reminder group. The authors noted that the major limitation was not studying the difference between the two clinical reminder systems on patient outcomes (Cannon & Allen, 2000).

Secondly, in an evaluator-blinded RCT, Zanetti et al. (2003) investigated the effectiveness of reminders (automated alerts in the operating room) and educational materials (CPG). The aim was for operating room nurses and physicians to improve antibiotic prophylaxis by following a CPG as a means to decrease postoperative infection rates in prolonged cardiac operations in a hospital in northeastern United States. Results indicated that use of the reminder mechanism was effective in increasing the operating room staff's use of the CPG. Additionally, the intraoperative redosing was significantly more frequent in the reminder group than the control, $p < .001$. In the six months preceding study, 129 of 480 prolonged surgical procedures received antibiotic redosing, $p < .001$. Rate of surgical site infection between the intervention group and the control group was not significant, $p = .42$, but was significant when compared to the prestudy period, $p = .02$. The use of the experimental design and the number of surgical patients ($N = 273$) strengthened the study. The Hawthorne effect threatened the internal validity because of the closed nature of the operating room environment. Using structured educational

meetings to share the rationale for the reminder system with the operating room nurses and physicians would have strengthened the treatment fidelity (Zanetti et al., 2003).

Thirdly, McDonald et al. (2005) investigated the effectiveness of reminders (e-mail) in a RCT with control, basic, and augmented intervention groups. In addition to reminders, the augmented group received educational materials (clinician resources). The aim was to improve home health care nurses' use of a pain CPG as a means to improve patients' pain management. Participants were 336 nurses working in home health care in midwestern United States. Results indicated that use of the reminder mechanism was effective in increasing the nurses' use of the CPG, but the influence on patient outcomes, the reduction in reported pain levels, was not statistically significant, $p = .13$, across the three groups even though the basic intervention group experienced significantly lower pain at rest than usual care, $p = .03$. The experimental design strengthened the internal validity. Depending on the origin of the patients' pain, maturation was a potential threat to the internal validity. Treatment fidelity was strengthened by the detailed protocol provided for the nurses and the nurses' adherence to the study protocol (McDonald et al., 2005).

Lastly, Feldman et al. (2005) tested the effectiveness of reminders (evidence-based computer reminders) and educational materials (CPG and clinician resources) in a RCT using control, basic, and augmented interventions groups. The aim was to help home care nurses improve the self-care of their heart failure (HF) patients by the use of a CPG in the basic group and in the augmented group. The augmented group used the initial nurse reminder plus other educational materials as a means to improve patients' self-care management and outcomes. Nurses were randomly assigned to the control, basic, or the augmented group with new HF patient referrals. Patient assignments were further determined by geographic location in the

midwestern region of the United States and nurses' caseloads. Results indicated that use of the evidence-based computer reminders were effective in improving the nurses' dissemination of knowledge about self-care behaviors, as well as improving the patient outcomes. The internal validity was strengthened by the experimental design, but the external validity was weakened by the limited data that was collected about the home care nurses' practices. Results were consistent with another study; therefore, treatment fidelity and external validity were strengthened by the replication (Feldman et al., 2005; Murtaugh, Pezzin, McDonald, Feldman, & Peng, 2005).

Quasi-experimental design. Two quasi-experimental design studies investigated reminders as the primary translation strategy (Kelley et al., 2002; Swoboda et al., 2004). First, in a three-phase quasi-experimental design, Swoboda et al. (2004) investigated the effectiveness of annual hospital educational meetings (infection control sessions), auditing (electronic monitoring), and reminders (voice prompts) to improve infection control. Phase I was electronically monitoring and direct observation, phase II was electronic monitoring and computerized voice prompts, and phase III was electronic monitoring only. The aim was to improve the hand hygiene of nurses, other health care providers, and visitors for the purpose of decreasing the nosocomial infection rates. Participants' entries into a patient room were electronically monitored which resulted in 251,526 for 420 days for an intermediate care unit in northeastern United States. Results indicated that use of auditing was effective in phase I to phase II in improving hand hygiene by 37% (odds ratio, 1.38; 95% confidence interval, 1.04-1.83). The overall rate of nosocomial infections decreased when combining phases II and III, but the association between nosocomial infection and individual phase was not significant, $p = .13$. There were attempts to strengthen the internal validity of the study and to control for patient

confounders by collecting data about patient comorbidities and risk factors associated with nosocomial infection. External validity was limited by the inability to distinguish among the participants who entered the patients' room. Including visitors as participants violated the treatment fidelity since the visitors do not receive the infection control education (Swoboda et al., 2004).

In a second quasi-experimental retrospective design, Kelley et al. (2002) investigated the effectiveness of reminders (newly-designed admission form). The aim was to increase the nurse practitioners' use of preventive screenings as a means to improve women's health care. Participants were nine nurse practitioners who admitted patients with general medical problems to a hospital in midwestern United States. Results indicated that use of the reminder mechanism was effective in increasing the nurse practitioners' discussion of cervical cancer screening, $p = .001$, but was not effective in increasing the awareness of the importance of obtaining PAP smears. Data relevant to obtaining PAP smears was limited, so data analysis about that variable was not possible. A strength of the study was the use of a power analysis from a larger study to determine the sample size of patient participants for this study. Even though a power analysis was used, the internal validity was threatened by the small sample size and the use of a convenience sample. Additionally, patients' self-reporting on preventive screenings might have made some patients uncomfortable, which would render the analysis of the outcome variable unreliable. Treatment fidelity was compromised by the retrospective chart review which does not allow for treatment monitoring and immediate problem resolution in a study (Kelley et al., 2002).

Synthesis of Reminders

Evidence from RCTs (Cannon & Allen, 2000; Feldman et al., 2005; McDonald et al., 2005; Zanetti et al., 2003) strongly supports the effectiveness of reminders in increasing the occurrences of the desired behaviors of the health care providers. Additionally, two quasi-experimental studies (Kelley et al., 2002; Swoboda et al., 2004) supported the findings of the RCTs relevant to reminders. Four RCTs investigating reminders as a strategy added strength to the evidence because of minimal threats to internal and external validity in the studies (Cannon & Allen, 2000; Feldman et al., 2005; McDonald et al., 2005; Zanetti et al., 2003). Validity was limited in three studies because of the lack of random assignment or lack of a control group (Abbott et al., 2006; Cretin et al., 2001; Spitler et al., 2004). Fair evidence supported the effectiveness of use of the new practice by nurses and other health care providers in improving desired patient outcomes. Reminders were not effective in improving the patient outcomes in one study since pain was a chronic problem for some of the patients and maturation was a potential threat to the internal validity (McDonald et al., 2005). However, further evidence is needed to determine the effectiveness of reminders on patient outcomes.

There was fair evidence that reminders were an effective translation strategy for increasing adoption by providers of evidence-based practice (Cannon & Allen, 2000; Feldman et al., 2005; Kelley et al., 2002; McDonald et al., 2005; Swoboda et al., 2004; Zanetti et al., 2003). Furthermore, reminders were an effective translation strategy for improving patient outcomes (Cannon & Allen, 2000; Feldman et al., 2005; Zanetti et al., 2003). Therefore, the recommendation rating of (B) was assigned.

Audit and Feedback

The final translation strategy, audit and feedback, was only used in combination with other translation strategies. One systematic review about audit and feedback was retrieved

(Jamtvedt, Young, Kristoffersen, Thomson O'Brien, & Oxman, 2006). Four studies used audit and feedback as the primary translation strategy (Baier et al., 2004; Horner, Hanson, Wood, Silver, & Reynolds, 2005; Karlsten, Strom, & Gunningberg, 2005; Seers, Crichton, Carroll, Richards, & Saunders, 2004). Studies that investigated translation strategies in combinations were one RCT (Seers et al., 2004), four pretest-posttest quasi-experimental design studies (Baier et al., 2004; Horner et al., 2005; Karlsten et al., 2005; Spitler et al., 2004), one controlled before-after quasi-experimental design study (Hanson et al., 2005), and one three-phase quasi-experimental design study (Swoboda et al., 2004). Studies in this section of the review were organized first by the strength of the evidence, strongest to weakest, and then chronologically.

Systematic review design. The aim of the review was to assess the effects of audit and feedback on the practice of health care professionals and patient outcomes. RCTs of the translation strategy, audit and feedback, were included in the review. A total of 118 studies were reviewed with 30 new studies added to this Cochrane Review. Two independent reviewers extracted data for meta-regression and visual and qualitative analyses of the studies. The risk difference and risk ratio were calculated for each study and adjusted for baseline compliance. For dichotomous outcomes the adjusted risk difference of compliance versus desired practice varied from -.16 to .70, median = .05, and the inter-quartile range = .03 to .11. The adjusted risk ratio varied from .71 to 18.3, median = 1.08, and the inter-quartile range .99 to 1.30. For continuous outcomes, the adjusted change relative to control varied from -.10 to .68, median = .16, and the inter-quartile range = .05 to .37. Participants were health care professionals. The intervention of audit and feedback was defined as any health care providers' summary of performance over time. Outcome measures were objectively scored by the health care provider's performance or by patient outcomes. Audit and feedback alone, audit and feedback with

educational meetings, and audit and feedback as part of a multifaceted intervention were explored for differences in the effectiveness of the interventions. The effects of audit and feedback were generally small to moderate. The relative effects were more likely to be larger when baseline adherence to recommended practice was low and when intense feedback was provided (Jamtvedt et al., 2006).

Randomized control trial design. In a RCT, Seers et al. (2004) investigated the effectiveness of educational meetings (four interactive sessions), educational materials (laminated copies of the drug algorithm), and audit and feedback (detailed feedback of baseline data and discussion). The aim was to encourage nurses' and physicians' use of evidence-based pain management as a means to improve postoperative pain outcomes. The setting was four surgical wards randomized as control or intervention groups in a teaching hospital in southern England. Results indicated that use of the three strategies was effective initially in improving pain in the intervention groups, but the change was not sustained at three months. Patient outcomes showed at baseline that the control ward patients had significantly more pain at rest since surgery, $p = .009$, and the pain at rest since surgery was significantly worse, $p = .023$. Three months after the strategy there were no significant differences in pain levels or drug use between the intervention and control groups, pain at rest since surgery, $p = .49$. A strength of the study was the use of the RCT design, however, a cluster randomized design would have been better if a larger sample size was obtained. Generalizability was threatened by using a convenience sample of 120 patients. Internal validity was threatened by the possible contamination between control and intervention groups. Treatment fidelity was weakened by the inability to control for baseline differences and a high turnover of nurses during the time of the study (Seers et al., 2004).

Quasi-experimental design. Three quasi-experimental design studies investigated audit and feedback as the primary translation strategy. First, in a quasi-experimental pretest-posttest design, Baier et al. (2004) investigated the effectiveness of educational materials (CPG), educational meetings (education and training workshops), and audit and feedback (collecting process of care and outcomes data). The aim was to improve the use of a pain management CPG by the nursing home staff as a means to improve pain management. Participants were nurses and physicians working in 17 nursing homes in northeastern United States. Results indicated that use of educational meetings, and audit and feedback were effective in increasing the use of the CPG in nursing homes, as well as aggregate level nonpharmacological process measures demonstrated significant improvement, $p < .001$. Only one of four pharmacologic process measures demonstrated a trend toward improved adherence for residents with daily, moderate, or severe pain, $p = .06$. At the facility level, 15 nursing homes improved significantly in nonpharmacologic process measures and 2 nursing homes improved in pharmacologic measures. The outcome measure proportion of residents with pain declined, $p = .03$, and in the study group pain prevalence was less than the non-study group, $p = .003$. Internal validity was strengthened by project staff conducting individual training with quality improvement teams to ensure the reliability of data collection. Changing the design to a block randomized experimental design would strengthen the treatment fidelity and hence, the internal validity. Another limitation to the study design was the inability to determine which intervention components, individually or in combination, were successful (Baier et al., 2004).

Second, a quasi-experimental pretest-posttest study by Horner et al. (2005) investigated the effectiveness of audit and feedback (chart audits and feedback), educational meetings (educational workshops), and educational materials (a pain management toolkit). The aim was

to evaluate the effect of a quality improvement intervention on three pain management quality indicators selected from pain management CPGs as a means to improve patients' pain management in nursing homes. Participants were nurses, nursing assistants, physicians, and other health care providers working in nine nursing home facilities in southeastern United States. Results indicated that use of the educational materials, educational meetings, and audit and feedback were effective in increasing the multidisciplinary team's use of the CPG quality indicators, as well as increasing the pain assessments in residents with pain from 8% to 29%, $p < .001$. Residents receiving nonpharmacologic pain treatments increased from 31% to 42%, $p = .10$, but pain medication use did not change. The random sampling chart audits of 265 nursing home residents strengthened the internal validity. The generalizability of the findings was threatened by the resident sample being predominantly female (84%), as found in most nursing homes. Treatment fidelity was strengthened by a well-designed plan of using intervention strategies of chart audits, data feedback, provider education, and technical support as needed (Horner et al., 2005).

Third, in a quasi-experimental pretest-posttest design, Karlsten et al. (2005) investigated the effectiveness of educational meetings (educational training), educational materials (printed protocols and standing orders), and audit and feedback (patient chart audits). The aim was to improve nurses' and surgeons' postoperative pain assessment as a means to improve pain management. Participants were from nine general and orthopaedic surgery units in a Swedish hospital. Results indicated that use of educational meetings, educational materials, and audit and feedback was effective in increasing the use of the pain assessment in nurses and surgeons. Assessment of pain by nurses was statistically significant when comparing the audits of 2000 and 2001-2002, $\chi^2(1, N = 474) = 24.69, p < .01$. Also, in the 2001-2002 audit, patients' overall rating

of postoperative pain improved, 97% of the patients rated pain as good, very good, or excellent, and 3% rated postoperative pain as not good or bad ($N = 38$). The internal validity was strengthened by the inclusion of surgical and orthopaedic surgery units to increase the patient sample size. A threat to the internal validity was the use of retrospective chart reviews for audit purposes. Moreover, lack of randomization compromised the internal validity. Treatment fidelity was strengthened by mandatory education and successful completion of a pain management certification exam every three years (Karlsten et al., 2005).

Synthesis of Audit and Feedback

Evidence from a systematic review with strong internal validity demonstrated that the effects of audit and feedback are small to moderate, and absolute effects are more likely to be larger when baseline adherence to recommended practice was low (Jamtvedt et al., 2006). A RCT and three quasi-experimental studies (Baier et al., 2004; Horner et al., 2005; Karlsten et al., 2005; Seers et al., 2004) strongly support the effectiveness of the use of audit and feedback in combination with other strategies in promoting adoption of new practice by nurses and other health care providers. Diverse patient outcome measures (Baier et al., 2004; Hanson et al., 2005; Horner et al., 2005; Karlsten et al., 2005; Seers et al., 2004) hindered the evaluation of desired outcomes. There was evidence from the only RCT that the lack of a standardized strategy threatened the internal validity and offered a plausible explanation for why audit and feedback were not effective over time. Further evidence is needed on how to sustain new practice with the use of audit and feedback (Seers et al., 2004).

There was good evidence that audit and feedback was an effective translation strategy for increasing adoption by providers of evidence-based practice (Baier et al., 2004; Horner et al., 2005; Jamtvedt et al., 2006; Karlsten et al., 2005; Seers et al., 2004). Furthermore, audit and

feedback was an effective translation strategy for improving patient outcomes (Baier et al., 2004; Horner et al., 2005; Karlsten et al., 2005; Seers et al., 2004). Therefore, the recommendation rating of (A) was assigned. Evidence ratings for translation strategies and the influence of nurses' attitudes will be summarized after reviewing the evidence relevant to nurses' attitudes toward research utilization.

Nurses' Attitudes toward Research Utilization

Research utilization has been in the nursing literature since Abdellah identified that nursing had a major gap in translating research findings into practice (Abdellah, 1970). One determining factor for the use of research was nurses' attitudes toward research (Estabrooks, Floyd et al., 2003). In order to develop strategies that encourage nurses to adopt the use of research into practice, many researchers have explored nurses' attitudes toward research use (Björkström & Hamrin, 2001; Clifford & Murray, 2001; Estabrooks, 1999b; Humphris, Hamilton, O'Halloran, Fisher, & Littlejohn, 1999; Jolley, 2002; Kenny, 2005; Kuuppelomäki & Tuomi, 2003; Logsdon, Davis, Hawkins, Parker, & Peden, 1998; Olade, 2003; Parahoo, 1998; Smirnoff, Ramirez, Kooplimae, Gibney, & McEvoy, 2007; Van Mullem, Burke, Bohmeyer, & al., 1999; Veeramah, 2004).

A thorough search of the literature spanning the last decade was performed to locate articles about studies designed to measure nurses' attitudes toward research utilization. Health and Psychosocial Instruments (HAPI), PubMed, MEDLINE, and CINAHL were searched using the following terms: nursing research, research utilization, research utilization and instruments, and nurses' attitudes influence on research utilization. Types of articles selected for review were studies designed to measure nurses' attitudes about research utilization. Reference lists of articles investigating nurses' attitudes about research utilization were also examined. After

reviewing the abstracts, 14 studies met the inclusion criteria. Studies were sorted into two categories, studies investigating nurses' attitudes or studies investigating nurses' attitudes and associations. Next the studies were organized first by the strength of the evidence, strongest to the weakest, and then chronologically.

Studies of Nurses' Attitudes toward Research and the Associations

Studies were reviewed that were relevant to nurses' attitudes toward research and were conducted for the purpose of developing a strategy in a specific area, rather than to add new information to the literature. Studies were also included that were designed for the purpose of adding new knowledge to the literature and to investigate the associations of nurses' attitudes toward research (Björkström & Hamrin, 2001; Estabrooks, 1999a; Estabrooks, Floyd et al., 2003; Kenny, 2005; Kuuppelomäki & Tuomi, 2003; McCleary & Brown, 2003; Olade, 2003; Veeramah, 2004). Studies were organized based on the internal consistency of the instruments, from strongest to the weakest, as determined by a rigorous systematic review (Frasure, 2008).

Systematic review design. Estabrooks et al. (2003) used a systematic review to examine the individual determinants of research utilization. Strength of the evidence was evaluated to determine if any factor increased research use. Twenty studies met the inclusion criteria. Attitude toward research, the determinant evaluated the most, was investigated in six studies and a statistically significant effect was found in five of the six studies. Although the systematic review supported a link between attitudes and research utilization, the direction of the influence was not clear. It was not determined if nurses' attitudes were a precursor for another determinant or another determinant was a precursor for nurses' attitudes (Estabrooks, Floyd et al., 2003).

Survey design. Using a sample of 600 from a pool of 1500 randomly selected Canadian nurses, Estabrooks (1999) tested her instrument and developed a model of research utilization by

evaluating a series of structural equation models. The objective of the study was to develop and test a series of structural equation models to explore the conceptual structure of research utilization. Working with one split half of the data ($N = 300$), a series of individual concepts were added to the structural equation model. The model was validated by using the second half of the data before the data was combined and analyzed again. The final result was a model that permitted only direct effects that were controlled for instrumental, conceptual, and persuasive research utilization. Three of 26 concepts yielded significant effects on research utilization. The concepts of positive attitude toward research, belief suspension, and inservices attended were potentially important determinants of overall research utilization. Limitations included the lack of availability of the individual subscale's internal consistency and the use of the survey method. A large random sample was a strength of the study (Estabrooks, 1999b).

Second, Kenny (2005) employed a descriptive correlational design to study the use of research in practice by 290 nurses at three United States military hospitals. The purpose of the study was to describe the level to which nurses in the military hospitals used findings in clinical practice and to examine the organizational and professional factors that influence research utilization. Estabrooks' Research Utilization Survey, adapted with permission, was used to measure nurses' attitudes toward research use. Attitude toward research correlated significantly with all conceptualizations of research utilization, direct ($r = .342, p = .000$), indirect ($r = .202, p = .001$), persuasive ($r = .321, p = .000$), and overall ($r = .376, p = .000$) Limitations to the study included the self-selection bias intrinsic to survey designs. The study sample could have been increased with the use of more military facilities. Study replication in non-military settings would increase the generalizability and may provide additional support for the findings (Kenny, 2005).

Third, Olade (2003) investigated attitudes and factors affecting research utilization in nurses ($N = 106$) from rural United States using a descriptive-correlational design. The purpose of the study was to explain the attitudes to research and the relationship between selected variables and nurses' attitudes toward research in rural settings. The Attitudes and Factors Affecting Research Utilization Questionnaire was used to measure nurses' attitudes. Results revealed 76.4% had an unfavorable or moderate attitude toward research. Only 23.6% of the nurses scored 81 to 100 (favorable). The mean score was 63.5 or moderate attitude toward research. The use of a convenience sample of rural nurses limits the generalizability of the study. Study replication with a larger more diverse sample would validate the study findings (Olade, 2003).

Fourth, McCleary and Brown (2003) investigated attitudes and factors affecting research utilization using the survey method in nurses ($N = 175$) from a pediatric teaching hospital in Ontario, Canada. The purpose of the study was to examine independent relationships between nurses' education about research use, attitudes toward research, knowledge about research, and research utilization. The Edmonton Research Orientation Survey (EROS) was used to measure nurses' attitudes toward research, research involvement, and research utilization. Nurses who completed a course about research design scored higher than those who had not completed a course on the EROS "Valuing Research" subscale (mean = 4.1, SD .55 compared to mean = 3.7, SD .63, $t = 3.8$, $df 173$, $p < .01$), and the EROS "Using Research" subscale (mean = 3.7, SD .51 compared to mean = 3.4, SD .60, $t = 3.5$, $df 173$, $p < .01$). The use of a small convenience sample of pediatric nurses limits the external validity of the study. Study replication with a larger more diverse sample would validate the study findings (McCleary & Brown, 2003).

Fifth, Björkström and Hamrin (2001) used an untitled 35-item questionnaire to survey randomly-selected Swedish nurses ($N = 289$) from four different examination years (1966, 1976, 1986, and 1996). The aim of the study was to develop and test an instrument to study nurses' attitudes toward research among nurses. Total item values ranged from 34 to 170, higher scores indicating positive attitudes toward research. Means (with standard deviations in parentheses) for the respective years were 121.24 (22.07), 130.58 (18.90), 122.59 (20.97), and 130.93 (16.20). Results demonstrated that nurses in general had positive attitudes toward research with the 1966 group appearing to be the least positive group. There were significant differences between the groups ($F = 4.980, p = .002$). The use of the survey method was a limitation. The random sample from four different years was a strength in the study (Björkström & Hamrin, 2001).

Sixth, Kuuppelomäki and Tuomi (2003) explored Finnish nurses ($N = 400$) attitudes about nursing research using the Nurses' Attitude to Nursing Research Questionnaire survey method. The purpose of the study was to investigate what nurses think about research and its associations with nurses' practice. The mean score was 2.84 (minimum 1.12, maximum 4.00, range 2.85, S.D. 0.59 and 95% confidence interval 2.78-2.90). Nurses had a moderately positive attitude toward using research. The power of the sample size was increased by recruitment of participants from two different hospitals and 10 community health centers. A strength of the study was the high response rate of 67% and the use of cluster sampling in 10 community health centers (Kuuppelomäki & Tuomi, 2003).

Seventh, Veeramah (2004) studied nurses' attitudes toward research using nurses ($N = 340$) from southeastern part of England. The aim of the study was to evaluate the associations among research education, attitudes toward research, and the use of the findings in practice by graduate nurses and midwives. A questionnaire was developed from reviewing literature on

attitudes toward research, research utilization, and barriers to research implementation.

Respondents showed positive attitudes toward research. In the following statements, “research is relevant to the real day-to-day work in nursing/midwifery” and “nursing/midwifery should become a research-based profession”, 96% and 89% respectively *agreed* or *strongly agreed* with the statements. A limitation of the study was the lack of statistical evidence of the associations between nurses’ attitudes and research use in practice. The sample size was a strength in the study (Veeramah, 2004).

Studies of Nurses’ Attitudes toward Research

Studies for the sole purpose of helping to develop a strategy in a specific area or solving an isolated quality improvement project were also reviewed (Clifford & Murray, 2001; Humphris et al., 1999; Jolley, 2002; Logsdon et al., 1998; Parahoo, 1999; Smirnoff et al., 2007; Van Mullem et al., 1999).

Quasi-experimental design. Clifford and Murray (2001) used a pretest-posttest design to investigate the research utilization of nurses ($N = 235$) in one acute care hospital in rural England. The aim of the study was to determine if a managed approach with a university team working collaboratively with clinical nurses and midwives to develop a research agenda would increase the use of research in their practices. An educational intervention of increased opportunities for staff to learn more about research and increased involvement in research activities were offered between the pretest and the posttest. Section four of The Research in Practice Survey was used to measure nurses’ attitudes toward research. Internal consistency reliability for the attitudes’ subscale was ($\alpha = 0.81$). Pretest-posttest results (1996 and 1999) demonstrated a positive attitude toward research overall. The mean scores were 63.9 and 65.1, respectively. The difference between the means was not significant, $p = .41$. A limitation to the

study was the decreased posttest response rate ($N = 81$). The decreased response rate (mortality) was a threat to the internal validity and made the resulting interpretation inconclusive. The pretest-posttest design was stronger than the survey design, but more rigorous designs remained an option. The longitudinal design was compromised by confounding variables in the organization during the course of the study (Clifford & Murray, 2001).

Survey design. Six survey designed studies of nurses' attitudes toward research were arranged chronologically and then alphabetically since the evidence exhibited significant homogeneity. The first study was conducted to explore the attitudes of nurses in Kentucky to identify factors that influence the implementation of research in practice. The sample was nurses ($N = 107$) who responded from among 1000 randomly-selected nurses in Kentucky. Registered Nurses' Views of Research was used to measure the nurses' opinions about factors supporting research utilization and factors perceived as barriers. The majority of the nurses (43%) used research findings at least once a year to make a practice change. Willingness to use research to change practice was related to higher education preparation, $\chi^2(3, N = 107) = 7.99, p = .046$. Also, willingness to change one's practice based upon research findings was related to being well-prepared in the educational process to participate in research, $r = .32, p = .01$. Since 80% of the sample viewed nursing research as a basis for nursing practice, the researchers concluded the nurses had an overall positive attitude toward using research in practice. A strength of the study was the random selection of nurses, but the sample size and lack of instrumentation reliability and validity data were limitations (Logsdon et al., 1998).

Second, the purpose of Humphris et al. (1999) study was to explore attitudes, participation, sources of support, and encouraging and discouraging factors of diabetic nurse specialists (DNSs) using research in practice. The questionnaire was especially designed for this

study and sent to all DNSs registered with the British Diabetic Association and a random sample of non-nurse specialists (NNS). Of 418 questionnaires sent to registered DSNs, 299 were completed and returned. The same questionnaire was completed by a random sample of 124 NNSs in acute care. The graduate DNSs had a slightly higher mean score (4.4) than the non-graduate DSNs' mean score (4.7) on a scale where 1 = *actively search out* and 10 = *I wait to be told*. The mean value for the NNSs was 4.7. The study was strengthened by the use of random sampling with the NNSs and the high return rate of both groups. Weaknesses were the study design, unequal sample sizes, and the use of questionnaires for data collection (Humphris et al., 1999).

Third, Parahoo (1999) investigated research utilization and attitudes toward research among psychiatric nurses ($N = 1368$) in Northern Ireland. The aim of the study was to survey psychiatric nurses on their attitudes toward research and their perceptions of the use of research and related activities in their practice. A total of 2600 questionnaires were disseminated to 23 hospitals. The questionnaire contained an 11-item attitude scale that was used in a previous study by the National Board of Nursing, Midwifery and Visiting in Northern Ireland. Eighty percent of the nurses in this sample had positive attitudes toward research, recognizing that research was relevant to the daily work of nurses. The convenience sample was a limitation. The internal validity was compromised by the possibility that participants could rate themselves higher than their true behavior in self-reporting. The researcher did not report the reliability and validity of the instrument (Parahoo, 1999).

Fourth, Van Mullem et al. (1999) explored nurses' knowledge, attitudes, and practices (KAP) of nursing research activities in nurses ($N = 1007$) using the survey method to explore the integration of research into daily practice. The KAP Survey was used to measure 33 research

activities encountered by nurses in clinical practice in midwestern United States. Scores for nurses' attitudes toward research were: low (318 nurses, 32%), moderate (437, 45%), and high (223, 23%). Education and job title significantly predicted knowledge and ability to perform research activities, but they were also related to willingness to engage in research activities. A strength of the study was the sample size, but the descriptive survey design was a weakness (Van Mullem et al., 1999).

Fifth, Jolley (2002) explored strategies for promoting research awareness using a survey design with nurses ($N = 41$) from England. The aim was to determine the need for developing research awareness to plan a general research strategy. Nurses' attitudes were measured using a survey of nurses' attitudes toward research and development. Fifty percent of the nurses were interested in all aspects of research and would like to help conduct research. Nurses' interests in research topics were used for staff education opportunities. Study limitations were the small sample size and limited statistical information. The survey was designed for a specific unit, so the results cannot be generalized. However, the study can be used to help build the body of knowledge relevant to nurses' attitudes toward research use (Jolley, 2002).

Sixth, Smirnoff et al. (2007) explored nurses' attitudes toward nursing research at a New York metropolitan medical center in nurses ($N = 470$) using the survey method. The purpose of the study was to examine the attitudes and beliefs of nurses toward research and the environment and their past experience with research. The Attitudes toward Nursing Research Questionnaire was used to measure the nurses' attitudes. A score less than 2.35 indicated a positive attitude and the overall mean score was 2.35 ($SD = .56$). "Research should guide nursing practice" ($M = 1.76$; $SD = .79$) and "Nurses should have the opportunity to engage in nursing research" ($M = 1.87$; $SD = .73$) were the two statements associated with the highest positive attitudes.

Relationships between variables demonstrated positive attitude correlates significantly with master's level and higher education and nurses who had worked at the hospital for 3-10 years, $F(2, 470) = 16.09, p = .000$, and $F(3, 470) = 4.61, p = .003$, respectively. Although the response from nurses with master's level of education was high, this may not represent most acute care settings in the United States (Smirnoff et al., 2007).

Synthesis of Nurses' Attitudes toward Research

Evidence from one systematic review (Estabrooks, Floyd et al., 2003) and seven survey studies (Björkström & Hamrin, 2001; Estabrooks, 1999a; Kenny, 2005; Kuuppelomäki & Tuomi, 2003; McCleary & Brown, 2003; Olade, 2003; Veeramah, 2004) support the associations between nurses' attitudes toward research and other factors that influence the use of research in practice. Additionally, there was fair evidence from one quasi-experimental study (Clifford & Murray, 2001) and six additional survey studies (Humphris et al., 1999; Jolley, 2002; Logsdon et al., 1998; Parahoo, 1999; Smirnoff et al., 2007; Van Mullem et al., 1999) designed for the sole purpose of helping to develop a strategy in a specific area or resolving an isolated quality improvement problem. The nonexperimental nature of a single survey rendered weak evidence, but the findings from all the studies on nurses' attitudes added strength because of the homogeneity of the studies. Furthermore, the body of data was evaluated as a whole and demonstrated fair evidence of effectiveness. Therefore, there was fair evidence that nurses' attitudes influenced adoption of research in practice.

Summary of the Review of the Literature Evidence

Collectively, there was fair evidence to support that educational materials, educational meetings, reminders, and audit and feedback were effective strategies for changing provider behavior and increasing adoption of evidence-based practice. Many of the studies were designed

with a combination of translation strategies. Because of the combinations, it was not always possible to know which variable was the mediating variable. Overall, multifaceted strategies were more effective than single strategies, possibly due to the frequency of occurrence of more than one strategy in the studies.

There was fair evidence to support that nurses' attitudes toward research influenced the adoption of evidence-based practice. The studies were nonexperimental in design because the empirical development and testing of instruments are in the early phases of nursing research. Because of the limited available research about the influence of nurses' attitudes on the adoption of research into practice, it was not possible to know the effect of the variable on adoption (Frasure, 2008). Although the survey development consisted of mostly nonexperimental studies, the use of surveys in quantitative studies added evidence to the overall study.

Fair evidence existed that translation strategies improved important health outcomes and the benefits outweighed any harm of the research, so based on the critical analysis of the evidence, the rating of (B) was supported. It would be a rare case when the risk of harm would outweigh the potential benefit in deciding to use one or more of the four strategies, and therefore, those pursuing practice and outcome improvements should consider using a combination of these four strategies when attempting to change provider behavior. There could possibly be harm if the cost of implementing a strategy was prohibitively expensive, so financial information should be included with an analysis, when resources allow.

If a strategy yielded no physical or psychological harm to a patient, then it was recommended that organizational support be obtained for financial consideration. Involving organizational leaders early and providing data will aid and expedite the process. Internal

politics cannot be ignored, and nurses must learn to maneuver through the system in the same manner as their physician counterparts (Greenhalgh et al., 2004).

Summary of the Literature Gap

This study was designed to demonstrate the need for using the strongest possible design and advanced statistical methods when studying translation strategies. Many of the studies involved multiple professions as participants, so as this body of literature grows, a multidisciplinary approach is necessary if the patient outcome relies on a variety of health care professionals. Experimental research is needed to provide the strongest evidence for practice change, and therefore experimental research should be the goal for nursing researchers. As more evidence becomes more accessible and the body of systematic reviews grows, nurses can use these resources in professional practice. It is vital that nurses develop a proactive plan for the future as health care continues to grow in complexity. Translation strategies can be one of the tools used to help solve some of the multifaceted issues that confront health care.

In order to build translation science, nursing experts need to conduct rigorous studies to target barriers for the use of evidence in practice rather than doing further research using qualitative methods to describe generic barriers and facilitators to evidence-based practice (Titler, 2004b). Since there was moderately strong evidence that combining strategies was more successful than using a single strategy, the most efficient and cost effective combinations must be identified to promote the use of translation strategies. This study was the first study to evaluate the influence of the combination of these four translation strategies and nurses' attitudes toward research on adoption of evidence-based practice in a time-series design study.

CHAPTER 3: METHODOLOGY

The primary purpose of the study was to examine the effects of an intervention consisting of the four translation strategies of educational materials (clinical practice guideline), educational meetings, reminders, and audit and feedback on nurses' adoption of an evidence-based bladder protocol for stroke patients in an acute care setting. The second purpose was to evaluate the difference in incontinence episodes of stroke patients before and after nurses received the intervention. The third purpose of the study was to evaluate the influence of nurses' attitudes and demographic characteristics on the adoption and the use of the evidence-based bladder protocol after receiving the intervention. The research questions were:

1. What was the difference in the scores of nurses' adoption rates before and after the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback to promote adoption of an evidence-based bladder protocol during the acute care phase of the stroke patient?
2. What was the difference in the rate of incontinence episodes of stroke patients before and after the intervention?
3. What were the differences in the nurses' research utilization and research attitudes scores before and after the intervention consisting of combined use of education materials, educational meetings, reminders, and audit and feedback?
4. Were there relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitude scores?

Study Design

A time-series design, using 8 one-week time points before the intervention and 16 one-week time points after the intervention, was used to answer research questions 1 and 2. To meet

the design requirements, data were collected over an extended period of time and an intervention was introduced during the time period as seen in Figure 3 (Polit & Beck, 2008).

Figure 3.

Schematic representation of study design

$O_1 O_2 O_3 O_4 O_5 O_6 O_7 O_8 / O_a / O_b \quad X \quad O_1 O_2 O_3 O_4 O_5 O_6 O_7 O_8$

$O_9 O_{10} O_{11} O_{12} O_{13} O_{14} / O_a / O_{15} O_{16}$

O_a = research utilization survey, O_b = demographic survey, X = intervention,

$O_1 - O_{16}$ = chart review form data collection

Setting and Sample

The setting was the 40-bed neuroscience acute care unit affiliated with a 695-bed academic medical center. The unit provided care for approximately 60 stroke patients per month with an average length of stay (LOS) of 7 days per patient. The percentage of stroke patients admitted with urinary incontinence varies in the literature. Forty percent of the participants were reported to have urinary incontinence in a study examining stroke outcomes (Patel, Coshall, Rudd, & Wolfe, 2001). Additionally, a review of the literature reported 32 – 79% of hospitalized stroke patients suffered from urinary incontinence (Brittain et al., 1999). These data were used in estimating that it would require three weeks to obtain an adequate sample of medical record data.

A variety of statistical analyses were required in this study. The power analysis was performed for research question 4 because multiple regression was the test requiring the largest sample. The N and df were adjusted until the highest power value was achieved. In the general power analysis program, G*Power, based on an alpha of .05, power of .80, medium effect size

of .30, and 7 independent variables (predictors), $N = 29$ was a sufficient sample (Erdfelder, Faul, & Buchner, 1996).

The medical record sample needed for analysis of the time-series data was independent at each time point. The pattern of correlation among repeated observations could have been estimated from previous studies, but similar studies were not found in the literature (Diggle, Heagerty, Liang, & Zeger, 2002). Using G*Power for repeated measures within factors, it was determined that 29 medical records was the minimal sample needed per group for before and after the intervention based on an alpha of .05, power of .80, medium effect size of .20, and 6 repetitions with correlations among repeated measures at .30 (Erdfelder et al., 1996). The number of incontinent episodes collected from patients' medical records was independent at both the before and after time points of the intervention. The number of time points and the required number of patients' medical records helped to project the length of time of each data collection period. Before the intervention, the data collection phase consisted of three weekly time points or until 29 completed chart reviews. After the intervention, the data collection phase consisted of three weekly time points or until 29 completed chart reviews.

Inclusion Criteria

The convenience samples for the study were registered nurses who worked on the neuroscience acute care unit and the medical records of stroke patients with urinary incontinence. Nurses' participation in the study was voluntary. Registered nurses whose primary unit of employment was neuroscience and had the ability to read, to write, and to understand English were included in the study.

Medical records of patients meeting the following criteria were included in the study: (a) admission diagnosis of a stroke, (b) age ≥ 18 years, and (c) urinary incontinence. If unable to

obtain a patient consent waiver from the Institutional Review Boards, the patients needed the ability to understand English and the ability to follow simple instructions. An American team of stroke researchers found no evidence for or against prompted voiding in stroke patients (Duncan et al., 2005), but a Canadian team of stroke researchers found moderate evidence that prompted voiding reduced the number of incontinence episodes (Teasell et al., 2007). Therefore, all stroke patients meeting the above inclusion criteria were enrolled in this study between November 2008 and June 2009.

Intervention

The intervention consisted of the use of the four translation strategies of educational materials (prompted voiding algorithm, see Figure 4), educational meetings (staff education), reminders (e-mail messages and bulletin board updates), audit (chart review form data, Appendix A) and feedback (e-mail messages and bulletin board updates). The purpose of the intervention was to teach and encourage nurses to adopt a prompted voiding algorithm for stroke patients in a neuroscience acute care setting. The intervention lasted three weeks or until data indicated that opportunities to implement the prompted voiding were seldom missed. The use of the translation strategies as components of the intervention and their model fit are explained in the following paragraphs.

Figure 4.

Prompted Voiding Algorithm

To understand the use of the four translation strategies in adoption of an innovation, an evidence-based continence program, it was helpful to examine the model of investigation in Figure 2. The translation strategies fit the model of investigation because educational materials and educational meetings were attributes of dissemination, reminders were attributes of implementation, and audit (monitoring) and feedback were attributes of system readiness and implementation. The strategies were not measured in this study.

Educational Materials

Current clinical practice guidelines and recommendations from stroke experts are in support of bladder protocols for stroke patients, but no evidence-based protocols existed in these guidelines (Duncan et al., 2005; Teasell et al., 2007). A search was performed to find an evidence-based bladder protocol that had been used with stroke patients. Stroke experts in the United States were queried by e-mail for current protocols. Two protocols were received, but neither provided any level of evidence for the interventions. As in the model of investigation, innovation was operationalized in the algorithm from *Prompting Continence Using Prompted Voiding* (RNAO, 2005). This prompted voiding algorithm was chosen as the educational material because it provided a level of evidence for each intervention and because of previous use with cognitively impaired patients (Table 5 and Figure 5). The presence of the algorithm on the charts of the stroke patients also served as a prompt or reminder to follow the bladder protocol during the intervention phase.

Table 5

Levels of Evidence

Ia	Evidence obtained from meta-analysis or systematic review of randomized control trials.
Ib	Evidence obtained from at least one randomized control trial.
IIa	Evidence obtained from at least one well designed controlled study without randomization.
IIb	Evidence obtained from at least one other type of well-designed quasi-experimental study without randomization.
III	Evidence obtained from well-designed non-experimental descriptive studies, such as comparative studies, correlation studies and case studies.
IV	Evidence obtained from expert committee reports or opinions and/or clinical experiences of respected authorities.

Registered Nurses' Association of Ontario. Retrieved November 10, 2007, from <http://rnao.org>

Figure 5.

Prompted Voiding Algorithm with Levels of Evidence

Educational Meetings

Structured educational meetings about the use of the prompted voiding algorithm were provided for all nurses and patient care assistants in the unit. The nurses had been exposed to evidence-based practice prior to this study, therefore, the education focused on the strength of the evidence relevant to the interventions in the prompted voiding algorithm. The purpose of the study was also reviewed with emphasis on the goal of improving patient outcomes by using the evidence-based bladder protocol. If a staff member could not attend an educational meeting or if there was a newly-hired staff member, an individual meeting was arranged by the investigator. Nurses were not included in the study if hired after the conclusion of the intervention. After all nurses were educated about the clinical practice guideline, the health unit secretary was asked to place the prompted voiding algorithm on the front of every stroke patient's medical record upon admission to the unit. After the nurse did the admission assessment, the nurse initiated the prompted voiding algorithm if the patient met inclusion criteria. The PI was present on the unit or available for questions by pager at all times.

Reminders

The nurse managers and all staff members of the unit were sent e-mail reminders during the intervention. The bulletin board was updated with audit reports weekly during the intervention. Bar graphs and pie charts were used so staff members could view the progress of the intervention without taking time away from their patient care responsibilities.

Audit and Feedback

Audit (monitoring) and feedback, two attributes of system readiness and implementation, were conducted at a rapid pace to keep the nurses (adopters) engaged and making decisions about adopting new practice behaviors. Use of the chart review form for collecting and

organizing relevant data for change in system readiness were needed to present a strong case for change.

During the intervention, audit data about nurses' adoption behaviors of the prompted voiding algorithm were collected weekly for three weeks. Both process and outcome data were collected. Once a week during the intervention, the audit data were presented as feedback to the staff in a report of the process indicators and the patient outcomes. The patient outcomes were reported as the rate of incontinence episodes and the process indicators were reported as the percent of adoption rate. The same chart review form was used to collect the post-intervention medical record data. Results were e-mailed to the nurses, and a bar graph was posted on the unit bulletin board used for frequent staff updates. After the initial e-mail reminder, later e-mail reminders were sent weekly until the end of the intervention. These reminders encouraged the staff to examine the study results on the unit bulletin board. After the intervention phase, the post-intervention data collection phase began.

Treatment Fidelity

Treatment fidelity was strengthened by the use of the prompted voiding manual, administration of the same dose and intensity of education to all nurses, and the primary investigator being involved in every phase of the study. The external validity was supported by the use of educational materials (prompted voiding algorithm and manuals) developed by the Registered Nurses' Association of Ontario (RNAO, 2005).

Measurement of Concepts

Concepts in the model that were actually measured were adoption/assimilation, nurses' attitudes toward research utilization and research, and consequences. Demographic

characteristics were measured to allow for evaluating their influence on nurses' attitudes toward research utilization and research.

Adoption/Assimilation

Adoption/assimilation was operationalized as nurses' adoption behaviors as measured by use of the bladder protocol. For research question 1, adoption was measured with an investigator-developed chart review form using activities specified on the prompted voiding protocol as the process indicators of adoption. Adoption was measured by the total scores of the process indicators for the nurses' adoption behaviors. For process indicators 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, and 15, the percent of adoption behaviors was determined by assigning *Yes* = 100% or *No* = 0% to the process indicators. One example of a *Yes/No* process indicator was "History of incontinence documented?" For process indicators 2, 4, and 9, the score was the calculated percent of the nurse behaviors determined by dividing *documented behaviors* by *the number of behaviors that should have been documented*. The total adoption score was the sum of scores of all process indicators divided by the number of applicable indicators, Appendix A.

Nurses' Attitudes Toward Research Utilization and Research

For research question 3, nurses' attitudes toward research utilization and research were operationalized using the Research Utilization Survey, adapted to a 41-item survey by Kenny (2002), Appendix B. Initial internal consistency reliability for the research utilization subscales have been reported as ranging from ($\alpha = 0.77-0.91$). Content validity was assessed by an expert panel and data from a pilot study. Construct validity was supported by the use of structural equation modeling (Estabrooks, 1999a). Rationale for choosing this instrument was based on a critical analysis of 14 instruments. This questionnaire was selected for use in this study because of the strong reliability and validity (Frasure, 2008).

The four subscales in the survey measured overall, direct, indirect, and persuasive research utilization. The Research Utilization Survey was designed by Estabrooks (1997) to provide information about the types of research utilization and then obtain responses according to the information given (Kenny, 2002). Estabrooks (1997) designed the survey to ask the overall research utilization question four times. In the adapted version by Kenny (2002), the fourth overall research question was dropped.

Overall research utilization. The overall research utilization subscale consisted of items 1, 3, and 13, which were designed to reassess overall research utilization after the nurse received more information about research utilization. Overall research utilization was defined as the use of any kind of research findings (nursing and non-nursing), in any way, in any aspect of work as a registered nurse. Nurses were asked not to count knowledge learned in nursing school during their basic nurses' training as research. The three questions about overall research utilization used an 8-point Likert response scale: 1 = *never*, 7 = *nearly every shift*, and 8 = *do not know*. The *do not know* answers were not included in the mean scores (Kenny, 2002). An overall research utilization group mean was derived for each of the items measuring nurses' overall research utilization by summing and averaging the nurses' responses to the item. Even though the overall research utilization question was asked three times in the survey, only the third score was reported because it was the final question and most influenced other information provided in the survey.

Provided information about overall research utilization. The four items (2, 5, 6, and 14) in this section of the survey used different response scales and provided information to the nurses about overall research utilization, and provided descriptive information for the study. Question 2 provided 14 items, with yes/no responses, from nursing literature to be considered as research

utilization. Question 4, “Would you use research more often in your practice if you could?” used *yes, maybe, no, and do not know* as responses without numeric values assigned. Item 5 was supplied for pertinent additional data from the nurses in the study about the impact of the use of research on patient care outcomes, using a 5-point Likert response scale: 1 = *strongly agree*, 5 = *strongly disagree*. Question 6 was an open-ended question about the nurse’s sources of learning about research findings. In question 14, nurses were asked to estimate the amount of nursing, medical, or other research that was used in the nurse’s practice, depending on how a nurse answered the third overall research utilization question, item 13.

Direct research utilization. In question 7, direct research utilization was defined as the use of any kind of research findings (nursing and non-nursing) where nurses directly used the findings in giving patient care and/or in client interventions. Nurses were asked not to count knowledge learned in their basic nurses’ training as research. The single question about direct research utilization used an 8-point Likert response scale: 1 = *never*, 7 = *nearly every shift*, and 8 = *do not know*. The *do not know* answers were not included in the mean scores (Kenny, 2002). A direct research utilization group mean was derived for the item measuring nurses’ direct research utilization by summing and averaging the nurses’ responses to the item.

Provided information about direct research utilization. Question 8, “How often have you avoided using research in this direct way because you did not believe you had the authority to do so, even though you were convinced of the usefulness of the research?” used a 5-point Likert response scale: 1 = *never*, 5 = *always*. Question 9 (a - d) used an 8-point Likert response scale: 1 = *never*, 8 = *do not know*, to elicit the number of times in the past year the nurse had encountered a research finding or recommendation.

Indirect research utilization. Question 10 measured indirect research utilization and was defined as the use of research findings (nursing and non-nursing) that changed nurses' opinions about how to approach certain patient care or client situations. The single question about indirect research utilization used an 8-point Likert response scale: 1 = *never*, 7 = *nearly every shift*, and 8 = *do not know*. The *do not know* answers were not included in the mean scores (Kenny, 2002). An indirect research utilization group mean was derived for the item measuring nurses' indirect research utilization by summing and averaging the nurses' responses to the item.

Persuasive research utilization. Question 12 involved the use of research findings (nursing and non-nursing) to persuade those who are usually in decision-making positions to make changes in conditions, policies, or practices relevant to nurses, patients, and the health of individuals or groups. Nurses were asked not to count knowledge learned in their basic nurses' training as research. The single question about persuasive research utilization used an 8-point Likert response scale: 1 = *never*, 7 = *nearly every shift*, and 8 = *do not know*. The *do not know* answers were not included in the mean scores (Kenny, 2002). A persuasive research utilization group mean was derived for the item measuring nurses' indirect research utilization by summing and averaging the nurses' responses to the item.

Provided information about persuasive research utilization. Questions 11(a - i), "How often have you used knowledge of particular research findings to try to persuade the following groups of people to make changes in this past year?" used a 5-point Likert response scale: 1 = *never*, 4 = *often*, and 8 = *do not know*. The question was used to define people who might be persuaded by nurses.

Attitude toward research scale. In section II, question 1 (a - f), the attitude toward research scale measured beliefs about research and consisted of six items that used a 5-point

Likert response scale: 1 = *disagree strongly*, 5 = *agree strongly*. Reverse coding was used in items b, d, and f since they were negative items. Responses on the items were summed to produce the total scale score ranging from 6 – 30. The alpha reliability coefficient of the subscale was 0.75 in a study performed by Kenny (2002).

Consequences

According to the Conceptual Model for the Spread and Sustainability of Innovations in Service Delivery and Organization, consequences are the effects of the innovation implementation process (Greenhalgh et al., 2005; Greenhalgh et al., 2004). For research question 2, consequences were operationalized as the rate of incontinence episodes as outcome indicators. Consequences were measured by the percent of voids that were incontinent per patient as recorded in the medical records.

Demographic Characteristics

The demographic data collected were age, gender, basic nursing education, highest completed level of formal nursing education, years worked as a nurse, and years worked at this hospital.

Procedure

Permission to conduct the study was obtained from the West Virginia University and University of Cincinnati Institutional Review Boards. Upon obtaining informed consent, the nurses were asked to complete the Research Utilization Survey. The time to complete the requested demographic information and the survey was approximately 15 to 20 minutes. The nurses were asked to complete the same survey a second time, one week after the conclusion of the intervention. The intervention was initiated by the investigator on January 26, 2009, after all of the nurses had completed the Time 1 survey.

Before the intervention, data about incontinence were collected weekly for 8 weeks until 29 reviews were obtained. After the intervention, data were collected weekly for 16 weeks until 29 chart reviews were completed. The required time was extended beyond three weeks because the time was needed to obtain the required number of patient medical records.

A master list was used with the names of all eligible nurses, with an assigned study ID number for each nurse and each medical record. Each nurse study ID number was written on the consent form and the Time 1 and Time 2 questionnaires. The master list was referenced when performing chart review to add the nurse's study ID number on the chart review form. The nurses' names and the patients' medical record ID numbers were maintained on the master list throughout the study. The master list was filed in a locked drawer in the principle investigator's (PI) locked office.

The code book contained detailed coding instructions for each of the variables collected from the chart review form and the questionnaire and entered into the password protected SPSS raw data file. Coding decisions made by the investigator were also included in the code book.

Confidentiality

To maintain confidentiality, a study ID number was assigned to each nurse and to each patient medical record. Maintaining anonymity was not possible, but the nurses were asked not to place any identifying information on the Time 1 and Time 2 questionnaires. The list of nurses' names was destroyed after completion of data entry and data cleaning.

Data Analysis

The chart review form data and Time 1 and Time 2 survey data were entered into Statistical Package for Social Sciences (SPSS) computer software program (SPSS, 2007) for each nurse, using the study ID. Prior to analysis, the data were cleaned and frequency

distributions were visually checked for outliers or impossible values by running histograms and box-plots. Missing data patterns were analyzed and a plan for handling missing data was formulated. Possible strategies included: (a) deleting cases if < 5% had missing data, (b) estimating missing data, or (c) repeating analyses with and without missing data. Missing data were extremely rare, but repeating analyses with and without missing data was used when indicated. Data were analyzed using SPSS. Bivariate relationships among the variables were inspected by using SPLOMs in SPSS. A smooth regression line was added to each scatter plot to assess curvilinearity. Simple bivariate correlation matrices were calculated and examined. A separate SPSS file with the incontinence data entered by the Medical Record Study ID number was used to answer research question 2.

Specific Statistical Procedures for Each Research Question

Research question 1. What was the difference in the scores of nurses' adoption rates before and after the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback to promote the adoption of an evidence-based bladder protocol during the acute care phase of the stroke patient?

The dependent variable (nurses' adoption rates) was analyzed using SPSS and an autoregressive, integrated, moving average (ARIMA) model. The first 8 weeks served as the baseline and the remaining 16 weeks were the post-intervention time-series data. Data were examined for outliers among the observations and a logarithmic transform was not applied to the series (Tabachnick & Fidell, 2007). In order to preserve as many data points as possible, there were 5 ARIMA models with 5 data points for each of the 29 medical records in the medical record sample.

The assumptions were those of normality of distributions of residuals, homogeneity of variance and zero mean residuals, independence of residuals, and absence of outliers. Analysis of residuals produced by the SPSS ARIMA program offered an assessment of the normality of distributions of residuals, homogeneity of variance and zero mean residuals, independence of residuals, and absence of outliers. A plan was made to transform the dependent variable if residuals were not normal (Tabachnick & Fidell, 2007).

Normality of distribution of residuals was evaluated by examining the normalized plots of the residuals for the model before evaluating the intervention. Homogeneity of variance and zero mean residuals was evaluated by examining plots of standardized residuals versus predicted values to assess homogeneity of variance over time. Independence of residuals was evaluated by autocorrelation functions and partial autocorrelations for patterns and the model was adjusted as needed. Lastly, absence of outliers was evaluated by examining the time-series plot before and after adjusting for autocorrelation to identify obvious outliers (Tabachnick & Fidell, 2007).

Research question 2. What was the difference in the rate of incontinence episodes of stroke patients before and after the intervention?

The dependent variable (incontinence episodes) was analyzed using SPSS and an autoregressive, integrated, moving average (ARIMA) model. The first 8 weeks served as the baseline and the remaining 16 weeks were the post-intervention time-series data. Data were examined for outliers among the observations and a logarithmic transform was not applied to the series (Tabachnick & Fidell, 2007). In order to preserve as many data points as possible, there were 5 ARIMA models with 5 data points for each of the 29 medical records in the medical record sample.

The assumptions were those of normality of distributions of residuals, homogeneity of variance and zero mean residuals, independence of residuals, and absence of outliers. Analysis of residuals produced by the SPSS ARIMA program offered an assessment of the normality of distributions of residuals, homogeneity of variance and zero mean residuals, independence of residuals, and absence of outliers. A plan was made to transform the dependent variable if residuals were not normal (Tabachnick & Fidell, 2007).

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Research question 3. What were the differences in the nurses' research utilization and research attitudes scores before and after the intervention consisting of combined use of education materials, educational meetings, reminders, and audit and feedback?

The means, standard deviations, and ranges for each subscale of the survey (overall, direct, indirect, and persuasive research utilization, and attitude toward research) were calculated by SPSS. Paired-samples *t* tests were performed on the total score of each of the Research Utilization Survey's subscales needed for use in this study from before and after the intervention. Data were evaluated for meeting the following assumptions of the paired-samples *t* test: (a) difference scores are normally distributed in the population, and (b) the cases represent a random sample from the population, and the difference scores are independent of one another. A

probability sample was not feasible, so a convenience sample was used. Therefore, the second assumption was violated. Results were corroborated for this sample distribution by performing exact t tests (StatXact 8, 2008).

Research question 4. Were there relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitude scores?

A standard model of multiple regression was used. Prior to running the multiple regression, the categorical predictors (gender, basic nursing education, and the highest completed level of formal nursing education) were dummy coded into numeric variables of 1s and 0s. The variables were coded into vectors used to describe the categories. For gender, one vector ($2 - 1 = 1$) was used. Basic nursing education required two vectors ($3 - 1 = 2$), and the highest completed level of formal nursing education required five vectors ($6 - 1 = 5$). With dummy coding, the beta weight represented the difference between the mean of the group assigned 1s and the group assigned 0s (Munro, 2005, p. 274).

Pearson correlation coefficients were used in bivariate analyses to examine the associations between the dependent variable (DV), adoption rate, and seven independent variables (IVs) of age, gender, basic nursing education, highest completed level of formal nursing education, years worked as a nurse, years worked at this hospital, and nurses' research attitude scores (Mertler & Vannatta, 2005).

A multiple regression model was run to analyze the relationship among adoption rate scores, the demographic characteristics, and nurses' research attitude scores. The DV, adoption rate, was regressed on the IVs of age, gender, basic nursing education, highest completed level of formal nursing education, years worked as a nurse, years worked at this hospital, and nurses' research attitude scores. Data were evaluated for meeting the assumptions of multiple

regression. The assumptions were those of normality, linearity, and homoscedasticity. Analysis of residuals produced by the SPSS multiple regression program offered an assessment of the assumptions of normality, linearity, and homoscedasticity concurrently. Further assessment was done to validate that the assumptions of normality, linearity, and homoscedasticity were met.

Normality was assessed using tests for skewness and kurtosis. Normal distribution was indicated by skewness and kurtosis values of zero, and Kolmogorov-Smirnov statistics.

Linearity was assessed by the inspection of bivariate scatterplots. Homoscedasticity was assessed by interpreting the results of the Box's M Test (Mertler & Vannatta, 2005). Results were corroborated for this sample distribution by performing an exact regression test (LogXact 8, 2008).

CHAPTER 4: RESULTS

Introduction

This chapter examines the data from a quasi-experimental study using a time-series design to answer research questions 1 and 2. Research questions 3 and 4 required the use of paired-samples *t* test analyses and multiple regression, respectively. First, a description of the sample will be presented. Next, the individual research questions will be answered followed by additional findings that will be reported. Finally, the results will be summarized.

Data analyses were performed using three computer software programs, Statistical Package for Social Sciences (SPSS) Version 16.0 for Windows (SPSS, 2007), StatXact 8 (Cytel, 2008), and LogXact 8 (Cytel, 2008). A one-tailed significance level of .05 was used for all analyses because the direction of the variable relationships was predictable.

Characteristics of the Sample

The study nurse sample consisted of 33 registered nurses who were recruited on the following criteria: nurses whose primary unit of employment was neuroscience and had the ability to read, to write, and to understand English. Twenty of the 33 (61%) nurses agreed to participate in the Research Utilization Survey, pre- and post-intervention. The 33 nurses who participated in the use of the evidence-based bladder protocol utilized the protocol at least once while providing care to a stroke patient. Total observations pre-intervention were 1768 and total observations post-intervention were 2414.

A breakdown of the nurse sample, as shown in Table 6, revealed that of the 33 nurses, 31 were female (93.9) and 2 were male (6.1%). This percentage was slightly higher than the 5.8% reported in the National Sample Survey of Registered Nurses (NSSRN) 2004, a survey administered to registered nurses in the United States every 4 years by mail and/or by the internet

for the 2004 version ($N = 35,724$). Ages ranged from 22-57 ($M = 33.8$) in this study sample, while the NSSRN (2004) reported ($M = 43.4$) for the hospital nurse. The majority of the nurses in the nurse sample had completed the baccalaureate degree (51.5%), whereas, the NSSRN (2004) reported 34.2% for the baccalaureate degree nurses.

Table 6

Demographic Characteristics of the Nurse Study Sample (n = 33)

Variable	Characteristic	n (%)
Gender	Female	31 (93.9)
	Male	2 (6.1)
Basic nursing education	Associate Degree	14 (42.4)
	Diploma	4 (12.1)
	Baccalaureate Degree	15 (45.5)
Highest completed level of formal nursing education	Associate Degree	13 (39.4)
	Diploma	3 (9.1)
	Baccalaureate Degree	17 (51.5)
Age	Mean (<i>SD</i>)	33.79 (11.60)
	Range	22 - 57
Years worked as a nurse	Mean (<i>SD</i>)	8.79 (10.51)
	Range	0.5 - 37
Years worked at study hospital	Mean (<i>SD</i>)	5.49 (5.70)
	Range	0.2 - 22

Descriptive Data of Theoretical Variables

Mean scores, standard deviations, skewness, kurtosis, and ranges (Table 7) for adoption/assimilation (nurses' adoption rates), overall, direct, indirect, and persuasive research utilization and attitudes toward research (Research Utilization Survey), and consequences (incontinent episodes) were computed. All scores revealed normal distributions pre- and post-intervention except persuasive and overall research utilization scores post-intervention. Persuasive research utilization scores were positively skewed, while overall research utilization scores were negatively skewed.

The percent mean scores for nurses' adoption rates and incontinent episodes were derived from 5 time points pre- and post-intervention for each of the 29 medical records of acute stroke patients with incontinence. The total percent mean score was determined for the descriptive statistics, but the five data points were also used separately in the time-series data analyses in research questions 1 and 2. These dependent variables (DVs) will be furthered discussed with their corresponding research questions.

Table 7

Pre- and Post-Intervention Descriptive Data of Theoretical Variables

Variable	Mean (<i>SD</i>)	(Min, Max)	Std error of Skewness	Std error of Kurtosis
Pre-intervention				
Adoption rates	18.08 (3.36)	(13.18, 22.24)	.91	2.00
Incontinence				
episodes	65.92 (36.39)	(6.60, 100)	.91	2.00
Overall RU	4.63 (1.71)	(3, 7)	.52	1.01
Direct RU	3.85 (1.95)	(1, 7)	.51	.99
Indirect RU	4.89 (1.56)	(3, 7)	.52	1.01
Persuasive RU	3.18 (1.63)	(1, 6)	.55	1.06
Attitudes toward				
research	25.63 (2.59)	(18, 30)	.52	1.01
Post-intervention				
Adoption rates	33.40 (7.10)	(20.42, 46.30)	.46	.89
Incontinence				
episodes	63.82 (23.80)	(20, 100)	.46	.89
Overall RU	5.00 (2.13)	(1, 7)	.51	.99
Direct RU	4.25 (1.83)	(1, 8)	.51	.99
Indirect RU	5.60 (1.73)	(3, 8)	.51	.99
Persuasive RU	3.68 (2.03)	(1, 8)	.52	1.01

Attitudes toward

research	25.70 (2.39)	(19, 30)	.51	.99
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Note. RU = research utilization; Min = minimum score; Max = maximum score; Std = standard.

In addition to percent mean scores, process indicators of each behavior from the chart review form were explored (Table 8). Pre-intervention process indicators 1, 2, 3, 8, 10, 12, 14, and 15 had a mean of 0%. The mean for post-intervention process indicators 8 and 14 remained at 0%. Process indicators 4, 6, 9, and 11 were normally distributed pre- and post-intervention. Process indicators 10 and 13 were normally distributed post-intervention with process indicator 13 being positively skewed pre-intervention. Process indicators 1 and 5 were normally distributed pre-intervention and positively skewed post-intervention. Process indicators 2 and 3 were positively skewed post-intervention while process indicator 7 was positively skewed pre- and post-intervention. Finally, process indicators 12 and 15 were negatively skewed post-intervention.

Table 8

Pre- and Post-Intervention Descriptive Data for Documented Adoption Behaviors Scores (n = 33)

Variable	Pre-intervention Mean Percent (SD)	Post-intervention Mean Percent (SD)
1. History of incontinence	0 (0)	17.6 (37.4)
2. Percent cognitive awareness*	0 (0)	20.4 (30.7)
3. Patient's motivation to be continent	0 (0)	17.7 (35)
4. Percent source of fluid intake	91.9 (8.5)	82.8 (14)
5. Date and time of last bowel movement*	8 (11)	17.7 (17.3)
6. Medical/surgical history	99.2 (0)	99.2 (0)
7. Medications that would increase urinary frequency	8 (17.9)	26.2 (37)
8. Medications that would decrease urinary frequency	0 (0)	0 (0)
9. Percent functional ability	53 (14.4)	79.2 (17.3)
10. Environmental barriers	0 (0)	36.2 (40.8)
11. Date of last urinalysis*	12 (11)	10.8 (10.2)
12. Two-day voiding record	0 (0)	92.7 (16.8)
13. Intervention for constipation*	4 (8.9)	45.4 (38.6)
14. Encouragement of decaffeinated products	0 (0)	0 (0)
15. Scheduled prompted voiding times*	0 (0)	84.2 (28.2)

Note. * $p < .05$; one-tailed test.

Findings for the Research Questions

Research Question 1: What was the difference in the scores of nurses' adoption rates before and after the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback to promote the adoption of an evidence-based bladder protocol during the acute care phase of the stroke patient?

A time-series model for adoption rates was developed to examine the effect of the intervention introduced on January 26, 2009. The selected design was 5 time points for each of the 29 medical records during the 8 one-week pre-intervention phase, and 5 time points for each of the 29 medical records during the 16 one-week post-intervention phase. The design was necessitated by use of correlated longitudinal data, nurses' schedules, and stroke patients' length of stay. Patients' pre-intervention mean length of stay was four days and post-intervention mean length of stay was five days. Data were collected over an extended period of time and an intervention was introduced during the time period to meet time-series requirements. As seen in Figure 6, there were no obvious outliers among the observations. An auto-regressive, integrated, moving average (ARIMA), (0, 1, 1) interrupted time-series model without transformation was used to examine the step effect of the intervention.

After statistical advice to preserve as many data points and degrees of freedom as possible, all five time points were used as the DVs, nurses' adoption rates pre- and post-intervention. The five time points were maintained as five ARIMA models. The simple line graph demonstrated the expected change in the adoption rates pre- and post-intervention. The ARIMA model parameters were significant for the intervention for Model 1 and 2 and the moving average (MA) was significant for Models 2 – 5 (see Table 9).

Because data reduction was not performed and not all MA and intervention parameters were significant, interpreting five ARIMA models rather than one complicated the process. The advantage to having five models was the preservation of data points. For statistical purposes in this study, the degree of change was selected as the most important result over the best model fit. The mean adoption rate pre-intervention was 18.1% and the mean adoption rate post-intervention was 33.4%. The nearly two-fold increase in the adoption rate suggested that the impact of the intervention was a 15.3% increase in the mean adoption rate post-intervention.

Figure 6.

A simple line graph showing the median values for nurses' adoption rate with time points pre- and post-intervention.

Table 9
ARIMA Model Parameters for Nurses' Adoption Rates

Model	Parameter <i>t</i> test		Significance levels	
	MA	IV	MA	IV
1	.06	4.35	.48	.00
2	10.34	2.54	.00	.01
3	6.02	.81	.00	.21
4	7.48	1.13	.00	.13
5	3.27	-1.06	.00	.15

Note. MA = moving average parameter; IV = intervention parameter; one-tailed test.

Research Question 2: What was the difference in the rate of incontinence episodes of stroke patients before and after the intervention?

A time-series model for the rate of incontinence episodes was developed to examine the effect of the intervention. The selected design was 5 time points for each of the 29 medical records during the 8 one-week pre-intervention phase, and 5 time points for each of the 29 medical records during the 16 one-week post-intervention phase. The design was necessitated by use of correlated longitudinal data, nurses' schedules, and stroke patients' length of stay. Patients' pre-intervention mean length of stay was four days and post-intervention mean length of stay was five days. Data were collected over an extended period of time and an intervention was introduced during the time period to meet time-series requirements. An interrupted ARIMA (0, 1, 1) without transformation model was used to examine the step effect of the intervention.

After statistical advice to preserve as many data points and degrees of freedom as possible, all five time points were used as the DVs, incontinence episodes pre- and post-

intervention. The five time points were maintained as five ARIMA models. Many patients were discharged before the total five data points were collected pre-intervention ($n = 19$), but the ARIMA analysis was still able to be used. The ARIMA model parameters were significant for the intervention for Model 3 and the MA was significant for Models 1, 4, and 5 (see Table 10). There was no statistical significance found in Model 2.

Because data reduction was not performed and not all MA and intervention parameters were significant, interpreting five ARIMA models rather than one added complexity to the process. The advantage to having five models was the preservation of data points. For statistical purposes in this study, the degree of change was selected as the most important result over the best model fit. The mean rate of incontinence episodes pre-intervention was 65.9% and the mean rate of incontinence episodes post-intervention was 63.8%. The impact of the intervention was a 2.1% reduction in the mean rate of incontinence episodes post-intervention. These results indicated that the intervention was not as effective in the reduction of the rate of incontinence for the patients as it was for the increased adoption rate of the nurses.

Table 10

ARIMA Model Parameters for Rate of Incontinence Episodes

Model	Parameter <i>t</i> test		Significance levels	
	MA	IV	MA	IV
1	11.98	-.10	.00	.46
2	.11	-.19	.46	.43
3	.03	-1.80	.49	.04
4	5.56	-.50	.00	.31
5	3.36	-.34	.00	.37

Note. MA = moving average parameter; IV = intervention parameter; one-tailed test.

Research Question 3: What were the differences in the nurses' research utilization and research attitudes scores before and after the intervention consisting of combined use of education materials, educational meetings, reminders, and audit and feedback?

Paired-samples *t* tests were employed to assess the statistical significance of the nurses' research utilization and research attitudes score differences from Time 1 to Time 2, ($n = 20$). Indirect research utilization was the only set of scores that was statistically significant. The results for the paired-samples *t* tests were corroborated with exact tests using StatXact 8. Results of the StatXact 8 tests were the same as the asymptotic *t* tests; therefore, only the results of the asymptotic *t* tests are reported. G* Power was used to perform the post hoc power analyses for all of the *t* test results (Erdfelder, Faul, & Buchner, 1996).

The first paired-samples *t* test was conducted to evaluate the impact of the intervention on nurses' indirect research utilization scores. There was a statistically significant increase of indirect research utilization from Time 1 ($M = 4.89$, $SD = 1.56$) to Time 2 ($M = 5.74$, $SD = 1.66$),

$t(-3.024) = .00$ (one-tailed). The mean increase of indirect research utilization scores was $-.84$ with 95% confidence interval ranging from -1.43 to $-.26$. Post hoc analysis of $d = .70$ indicated a medium to large effect size (Cohen, 1988). Based on the difference between the paired means and standard deviations of the pre-and post-intervention rates, $n = 19$ provided 90% power.

Survey question 10 measured indirect research utilization and was defined as the use of research findings (nursing and non-nursing) that changed nurses' opinions about how to approach certain patient care or client situations. Positive statistical significance of indirect research utilization subscale might represent nurses' responses to being exposed to the use of the evidence-based bladder protocol.

A second paired-samples t test was conducted to evaluate the impact of the intervention on nurses' overall research utilization scores. No significant difference was found between overall research utilization from Time 1 ($M = 4.63$, $SD = 1.71$) to Time 2 ($M = 5.11$, $SD = 2.13$), $t(-.96) = .17$ (one-tailed). The mean increase in overall research utilization scores was $-.47$ with 95% confidence interval ranging from -1.51 to $.56$. Post hoc analysis of $d = .22$ indicated a small effect size (Cohen, 1988). Based on the difference between the paired means and standard deviations of the pre-and post-intervention rates, an $n = 128$ would have provided 80% power.

The third paired-samples t test was conducted to evaluate the impact of the intervention on nurses' direct research utilization scores. No significant difference was found between direct research utilization from Time 1 ($M = 3.85$, $SD = 1.95$) to Time 2 ($M = 4.89$, $SD = 1.83$), $t(-1.12) = .14$ (one-tailed). The mean increase in direct research utilization scores was $-.40$ with 95% confidence interval ranging from -1.15 to $.35$. Post hoc analysis of $d = .65$ indicated a medium effect size (Cohen, 1988). Based on the difference between the paired means and

standard deviations of the pre-and post-intervention rates, an $n = 20$ would have provided 80% power.

A fourth paired-samples t test was conducted to evaluate the impact of the intervention on nurses' persuasive research utilization scores. No significant difference was found between persuasive research utilization from Time 1 ($M = 3.18$, $SD = 1.63$) to Time 2 ($M = 3.59$, $SD = 1.73$), $t(-1.38) = .09$ (one-tailed). The mean increase in persuasive research utilization scores was $-.41$ with 95% confidence interval ranging from -1.04 to $.22$. Post hoc analysis of $d = .33$ indicated a medium effect size (Cohen, 1988). Based on the difference between the paired means and standard deviations of the pre-and post-intervention rates, an $n = 56$ would have provided 80% power.

The final paired-samples t test was conducted to evaluate the impact of the intervention on nurses' attitudes toward research scores. No significant difference was found between attitudes toward research scores from Time 1 ($M = 25.63$, $SD = 2.59$) to Time 2 ($M = 25.79$, $SD = 2.42$), $t(-.23) = .41$ (one-tailed). The mean increase in the attitudes toward research scores was $-.16$ with 95% confidence interval ranging from -1.59 to 1.28 . Post hoc analysis of $d = .05$ indicated a very small effect size (Cohen, 1988). Based on the difference between the paired means and standard deviations of the pre-and post-intervention rates, an $n = 2161$ would have provided 80% power.

Research Question 4: Were there relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitudes scores?

A standard multiple regression was conducted to evaluate the relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitudes scores. The DV, adoption rate, was regressed onto the independent variables (IVs) of age, basic nursing

education, highest completed level of formal nursing education, years worked as a nurse, years worked at this hospital, and nurses' research attitudes scores.

The linear combination of the IVs was not overall significantly related to adoption rate. Because there were significant correlations (Table 11), the decision was made to explore other models for relationships among the variables. Education and highest degree earned were highly correlated. Given that education was correlated with adoption rate, education was chosen to represent this characteristic in the final regression model.

Table 11

Estimated Pearson Correlations between the Demographic Variables, Research Attitudes, and Nurses' Adoption Rates

Variables	1	2	3	4	5	6	7	8
1. Gender	–	.15	-.09	-.06	.24	.30	-.33	.08
2. Age		–	-.51*	-.50*	.78**	.40*	-.39*	-.26
3. Education			–	.96**	-.02	.29	.29	.44*
4. Highest degree				–	-.01	.30	.43*	.41
5. Nursing years					–	.64**	-.18	-.23
6. Nursing at hospital						–	-.12	.12
7. Research attitudes							–	-.08
8. Adoption rate								–

Note. * Correlation is significant at the 0.05 level (one-tailed); ** Correlation is significant at the 0.01 level (one-tailed).

The demographic variables were added to Block 1 of the regression model while nurses' research attitudes scores were added to Block 2. SPSS was set to select the most statistically significant variables within each block. Education was significant ($b = 2.06$, $SE = .98$, $t = 2.10$, $p = .03$) after controlling for the influence of research attitudes which appeared to function as a suppresser variable in this model, $R^2 = .20$, $F(1, 15) = 3.69$, $p = .04$ (one-tailed). The medical record sample size, $n = 29$, was needed to achieve the desired 80% power as documented in Chapter 3. The multiple regression results were corroborated with exact tests using LogXact 8. Results of the LogXact p values were the same as the asymptotic p values.

Additional Results

The nurses who participated in the survey were asked their opinion about the effectiveness of the bladder protocol. Additional descriptive statistics were performed to answer the investigator developed question for Time 2 (Table 12). The question, "Was the evidence-based bladder protocol effective in the management of the incontinent stroke patient?" used *very effective*, *somewhat effective*, *slightly effective*, and *not effective* as responses without numeric values assigned.

Table 12

Effectiveness of the Evidence-Based Bladder Protocol (n = 20)

Variable	Frequency	Percent
Somewhat effective	16	80
Slightly effective	1	5
Missing	3	15
Total	20	100

Summary

The primary purpose of the study was to examine the effects of an intervention consisting of the four translation strategies of educational materials (clinical practice guideline), educational meetings, reminders, and audit and feedback on nurses' adoption of an evidence-based bladder protocol for stroke patients in an acute care setting. The second purpose was to evaluate the difference in incontinence episodes of stroke patients before and after nurses received the intervention. The third purpose of the study was to evaluate the influence of nurses' attitudes and demographic characteristics on the adoption and the use of the evidence-based bladder protocol after receiving the intervention. Data supported a two-fold increase in the nurses' adoption of an evidence-based bladder protocol, but there was no statistical difference in the incontinence episodes pre- and post-intervention. Nurses' level of basic nursing education had an influence on the adoption and the use of the evidence-based bladder protocol.

CHAPTER 5: DISCUSSION

This final chapter describes how the study findings for each research question were anticipated or not, and if the findings were consistent with theory and prior research. First, meaningful findings are explored for each research question. Next, implications for nursing practice and research are discussed. Lastly, study strengths and limitations are presented, followed by the conclusion.

Study Findings Related to Previous Research

Research Question 1: What was the difference in the scores of nurses' adoption rates before and after the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback to promote the adoption of an evidence-based bladder protocol during the acute care phase of the stroke patient?

The finding that nurses increased their adoption rate of an evidence-based bladder protocol two-fold was anticipated. Ten of the 15 behaviors increased in the use of an evidence-based bladder protocol during the acute care phase of the stroke patient after the combined use of educational materials, educational meetings, reminders, and audit and feedback. This finding is consistent with prior theory and research that found using a single translation strategy was rare. From the theoretical perspective, findings provide empirical support for the model of investigation when incorporating five of the eight constructs from Greenhalgh et al.'s model that were needed to promote nurses' adoption behaviors. Innovation, dissemination, system readiness, adoption, and implementation were required as theoretically proposed (Greenhalgh et al., 2005; Greenhalgh et al., 2004). The intervention consisted of the innovation (an evidence-based bladder protocol), dissemination (meeting attendance), system readiness (audit data), and implementation (adoption summaries and e-mail reminders). When measures of

adoption/assimilation were evaluated for change after the intervention, there was a two-fold increase in nurses' adoption behaviors. Most previous translation research studies used multifaceted strategies and it was difficult to determine which strategy was the most effective or provided the strongest evidence (Grimshaw et al., 2004). In prior studies examining translation strategies, nurses were participants but were not always the primary participants as in this study.

Findings for the adoption behaviors were divided into three groups: (a) those that did improve, (b) those that did not change, and (c) those that decreased. The five behaviors that improved and were statistically significant (Chapter 4, Table 8) were process indicators 2 (percent cognitive awareness), 5 (date and time of last bowel movement), 12 (two-day voiding record), 13 (intervention for constipation), and 15 (scheduled prompted voiding times). The seven behavior process indicators that did not change or were not statistically significant were process indicators 1 (history of incontinence), 3 (patient's motivation to be continent), 6 (medical/surgical history), 8 (medications that would decrease urinary frequency), 9 (percent functional ability), 10 (environmental barriers), and 14 (encouragement of decaffeinated products). The standard error of the difference was 0 for behaviors 6, 8, and 14. Adoption behavior mean percents were higher post-intervention than pre-intervention but not statistically significant for behaviors 1, 3, 9, and 10.

The five behaviors that improved can be further divided into two groups. The process indicators for behaviors 5 (date and time of last bowel movement) and 13 (intervention for constipation) were dependent upon the patient's clinical condition. Documenting these behaviors was already standard practice for nurses working on the neuroscience unit. The mean percent of process indicator 5 (date and time of last bowel movement) might have increased because of the focus on documentation of patients' intake and output during the study. In

addition, bowel and bladder documentation were visible on the same computer screen for each patient, making it easier to record pertinent data.

Process indicators 2 (percent cognitive awareness), 12 (two-day voiding record), and 15 (scheduled prompted voiding times) were new practices for the nurse sample and were the focal point of the prompted voiding algorithm. The nurse participants discussed the voiding record and the individualized patient voiding schedule with the researcher whenever a stroke patient was at that phase in the algorithm. Perhaps adoption of these behaviors was high because the nurses could see a direct association between prompted voiding times and decreased urinary incontinence, even when the nurses' work demands were high. Nurses had input into the patient's individualized schedule and autonomy in the implementation of the schedule. These are key components in promoting adoption of an innovation (Greenhalgh et al., 2005; Greenhalgh et al., 2004).

Prior research findings consistent with this study's findings support the use of the four translation strategies when promoting nurses' adoption of evidence-based practice. Nineteen articles (Horner et al., 2005; Clarke et al., 2006; Kelley et al., 2002; Feldman et al., 2005; McDonald et al., 2005; Roelands et al., 2004; Moore et al., 2003; Zanetti et al., 2003; Cannon & Allen, 2000; Kinsman et al., 2007; Hanson et al., 2005; Karlsten et al., 2005; Baier et al., 2004; Seers et al., 2004; Swoboda et al., 2004; Spitler et al., 2004; Cretin et al., 2001; Abbott et al., 2006; Berenholtz et al., 2004) were reviewed and all of the articles found translation strategies to be effective in promoting health care providers' adoption of evidence-based practice. Only 5 (McDonald et al., 2005; Roelands et al., 2004; Zanetti et al., 2003; Berenholtz et al., 2004; Abbott et al., 2006) of the 19 articles directly measured adoption rates, the remaining articles measured adoption rates indirectly by patient outcome results. One randomized control trial

(RCT), Roelands et al. (2004), was designed to measure nurses' adoption rates by self-reporting and was not used to support findings in this study because of the threat to the internal validity by the use of self-reports. Of the remaining four studies, two studies were RCTs (McDonald et al., 2005; Zanetti et al., 2003) and two studies were quasi-experimental (Berenholtz et al., 2004; Abbott et al., 2006) in design and were the most consistent with the present study.

The finding that the combined use of the four translation strategies was effective in increasing the nurses' adoption of evidence-based practice is consistent with the findings of Abbott et al. (2006) and Berenholtz et al. (2004). Their findings indicated that use of the educational materials, educational meetings, reminders, and audit and feedback was effective in increasing the use of the clinical practice guideline (CPG). Even though the adoption rate was slower than expected and the practice did not continue after the Abbott et al. (2006) study was completed, the finding supports the effectiveness of the combined use of these strategies. In the present study, the adoption rate data collection took longer than expected because of the availability of the medical record sample not because the nurses were slow to adopt evidence-based practice.

Additionally, the finding that nurses' adoption behaviors can be quantified by using chart review is consistent with the finding of McDonald et al. (2005) that clinical record abstraction is a viable data collection method. When considering the effectiveness of the combined use of educational materials (CPG and clinician resources) and reminders to promote adoption of evidence-based pain guidelines, their finding that the intervention had limited effect on nurse-documented care practices was also consistent with the finding of this study. Either the nurses' adoption behaviors were not documented thoroughly during this study, or the behaviors were not performed.

Lastly, the finding that use of reminders as one of four translation strategies in the intervention was effective in increasing the nurses' adoption of the evidence-based bladder protocol is consistent with the finding of Zanetti et al. (2003). The previous study found that the use of an automatic reminder system in the operating room improved compliance with antibiotic prophylaxis guidelines. Their finding indicated support for the effectiveness of the combined use of reminders and educational materials (CPG) to promote adoption of evidence-based antibiotic prophylaxis guidelines.

Because no studies were located that used the same intervention and outcomes measures, it is difficult to compare studies. There were no findings in the present study to contradict a recent review by Frasure (2006). The review found there is fair evidence that educational materials and reminders were effective translation strategies for increasing adoption by providers of evidence-based practice. Additionally, there is good evidence that educational meetings and audit and feedback were effective translation strategies for increasing adoption by providers of evidence-based practice. Inconsistent findings show the need to maximize the strength of the evidence through future studies.

Even though the magnitude of the adoption of evidence-based practice was consistent with other studies, considerable opportunity for further adoption exists for most of the behaviors, indicating fair effectiveness of the use of the four translation strategies. Plausible explanations include: (a) the need for a more robust intervention, (b) the researcher might have not seen documentation to validate a particular behavior, and (c) the nurse sample might have had times when behaviors were performed, but not documented because there was no designated form for the prompted voiding algorithm. Some of the behaviors were incorporated into existing

documentation and other behaviors required the nurse to remember to document an intervention on separate forms, some of which were physically distant from the patient's bedside.

Implications for Practice

This study was the first to evaluate the influence of the combination of these four translation strategies and nurses' attitudes toward research on adoption of evidence-based practice in a time-series design study. The time-series design was used because an experimental design was not feasible, but these findings can be pilot data for experimental research that is needed to provide the strongest evidence for practice change. In the review (Frasure, 2006) of the four strategies, there was a rare case when harm outweighed the risk when deciding to use one or more of the strategies. Therefore, those pursuing practice improvements should consider using a combination of these four strategies when attempting to change nurses' behaviors. There is no harm in advocating for the use of the bladder protocol because there is minimal risk involved in using these strategies to adopt the evidence-based bladder protocol. The bladder protocol might be helpful to a unit where there is no protocol. The benefits of using a tested evidence-based protocol would outweigh the benefits of writing and using a protocol that is not evidence-based.

The Registered Nurses' Association of Ontario allows nurses to adapt the educational materials (prompted voiding algorithm) to fit the needs of the patient setting. As suggested by the concept (adoption and assimilation) in Greenhalgh et al.'s model (2004), the researcher could facilitate the unit manager or a unit change champion in working with the nurses to identify the most important prompted voiding criteria to be used on their unit and provide consultation for educational meetings (individual or group workshops). Education might be targeted at the behaviors that are critical to the success of the bladder protocol and should be used exclusively to

see if adoption rates increase. The audit (chart review form) could be modified to fit the needs of the unit for audit and feedback to be given at scheduled intervals. Feedback (e-mail messages and bulletin board updates) could also serve as staff reminders about the new protocol.

Encouraging stakeholders' participation in the practice change can enhance adoption of the innovation (Rogers, 2003). The nurse manager or the unit change champion could promote participation via a unit designed reward system and celebrations to raise the excitement and the awareness of the practice changes.

Research Question 2: What was the difference in the rate of incontinence episodes of stroke patients before and after the intervention?

The finding that the rate of incontinence episodes did not significantly decrease was unanticipated, but understandable after analyzing the nurses' adoption behaviors. Consequences, one of the eight constructs from Greenhalgh et al.'s model, was incorporated into the model of investigation. Theory supports that consequences (continence episodes) whether negative or positive, needed to be monitored and reported to the adopters to guide the decision to adopt or reject the innovation. Positive consequences served as motivators for the adopters while transparency in reporting negative consequences enhanced trust (Rogers, 2003). The empirical finding of this study supports the model of investigation because the consequences were the effects of the implementation process (Greenhalgh et al., 2005; Greenhalgh et al., 2004). Most of the adoption behaviors did not improve significantly and the consequences demonstrated the influence of the implementation process on patient outcomes. Measures of consequences (continence episodes) were evaluated for change after the intervention, but there was no significant change in incontinence episodes.

This finding from this study is not consistent with prior research and theory. The use of the intervention of the combined use of educational materials, educational meetings, reminders, and audit and feedback in studies with diverse patient populations has been shown to be effective in improving patient outcomes. Only two studies were located that used the combined use of the same four translation strategies (Abbott et al., 2006; Berenholtz et al., 2004). Unlike the present study, findings from both of these previous studies support Greenhalgh et al.'s model demonstrating that patient outcomes can significantly improve with the appropriate implementation process. After reviewing the four translation strategies and their effectiveness on patient outcomes, plausible explanations for a less significant change than expected in incontinence episodes are discussed.

Potential Explanations for Patient Outcomes

Many factors might have threatened the internal validity of the study and contributed to the unanticipated lack of decrease in the incontinent episodes. One possible explanation for the patient outcomes, insignificant improvement, was that not all of the 15 adoption behaviors improved. For instance, results for process indicators 12 (two-day voiding record) and 15 (scheduled prompted voiding times) were very good post-intervention, but others were lower. The inconsistencies made it impossible to know which behaviors were the most effective. The materials for the prompted voiding protocol (RNAO, 2005) clearly state that the bladder protocol is not a “cookbook” approach. This philosophy is consistent with the evidence-based principle of taking individuals’ needs into account when planning care, but makes protocol adherence difficult to assess during the two-day voiding record phase.

One plausible explanation for why adoption of this behavior did not improve the rate of urinary incontinence was that patients’ voiding schedules could only be based on estimated

voiding times during the two-day voiding record phase. The adoption behavior, *initiating individualized prompted voiding schedule* (scheduled prompted voiding times), had the strongest level of evidence (Ia) from the prompted voiding algorithm and had a high rate of adoption (84.2%). Still, it was difficult to individualize the prompted voiding schedule because of challenges presented in collecting the exact voiding times during the two-day voiding record phase, even with help from patient care assistants (PCAs). This was because, when using incontinent pads or male external catheters, the exact voiding time was only able to be approximated when a patient was found to be incontinent. Job demands do not allow for the nurses or the PCAs to know and record exact voiding times of incontinent stroke patients, adding to documentation measurement error as discussed in research question 1.

Another plausible explanation for the finding that the incontinence episodes did not significantly decrease was that the mean length of stay (LOS) could be sufficient to start a patient on a prompted voiding schedule, but was insufficient to see the desired change. Patients' pre-intervention mean LOS was four days and post-intervention mean LOS was five days. The mean LOS included the ICU days, and ICU nurses were not recruited for the study. Also, while in the ICU, the majority of patients required an indwelling urinary catheter. Patients who were incontinent after the removal of indwelling urinary catheters were started on the prompted voiding algorithm. The prompted voiding algorithm (RNAO, 2005) recommended the use of a three-day voiding record before starting a patient on a prompted voiding schedule. The researcher decreased the time for the voiding record by one day because of acute care patients' LOS. Decreasing the data collection period of the voiding record might have decreased the effectiveness of the CPG, but the short LOS was probably a more significant contributing factor.

A final plausible explanation for the finding that might have threatened the internal validity was the number of stroke patients with incontinence during the study. Pre-study figures projected that the post-intervention data collection phase would last three weeks. To achieve the required number of patients, data collection lasted 16 weeks. Although the nurses were still engaged in using the bladder protocol, the threat of maturation was present because of the extended time needed for the study. The passage of time caused the nurses to question when the study would end and there was an expressed sense of fatigue with the study protocol (Polit & Beck, 2008). Some of the nurses might have perceived the use of the bladder protocol as increasing their workload. This perception might have been a contributing factor to the potential study fatigue. The length of time needed for research studies can be unpredictable and that is why it is important for the researcher to update participants, if not restricted by the study design.

Implications for Practice

Because nurses' adoption of the evidence-based bladder protocol influences urinary continence, it is imperative to understand the inconsistencies in nurses' adoption rates. Involving and updating the nurses who are making the practice change might decrease the threat of maturation, as well as increase the desire to increase adoption behaviors. Just as communication is important to nurses, an additional implication for practice might be to add a more structured effort to strengthen nurse-patient communication to increase the intervention's impact on the rate of urinary incontinence (McDonald et al., 2005). The stroke patients in this study who were able to participate in their care were more successful with prompted voiding than patients who had difficulty with communication. Another possible way to get patients involved with the bladder protocol and to be more efficient with the LOS would be the use of patient diaries. Patients who

are cognitively aware of the bladder protocol could record times of incontinent and continent episodes in their diaries (RNAO, 2005).

Research Question 3: What were the differences in the nurses' research utilization and research attitudes scores before and after the intervention consisting of combined use of education materials, educational meetings, reminders, and audit and feedback?

The finding that the nurses' research utilization and research attitudes scores increased from Time 1 to Time 2, but the indirect research utilization score was the only result that was statistically significant is consistent with previous research. The post-intervention mean for indirect research utilization was the highest, then direct research, and finally persuasive research utilization. The finding for the research utilization scores is supported by Kenny (2002) in a descriptive correlational design study that examined the organizational and professional factors that contribute to research utilization of registered nurses. The finding for the research utilization scores in this study is also consistent with Estabrooks' conceptual model of research utilization that provides the empirical evidence for measuring research utilization and nurses' attitudes toward using research in practice (Estabrooks, 1999a).

Regarding persuasive research utilization being the lowest score, in an environment that is just beginning to consider adopting evidence-based practice, it is not surprising that the nurses would be slow to persuade others to use research in practice. Indirect research utilization does not require the nurse to change policy or practice, and that can be an overwhelming experience when nurses are in the early phases of learning about the use of research in practice.

In a recent systematic review (Frasure, 2008), 14 instruments measuring nurses' attitudes toward research were analyzed. Seven of the studies investigated the associations of nurses' attitudes toward research (Björkström & Hamrin, 2001; Estabrooks, 1999a; Kenny, 2005;

Kuuppelomäki & Tuomi, 2003; McCleary & Brown, 2003; Olade, 2003; Veeramah, 2004). The other seven studies were for the sole purpose of helping to develop a strategy in a specific area or solving an isolated quality improvement project were also reviewed (Clifford & Murray, 2001; Humphris et al., 1999; Jolley, 2002; Logsdon et al., 1998; Parahoo, 1999; Smirnoff et al., 2007; Van Mullem et al., 1999). Clifford and Murray (2001) conducted the only study that used a pretest-posttest design somewhat comparable to the design of the present study. As in this study, pretest-posttest results demonstrated a positive attitude toward research overall, but the difference between the means was not significant. Dissimilarities in the studies were the sample sizes, the intervention, and the time intervals for the studies. The previous study had a pretest nurse sample ($N = 235$) and a posttest nurse sample ($N = 81$). An educational intervention to increase nurses' research knowledge and activities was offered between the pretest and the posttest time points, 1996 and 1999, respectively. In another recent pretest-posttest study (Larrabee et al., 2007), attitudes toward role and interest in participating in research or use of research to change practice scores decreased from Time 1 to Time 2. The finding was limited because of the study design and the three year interval between data collection times.

In the present study, attitudes toward research had an anticipated increase post-intervention. The increase was not statistically significant, but the intervention might have had a positive effect on nurses' research attitudes. One plausible explanation for the lack of statistical significance was the sample size, $n = 20$. The pre-study power analysis found that 29 nurses were needed for statistical significance in the survey. Even with an incentive after completing Time 2, some of the eligible nurses chose to not participate in the survey.

A second plausible explanation relevant to the survey method is that attitudes have been shown to change with the data collection procedure. Internal validity was threatened by the use

of innovative material in the pre-intervention survey (Polit & Beck, 2008). Not only were the nurses exposed to taking a survey, the survey was designed to provide knowledge as it was completed. A final plausible explanation for the inconsistent finding is that the concept of research utilization was new to participants in this study. Nurses verbalized ambiguity about which daily interventions were research-based versus traditional practices. Even with reassurance from the researcher, nurses showed signs of frustration when trying to assess their practice and how they use research.

Implications for Practice

Nurses' attitudes vary about research, but educational programs should attempt to connect with all nurses, regardless of the nurse's level of interest. Improving patient outcomes is valued by nurses, so patients' benefits need to be tied to educational programs. Melnyk and colleagues found that nurses strongly believed that practice based upon evidence improves clinical care and patient outcomes (Melnik et al., 2004). Nurses would be more inclined to adopt practice changes that are relevant to their practice and patient populations. A variety of innovative educational strategies, including interactive learning (Melnik et al., 2004), should be used to acknowledge and target the nurses' diverse learning styles.

One incentive for incorporating research into practice is that evidence indicates patients who receive care based upon the best and latest evidence experience better patient outcomes (Heater, Becker, & Olson, 1988). Additionally, evidence demonstrates that health care providers have higher levels of job satisfaction when using evidence-based practice versus traditional patient care interventions (Dawes, 1996). Higher job satisfaction might potentially increase nurses' attitudes toward using and participating in the use of research in practice.

Research Question 4: Were there relationships among the adoption rate, nurse demographic characteristics, and nurses' research attitudes scores?

In examining the relationships among adoption rate, nurse demographic characteristics, and nurses' research attitudes scores, the only variable with a relationship to adoption rate was education, after controlling for the influence of nurses' attitudes. This finding was anticipated because of the limited sample size. The percentage of nurses in this sample that had completed the baccalaureate degree was 17.3% higher than what was reported by the NSSRN (2004). Perhaps this increase accounts for the influence of education on adoption. Another demographic variable that differed significantly from the NSSRN (2004) was age. Ages ranged from 22-57 ($M = 33.8$) in this study sample while the NSSRN (2004) reported ($M = 43.4$) for the hospital nurse. The influence of the lower mean age for this nurse sample is not known.

The finding of this study that the only variable with a relationship to adoption rate was education is not consistent with previous studies. Two previous studies reported that the variable of attitudes toward research influenced research utilization in nurse samples (Estabrooks, 1997; Kenny, 2002). While the methods for data collection differ, adoption rate and research utilization are conceptually similar variables. In the Greenhalgh et al. model (2004), attitudes are an attribute of the construct of adoption. In order to understand nurses as the adopters, it is necessary to understand nurses' attitudes toward using and participating in research and the effect on the adoption of evidence-based practice (Rogers, 2003). Adoption rate is derived from an investigator developed chart review form for nurses' adoption behaviors, while research utilization is a self-reported performance measure in the survey.

Kenny (2002) also found that education was not a predictor for research utilization. In this study, education was the only variable with a statistically significant relationship with

nurses' adoption rates. For this nurse sample, a higher percent of baccalaureate degrees and a lower mean age than the NSSRN (2004) might have made the nurses more willing to participate in using research in practice. Estabrooks (1997) and Kenny (2002) did not find the variables of age and education to be significant. Further examination of these variables in future studies is needed.

One plausible explanation for insignificant findings is that there was a threat to the internal validity relevant to nurses' adoption behaviors. The adoption rate might be lower because nurses chose to not adopt the behavior, did not document their behaviors, or the researcher might have had data collection errors. A second plausible explanation regarding statistically significant attitude scores was that the use of the survey method threatened internal validity because of the nature of self-reporting (Polit & Beck, 2008). A third plausible explanation was that nurses' attitudes scores might have been more significant with more nurses participating in the survey ($n = 20$). Power was decreased by the small sample size because nine nurses chose to not participate in the survey.

Implications for Practice

Because the level of nursing education was found to possibly influence adoption of evidence-based practice, a research mentor or champion could be invaluable to providing education about evidence-based practice to staff nurses. The lower mean age of the nurses indicates they have not been a nurse as long as some of their older peers. Practice changes might be easier to incorporate into patient care if nurses are not as entrenched in traditional care routines. Novice nurses might be provided a foundation for practice if evidence-based practice is taught to the nurses as the goal of care.

The role of a research champion was not part of this study's intervention because it was not a construct in Greenhalgh et al.'s model, but the influence of the researcher as a boundary spanner was present as an attribute of the construct of diffusion and dissemination. Boundary spanners are people who have strong ties both inside and outside of an organization who are willing to link the organization to the outside relevant to the innovation (Greenhalgh et al., 2005; Greenhalgh et al., 2004). Formalizing relationships between academic and clinical sites can benefit both researchers and nurses employed by hospitals. When studying research facilitators and agencies, Melnyk et al. (2004) found nursing faculty and schools of nursing to rank highest when they helped nurses integrate research evidence into practice. Many academic health care institutions have already designed research and practice models (Larrabee, 2009; Melnyk et al. 2004). Successful programs could be research and practice models for other interested institutions.

Recommendations for Nursing Research

Remaining gaps in knowledge still exist about the combined use of the four translation strategies of educational materials, educational meetings, reminders, and audit and feedback in the adoption of an innovation. The innovation in this study was a bladder protocol for stroke patients. The strategies were used as an intervention to encourage nurses to adopt an evidence-based continence program. The primary model (Conceptual Model for the Spread and Sustainability of Innovations in Health Service Delivery and Organization) tested by Greenhalgh et al. (2004), addressed system readiness factors influencing adoption, implementation, and dissemination of an innovation. The concept of sustainability was not studied because of time constraints, but that was an area of concern. It was difficult enough to maintain nurses' interests

for 16 weeks, so permanent change would be even more of a challenge. Further studies are needed to identify strategies that promote permanent and sustained practice changes.

First, more research, especially intervention studies, is still needed on specific translation strategies that are known to promote the adoption of research in practice (Melnik et al., 2004). This study should to be replicated with the intervention phase being longer and more robust than the present intervention. Possible ways to make the intervention more robust would be a more aggressive approach to announcements and updates relevant to the study, and possibly giving the nurses the printed protocol on lanyards (Larrabee, 2009) or laminated pocket cards. The study should be replicated with stroke patients in other settings, such as rehabilitation, or in other patient populations with urinary incontinence problems. Study replication should also be conducted with a different patient population using the same intervention, but replacing the CPG with one that is appropriate for the needs of the different patient population.

Second, the LOS in the acute care setting may not allow for the time needed to be successful with the prompted voiding algorithm. Research is needed to examine if acute care settings and rehabilitation settings might partner in the use of an evidence-based bladder protocol. Many acute care and rehabilitation settings have existing relationships; hence, the continuity of care should be feasible. The combination of the acute care LOS and the rehabilitation LOS should be sufficient time to determine the exact number of days that are needed for the prompted voiding algorithm to be successful.

Third, significant patient outcomes are vital to the adoption of research into practice. Research has demonstrated that identifying a patient's individualized voiding patterns is important to the prompted voiding schedule (RNAO, 2005). The voiding record data need to be more accurate and less burdensome for nurses and PCAs to collect in order to promote

compliance. Moisture sensors in incontinence pads or in patients' beds are available technologically, but there is a need for research and development relevant to incontinence care. Collaboration with multidisciplinary researchers and corporations is needed to use moisture sensor technology to promote the improvement of patient outcomes.

Strengths and Limitations

Strengths

A major strength of this study was the treatment fidelity provided by the use of the prompted voiding algorithm and manual (RNAO, 2005), administration of the same dose and intensity of education to all nurses, and the primary investigator being involved in every phase of the study. Additionally, the nurses in the sample were accustomed to a regimented environment and using detailed protocols, factors that also added strength to the treatment fidelity. Overall, increased adoption rate compliance showed the strength of the treatment fidelity, but the adoption rate fluctuated throughout the study. Another strength was use of the Research Utilization Survey, an instrument with strong validity and reliability to measure nurses' attitudes toward using and participating in research.

Limitations

A limitation to the study was the extended time needed for the post-intervention data collection phase. The passage of time is known as the threat of maturation when considering internal validity. More time for the intervention could have been added to provide a more robust intervention if the time requirement had been known during the design of the time-series study. A "booster dose" of educational meetings, reminders, and audit and feedback between the second and third months of the post-intervention phase might have also been beneficial. As stated earlier, nurses willingly participated until the required medical record sample was

obtained, but an additional formalized education meeting would have strengthened the intervention, potentially promoting higher adherence to the bladder protocol. For future studies, a booster intervention should be considered to increase the likelihood of producing statistically significant change in adoption behaviors and patient outcomes.

Another limitation and threat to internal validity was the use of a convenience sample, unfortunately, random sampling was impossible with the limited number of nurses eligible for this study. The researcher made every effort to increase the nurse sample without coercion. Nurses who supported the use of the bladder protocol but chose to not participate in the Time 1 and Time 2 surveys were still acknowledged for their contribution. There was also a threat to external validity because results cannot be generalized to nurses who work in other neuroscience units in the acute care setting.

Conclusions

The primary purpose of the study was to examine the effects of an intervention consisting of the four translation strategies of educational materials (CPG), educational meetings, reminders, and audit and feedback on nurses' adoption of an evidence-based bladder protocol to improve stroke patients' outcomes in an acute care setting. Variables that influenced adoption were also studied. Findings demonstrated that the use of the four translation strategies had a two-fold increase in nurses' adoption of an evidence-based bladder protocol, but opportunities for increased adoption of behaviors remained. The use of the four translation strategies was not as effective in improving patient outcomes.

The model of investigation that provided the framework for this study consisted of nurse attitudes from Estabrooks' model, nurse demographic characteristics, and the six constructs of innovation, dissemination, system readiness, adoption, implementation, and consequences from

Greenhalgh et al.'s model. This study is the first to provide empirical support for the influence of the combination of these four translation strategies and nurses' attitudes toward research on adoption of evidence-based practice in a time-series design study; thus, the combined use of the four strategies does have an impact on nurses' adoption of evidence-based practice.

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APPENDIX A: DATA COLLECTION FORM

Instructions for completing the chart review form:

1. Assign the nurse and the patient study ID number and record in designated space.
2. For nurse behaviors process indicators 1, 3, 5, 6, 7, 8, 10, 11, 12, 13, 14, and 15, enter scores 0%, 100%, or NA.
Sum and average the total score and enter the % Mean 1 score in the provided space.
3. For nurse behaviors process indicators 2, 4, and 9, enter the calculated percent of the nurse behaviors. Sum and record the % Mean 2 score in the in the provided space.
4. For patient outcome indicators, enter the calculated percent of the patient outcome indicators. Record the score in the space provided on the chart review form.

Chart Review Form: **Nurses' Adoption Behaviors Study**

Medical Record Room #_____

ANSWER CODE:

0% = NO

100% = YES

NA = Not Applicable

SOURCE CODE:

A. Flowsheet

D. Progress Notes

G. Computer

B. Reminder sheet

E. Patient Registration Form

H. Teaching Record

C. Admission Assessment

F. Medication Record

I. Voiding Record

	Date chart reviewed?	Write in							
	Number of minutes required for chart review?	Write in							
	Patient's account number/ Medical Record Study ID number	E							
	Date of stroke admission	E							
	Date of stroke discharge	D							
	NURSE BEHAVIORS	NURSE STUDY IDs							
	Process Indicators		RN1	RN2	RN3	RN4	RN5	RN6	RN7

1.	History of incontinence documented?	C, D							
2.	a) Number of times cognitive awareness of voiding was documented?	B, C							
	b) Number of times cognitive awareness of voiding should have been documented?	B, C							
	% cognitive awareness documented	2a/ 2b							
	c) Daily Glasgow Coma Scale Score								
3.	Was patient's motivation to be continent documented?	B, D							
4.	a) Number of times source of fluid intake was documented?	A, G							
	b) Number of times source of fluid intake should have been documented?	A, G							
	% source of fluid intake documented	4a/ 4b							
5.	Date and time of last bowel movement documented?	A, B, G							
6.	Medical/surgical history documented?	C, D							
7.	Medications that would increase urinary frequency identified?	B, F							
8.	Medications that would decrease urinary frequency identified?	B, F							
9.	a) Number of times functional ability was documented?	A, B, D							
	b) Number of times functional ability should have been documented?	A, B, D							

	% functional ability documented	9a/ 9b							
10.	Environmental barriers documented?	C, D							
11.	Date of last urinalysis documented?	A, B, D, G							
12.	Two-day voiding record completed?	G, I							
13.	Intervention needed for constipation/fecal impaction documented?	A, B, D							
14.	Encouragement of decaffeinated products documented?	D, H							
15.	Scheduled prompted voiding times after reviewing voiding record?	A, B, D							
	% Sum								
	Count								
	% Mean								
	Patient Outcome Indicators								
1.	a) What were the total urinary incontinence episodes upon discharge of the patient?	G							
	b) What was the total number of voiding episodes upon discharge of the patient?	G							
	% urinary incontinence episodes	1a/ 1b							

YES MAYBE NO DO NOT KNOW

5. Do you agree with the statement: "If nurses used research more in their practice it would make a positive difference to patient care and outcomes"?

Strongly Disagree					Strongly Agree
1	2	3	4	5	

6. What is the one most common source from which you learn about research findings? Be as specific as possible.

DIRECT RESEARCH UTILIZATION

For questions 7 - 9, please use the following definition of direct research utilization:

The use of any kind of research findings (nursing and non-nursing) where you **directly use the findings** in giving patient care and/or in client interventions. Do not count as research, things you learned in your basic nursing training.

Direct research use often results in protocol, procedure, routine or policy development. The following are examples of research that can be used in a direct way:

- Following current CDC immunization guidelines in outpatient clinics
- Limiting suctioning (and other interventions known to cause increased intracranial pressure-ICP) in ventilator patients with known or suspected high ICP
- Developing a protocol for pain management based on pain control research to be implemented on an oncology unit

7. Overall, in the past year, how often have you *used research findings in this direct way* in some aspect of your nursing practice?

Never	On 1 or 2 Shifts			On about half the shifts		Nearly every shift	Do not know
1	2	3	4	5	6	7	8

8. How often have you avoided using research in this *direct way* because you did not believe you had the *authority* to do so, even though you were convinced of the usefulness of the research?

Never	Rarely	Sometimes	Frequently	Always
1	2	3	4	5

9. Still considering this *direct* kind of utilization, how many times in the past year have you encountered a research finding or recommendation:

SCALE:

Never 1	On 1 or 2 Shifts 2	3	4	On about half the shifts 5	6	Nearly every shift 7	Do not know 8				
<hr/>											
(a)	That you <u>completely</u> implemented?			1	2	3	4	5	6	7	8
(b)	That you <u>partially</u> implemented?			1	2	3	4	5	6	7	8
(c)	That you <u>modified</u> to fit your situation and then implemented?			1	2	3	4	5	6	7	8
(d)	Where you <u>did nothing</u> , that is, did not implement the finding or recommendation?			1	2	3	4	5	6	7	8

INDIRECT RESEARCH UTILIZATION

For question 10, please use the following definition of **indirect research utilization** which is *different from the definition for direct utilization given above*:

The use of research findings (nursing and non-nursing) to **change your thinking or opinions** about how to approach certain patient care or client situations. Do not count as research, things you learned in your basic nursing training.

Indirect research use usually does *not* result in protocol, procedure, routine, or policy development. The following are examples of research that can be used in this indirect way:

- Because you are aware of the stages of death and dying, you understand a newly diagnosed cancer patient's refusal to accept the diagnosis.
- Knowing that smoking during pregnancy can result in low birth weight babies, you anticipate lower birth weight and other related problems in babies of smoking mothers.
- Based on the knowledge that pregnancy is sometimes a trigger for domestic violence you raise your index of suspicion during prenatal visits.

10. Overall, in the past year, how often have you used *research in this non-direct way* in some aspect of your nursing practice?

Never 1	On 1 or 2 Shifts 2	3	4	On about half the shifts 5	6	Nearly every shift 7	Do not know 8
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PERSUASIVE RESEARCH UTILIZATION

For questions 11 -12, please use the following definition *which is different from the definitions for direct and indirect research utilization*:

The use of research findings (nursing and non-nursing) **to persuade others, who are usually in decision-making positions, to make changes** in conditions, policies, or practices relevant to nurses, patients/clients, and/or the health of individuals or groups. Do not count as research, things you learned in your basic nursing training.

The following are examples of research that can be used in this persuasive way:

- You use your knowledge of the adverse effects of irregular shift rotations on employee performance and health to persuade your supervisors to improve the shift rotation in your unit.
- You use your knowledge of recent research which demonstrates that male infants experience significant pain during circumcision to persuade a physician you work with to use a local anesthetic during the procedure.

11. How often have you used knowledge of particular research findings to try to **persuade** the following groups of people to make changes in this way in the past year?

	Never	Rarely	Sometimes	Often	Do not Know
a. Nurse co-workers.	1	2	3	4	8
b. Physicians.	1	2	3	4	8
c. Other health professionals.	1	2	3	4	8
d. Nurse administrators.	1	2	3	4	8
e. Non-nurse administrators.	1	2	3	4	8
f. Community leaders.	1	2	3	4	8
g. Government representatives.	1	2	3	4	8
h. Members of the public.	1	2	3	4	8
i. Other (Specify: _____). . .	1	2	3	4	8

12. Overall, and including all of the categories of people in #11, in the past year how often *have you used research in this persuasive way*?

Never	On 1 or 2 Shifts			On about half the shifts		Nearly every shift	Do not know
1	2	3	4	5	6	7	8

OVERALL RESEARCH UTILIZATION

For question 13, please reassess your research utilization using the original definition of overall *research utilization*:

The use of any kind of research findings (nursing and non-nursing), in any kind of way, in any aspect of your work as a registered nurse. Do not count as research, things you learned in the nursing school where you did your basic nursing training.

13. Overall, in the past year, how often have you used research in some aspect of your nursing practice?

Never	On 1 or 2			On about		Nearly	Do not
	Shifts			half the		every	know
1	2	3	4	shifts	5	shift	8

14. If you circled a number from 2 to 7 in the above question, estimate how much of the research that you used was:

_____	% nursing
_____	% medical
_____	% other
100%	

SECTION II: Individual and Organizational Factors

1. For each item, please circle the one number that best describes your beliefs about research.

	Disagree strongly	Disagree	Uncertain	Agree	Agree strongly
a. Research is needed to improve nursing practice continually.	1	2	3	4	5
b. Research findings are too complex to use in practice.	1	2	3	4	5
c. I would change my practice as a result of research findings.	1	2	3	4	5
d. Research is not applicable to my practice.	1	2	3	4	5
e. Research helps to build a scientific base for nursing.	1	2	3	4	5
f. It takes too much effort to apply research to practice	1	2	3	4	5

2. How much faith do you have that researchers will produce research A great deal

	None				
a. that is relevant to you?	1	2	3	4	5
b. that is easily used by you?	1	2	3	4	5
c. that can safely be used in your practice? . . .	1	2	3	4	5

3. How *willing* are you to implement research when it contradicts something you

	Very unwilling				Very willing
a. learned <i>prior</i> to nursing school?	1	2	3	4	5
b. learned in nursing school?	1	2	3	4	5
c. learned in your place of work?	1	2	3	4	5

4. How often do you **actually implement** research when it contradicts something you

	Never				Very often
a. learned <i>prior</i> to nursing school?	1	2	3	4	5
b. learned in nursing school?	1	2	3	4	5
c. learned in your place of work?	1	2	3	4	5

5. How important are the following in your decision to use or not to use particular research findings in your practice?

	Not at all important				Very important
a. The research matches my personal values.	1	2	3	4	5
b. The research meets a clinical need.	1	2	3	4	5
c. The research is easy to understand.	1	2	3	4	5
d. The research is relatively easy to incorporate into my practice.	1	2	3	4	5
e. The results of implementing the research are visible to me.	1	2	3	4	5
f. The particular research based practice makes me feel like a better nurse.	1	2	3	4	5
g. The particular research practice makes my job as a nurse easier.	1	2	3	4	5
h. The research is relevant to my particular practice situation.	1	2	3	4	5

- i. Others who have tried the research
are positive about it.1 2 3 4 5
6. How much access do you have to do the following in your workplace?
- | | Very
little | | | | A great
deal | Not
available |
|---|----------------|---|---|---|-----------------|------------------|
| a. Medical Library w/ research journals. | 1 | 2 | 3 | 4 | 5 | 8 |
| b. Unit library | 1 | 2 | 3 | 4 | 5 | 8 |
| c. Library computers. | 1 | 2 | 3 | 4 | 5 | 8 |
| d. Electronic mail | 1 | 2 | 3 | 4 | 5 | 8 |
| e. Internet research resources | 1 | 2 | 3 | 4 | 5 | 8 |
7. The knowledge that I use in my practice is based on.....
	Never	Seldom	Sometimes	Frequently	Always
a. information I learn about each patient/client
as an individual.....	1	2	3	4	5
b. my intuitions about what seems to be "right"
for the patient/client	1	2	3	4	5
c. my personal experience of nursing
patients/clients over time.....	1	2	3	4	5
d. information I learned in nursing school.....	1	2	3	4	5
e. what physicians discuss with me.....	1	2	3	4	5
f. new therapies and medications that I learn about
after physicians order them for patients.....	1	2	3	4	5
g. articles published in medical journals.....	1	2	3	4	5
h. articles published in nursing journals.....	1	2	3	4	5
i. articles published in nursing research
journals.....	1	2	3	4	5
j. information in textbooks.....	1	2	3	4	5
k. what has worked for me for years.....	1	2	3	4	5
l. the ways that I have always done it.....	1	2	3	4	5
m. the information my fellow nurses share.....	1	2	3	4	5
n. information I get from attending
inservices/conferences.....	1	2	3	4	5
o. information I get from policy and
procedure manuals.....	1	2	3	4	5
p. information I get from the media (e.g., popular
magazines, television, internet, etc.).....	1	2	3	4	5
8. Do you think that better access to the above resources is important to whether or not you use research?
- | Not at all
important
1 | Somewhat
important
2 | Quite
important
3 | Very
important
4 | Extremely
important
5 |
|------------------------------|----------------------------|-------------------------|------------------------|-----------------------------|
|------------------------------|----------------------------|-------------------------|------------------------|-----------------------------|
9. During your workday is there ever time to do any of the following?
- | | Never | Rarely | Sometimes | Quite
often | Frequently |
|-----------------------------------|-------|--------|-----------|----------------|------------|
| a. Use the library. | 1 | 2 | 3 | 4 | 5 |
| b. Read journals/texts | 1 | 2 | 3 | 4 | 5 |
| c. Reflect on your practice | 1 | 2 | 3 | 4 | 5 |
| d. Participate in projects. | 1 | 2 | 3 | 4 | 5 |
| e. Participate in research | 1 | 2 | 3 | 4 | 5 |

10. Indicate the degree to which the following people are supportive of your using research in your practice:

	Not at all supportive				Very supportive	Do not know
a. Other nurses in your area.	1	2	3	4	5	8
b. Your immediate supervisor	1	2	3	4	5	8
c. Administration (nursing)	1	2	3	4	5	8
d. Administration (general).	1	2	3	4	5	8
e. Physicians.	1	2	3	4	5	8
f. Other health professionals.	1	2	3	4	5	8
g. Other (Specify: _____).	1	2	3	4	5	8

11. Is there someone in your organization who currently, or in the past year, has "championed" nursing research and/or research-based practice?

YES _____ NO _____ DO NOT KNOW _____

Thank you very much.

The careful consideration you gave to your answers will add to the knowledge base of how nurses use research in their practice and how that utilization can best be enhanced.

*Adapted with verbal permission from Research Utilization in Nursing: An Alberta Survey of Practising Nurses, 1996, Carole A. Estabrooks, University of Alberta, Canada.

SECTION III: Investigator Demographic Data

1. What is your gender? Male _____ Female _____
2. What is your age? _____
3. What is your basic nursing education?

Associate Degree	_____
Diploma	_____
Baccalaureate Degree	_____
4. What is your highest completed level of formal nursing education?

Associate Degree	_____	Master's Degree	_____
Diploma	_____	Doctorate	_____
Baccalaureate Degree	_____	Other	Specify: _____
5. Excluding your basic nursing training, how many years have you worked as a nurse?

Number of years _____ months _____
6. How many years have you worked at this hospital?

Number of years _____ months _____

Investigator Developed Question for Time 2 (only)

1. Was the evidence-based bladder protocol effective in the management of the incontinent stroke patient?
(Circle answer)

Very
Effective

Somewhat
Effective

Slightly
Effective

Not
Effective

CURRICULUM VITAE

Demographic Information

Name: Jamey S. Frasure

Work Title: Assistant Professor of Clinical Nursing
College of Nursing
University of Cincinnati

Work Address: 251 Proctor Hall
3110 Vine Street
Cincinnati, Ohio 45221-0038

Work Telephone: (513) 558-5714

Home Address: 3343 Lookout Drive
Cincinnati, Ohio 45208

Home Telephone: (513) 321-4693

Professional Registration: Ohio: RN-184263

Formal Education

<u>Institution & Location</u>	<u>Dates</u>	<u>Degree</u>	<u>Major</u>
West Virginia University	2003-present	PhD Candidate	Nursing
University of Cincinnati Cincinnati, Ohio	1992-1997	MSN	Adult Health Nursing
University of Cincinnati Cincinnati, Ohio	1978-1983	BSN	Nursing

Professional Experience

<u>Institution</u>	<u>Position</u>	
University of Cincinnati College of Nursing	Assistant Professor of Clinical Nursing	Effective September 1, 2003
University of Cincinnati College of Nursing	Instructor of Clinical Nursing	October 18, 1999- September 1, 2003
The University Hospital	Clinical Nurse I Neuroscience (intermittent)	September, 2003- present
University of Cincinnati Stroke Research Center	Clinical Research Nurse	2003-2006

University of Cincinnati Department of Emergency Medicine	Clinical Research Nurse	2000-2005
The University Hospital Cincinnati, Ohio	Clinical Nurse I CICU (intermittent)	May 1, 1999- January 1, 2001
	Cardiovascular Surgery Nurse Clinician	1991-1999
	Cardiac Transplant Coordinator	1990-1991
	Cardiac Catheterization Laboratory Staff Nurse	1986-1990
	Intensive Care Staff Nurse	1983-1986

Professional Organizations

Sigma Theta Tau International (2005-present)

Beta Iota Chapter (2005-present)

University of Cincinnati College of Nursing Alumni Interim President (September, 2009)

University of Cincinnati College of Nursing Alumni Class Agent (1984-present)

American Nurses Association (1983-present)

Ohio Nurses Association (1983-present)

Southwestern Ohio Nurses Association (1983-present)

Toastmasters International (2006-2009)

Publications

Frasure, J. (2008). Analysis of instruments for measuring nurses' attitudes towards research utilization: A systematic review. *Journal of Advanced Nursing*, 61 (1), 5-18.

Unpublished Manuscripts

Frasure, J. (2006). *Integrative review of four translation strategies: Audit and feedback, educational materials, educational sessions, and reminders*. Unpublished manuscript, West Virginia University.

Frasure, J., & Miller, E. (2002). *Care management issues for coronary artery bypass grafts involving radial artery donor sites*. Unpublished manuscript, University of Cincinnati.

Research Activities

Completed dissertation data collection on acute care neuroscience unit at The University Hospital, Cincinnati, Ohio in June, 2009.

Worked with Dr. Elaine Miller in final data management phase of a study that looked at the impact of stroke on the client's and the caregiver's quality of life.
Participated in the data collection and data entry in studies related to treatment options of the acute stroke patient from 2003-2006.

Research nurse for Emergency Medicine Cardiac Research and Education Group, eptifibatide for acute coronary syndrome: rapid administration vs. late administration – therapeutic yield (EARLY PILOT Study), April, 2000-April 2001.

Presentations

Research (regional level)

Analysis of instruments for measuring acute care nurses' attitudes towards research utilization: A systematic review (poster by Frasure, J.), presented at the 22nd Annual Conference sponsored by the Southern Nursing Research Society, Birmingham, AL, February, 2008.

Literature synthesis: The use of team-based learning as an active learning strategy (poster by Frasure, J.), presented at the 20th Annual Conference sponsored by the Southern Nursing Research Society, Memphis, TN, February, 2006.

Integrative Review of Hypertension Management (poster by Frasure, J.), presented at the 18th Annual Conference sponsored by the Southern Nursing Research Society, Louisville, KY, February, 2004.

Research (local level)

Integrative Review of Hypertension Management (poster by Frasure, J.), presented at Sigma Theta Tau International Alpha Rho Chapter, Morgantown, WV, October 15, 2005.

Presentations (local)

Opening a Dialogue: Ever had a Question in the Clinical Setting and Didn't Know How to Move the Idea Forward? Presented with K. Whitmer at University of Cincinnati, College of Nursing, October, 2008.

Review of Intramuscular Injection Sites, inservice for University Hospital Ambulatory Care Nurses, March, 2008.

Current Trends in Nursing Education, presentation for Kentucky Society of Perianesthesia Nurses, Reception Conference Center, Erlanger, KY, approximately 90 attendees on March 25, 2006.

Pancreatitis lecture, Accelerated Health Patterns, Synthesis/Integration May 2003, 2002, and 2001.

AIDS/HIV lecture, Accelerated Health Patterns Synthesis/Integration Seminar, May 2002 & 2001.

Teaching Roundtable: Documenting Teaching Excellence. Worked with committee members to facilitate a discussion in the area of teaching portfolios, peer evaluation, and student evaluations, February 25, 2002.

Senior Capstone NCLEX review sessions, April 26, May 3, 10, 17, 24, 31, 2001.

American Heart Association: Super Heart Saver Saturday Mass CPR trainer on Saturday, April 28, 2001 at Oakley Community and Senior Center.

American Heart Association: Training 2000 People in 2000, CPR trainer on Saturday, February 5, 2000 at Corryville Recreation Center.

PTCA, CABG, and other alternatives, University of Cincinnati, College of Nursing, forty-five level IV students on April 14 and January 21, 2000.

Senior Capstone NCLEX review sessions, 10 students each session on May 3, 2000 and May 17, 2000.

American Heart Association blood pressure screening and risk factor assessment at the Black Family Reunion 2000.

Everybody Counts at St. Mary School, Cincinnati, OH to sixth graders on physically handicapped individuals on October 24, 2000.

Community Service Information

University of Cincinnati Alumni Association Board of Governors, September, 2009.

Elected to Leader Succession Committee of Sigma Theta Tau Beta Iota Chapter, 2008-present.

Elected to SONA Board of Directors, 2003-2008.

Elected to serve as Secretary of SONA Board of Directors, 2001-2003.

Elected to the ONA House of Delegates for the 1999, 2001, 2003, and 2005 state conventions.

Elected to serve as chair of SONA Nomination Committee, May 2000-2001.

Professional Activities

<u>Program</u>	<u>Date</u>	<u>Location</u>	<u>CEU</u>
Cultivating a Climate of Civility	11/13/09	Ohio State University	5.5
Mixed Methods: Principles, Purpose, and Practice	10/26/09	University of Cincinnati	1.5
Neuroscience Staff Education Day	7/16/09	The University Hospital Cincinnati, OH	3.3
Nursing Organizations and	6/10/09	Southwestern Ohio	1.08

Health policy Issues		Nurses Association	
Scholarly Teaching: A Few Really Interesting Studies	5/4/09	University of Cincinnati	1.5
Transmission & Isolation: Dress the Doll	4/22/09	The University Hospital Cincinnati, OH	0.8
Implementing 2008 BSN Essentials	2/13/09	University of Cincinnati	2.8
Neuroscience Staff Education Day	11/20/08	The University Hospital Cincinnati, OH	2.6
Generational Diversity	11/17/08	University of Cincinnati	1.5
IMAGE	11/13/08	University of Cincinnati	1.0
Measurement of Nursing Phenomena	10/17/08	West Virginia University	2.4
Ohio Nursing Law & Rules	6/10/08	Cincinnati, OH	1.0
ACLS	4/9 & 4/16/08	Health Alliance, Cincinnati, OH	8.5
Southern Nursing Research Society	2/21-2/23/08	Birmingham, AL	17.83
TBL Revisited	2/18/08	University of Cincinnati	1.5
Understanding & Implementing a QI Process	1/28/08	University of Cincinnati	3.5
Critical Thinking & Test Writing Workshop	9/12/07	University of Cincinnati	5.4
Neuroscience Staff Education Day	7/17/07	The University Hospital Cincinnati, OH	2.6
End of Life Care	6/18/07	The University Hospital Cincinnati, OH	0.8
Ethical Decision Making	4/25/07	The University Hospital	2.08

and Nursing Practice		Cincinnati OH	
Teaching IOM: Implications for Nursing Education	4/18/07	University of Cincinnati	1.2
Effects of Religiosity	4/9/07	University of Cincinnati	1.0
Future of Research in Academic Settings	3/26/07	Cincinnati Children's Medical Center	6.0
Synergy – A Professional Practice Model	3/1/07	The University Hospital Cincinnati, OH	1.9
Evidence-based Stroke and TIA Prevention	1/22/07	University of Cincinnati	1.0
Professional Boundaries – What's All the Fuss	8/21/06	Bethesda Oak Cincinnati, OH	1.1
Uses of Data	Summer 2006	West Virginia University	3.0 G
Research Mentorship	Summer 2006	West Virginia University	3.0 G
Neuroscience Staff Education	6/6/06	The University Hospital Cincinnati, OH	3.1
Southern Nursing Research Society	2/2-2/4/06	Memphis, TN	10.0
Leveling the Playing Field: The Beginning of a Discourse on Diversity in our Classrooms	1/30/06	University of Cincinnati	2.4
Inpatient Diabetes Management	10/5/05	The University Hospital Cincinnati, OH	1.1
Nursing Research: Making a Difference in Quality Health Care	10/05	West Virginia University Hospitals	7.2
Advanced Statistical Methods	Fall 2005-Spring 2006	University of Cincinnati	9.0 G
Utilizing the NIH Scale	7/27/05	The University Hospital Cincinnati, OH	1.2

Assessing Levels of Consciousness and Coma	7/27/05	The University Hospital Cincinnati, OH	1.2
Neurological Assessment	7/27/05	The University Hospital Cincinnati, OH	1.2
Principles of Nursing Education	Summer 2005	West Virginia University	3.0 G
Leadership	Summer 2005	West Virginia University	3.0 G
Innovative Teaching Strategies	4/25/05	University of Cincinnati	3.0
Midwest Nursing Research Society	4/1-4/4/05	Cincinnati, OH	8.1
Organizational Behavior and Theory (cognate)	Spring 2005	University of Cincinnati	4.0 G
Improving Student Learning	1/31/05	University of Cincinnati	4.0
Nursing Rules and Laws	1/31/05	Southwestern Ohio Nurses Association	1.1
Data Management Analysis Using SPSS 12.0	1/3-3/7/05	University of Cincinnati	24
ACLS Provider Training Course	12/3/04	The University Hospital Cincinnati, OH	8.0
Educational Cognate	Autumn 2004	University of Cincinnati	3.0G
Research Methods 2	Summer 2004	West Virginia University	3.0 G
Contemporary Nursing Science	Summer 2004	West Virginia University	3.0 G
The Law and Legalities in Nursing	5/10/04	Cincinnati Bar Association	1.2
Data Management and Preparation	4/1-4/29/04	University of Cincinnati	24.0

Quality and Accessibility of Health Care	4/2/04	West Virginia University	2.3
Southern Nursing Research Society	2/19-2/21/04	Louisville, KY	10.8
Intermediate Statistical Methods	Winter 2004	University of Cincinnati	3.0 G
Introduction to Statistical Methods	Autumn 2003	University of Cincinnati	3.0 G
The 21 st Century Construct For Nursing	11/7/03	Ohio State University	3.3
Research Methods 1	Summer 2003	West Virginia University	3.0 G
Theoretical Basis of Nursing	Summer 2003	West Virginia University	3.0 G
Sigma Theta Tau Fall 2003 Conference	10/17/03	West Virginia University	6.6
Ohio Nurses Association Convention	10/5-10/7/03	Dayton, Ohio	4.6
Clinical Management of Patients with Depression	9/22/03	Cincinnati, Ohio	1.2
Clinical Reasoning Using The OPT Model	5/16/03	Sharonville Convention Center	3.3
Care of the Trauma Patient- Traumatic Brain Injury	4/23/03	The University Hospital	2.4
Current Issues in Renal Transplant	1/27/03	VA Medical Center	2.4
ACLS Provider Course	11/14 & 11/21/02	University Hospital	8.5
Spero Lectureship: Daniel Pesut	10/14/02	Kresge Auditorium	1.0
Entering The Mind Zone	6/20/02	Brigham and Women's Hospital	7.0
Laws and Rules Governing Nursing Practice in Ohio	5/20/02	Academy of Medicine Cincinnati, Ohio	1.0

Trends in Critical Care 2002	4/26/02	Kingsgate Conference Center	8.0
SONA Legislative Update	3/21/02	Xavier University	1.0
Building Curriculum Around Core & Specialty Competencies	1/25/02	Teleweb Conference University of Cincinnati	1.8
Lilly Conference	11/16/01-11/18/01	Miami University	0.0
Ethical Issues R/T Genetic Information	5/22/01	University of Cincinnati	1.2
Evolving and Expanding Horizons in Clinical Research	5/18&19/02	Kingsgate Conference Center	10.8
Resiliency and Nurses	5/8/01	Cincinnati Museum Center	1.2
Genetic Testing	5/1/01	University of Cincinnati	1.2
Evidence-Based Practice: Pathway to Quality Health Care	3/30/01	Drake Hospital	7.2
The Human Genome: Implications for Nursing	3/12/01	Xavier University	2.0
Overview of Basic Genetics Meiosis, Mendelian Inheritance	3/6/01	University of Cincinnati	1.2
Spero Lectureship: Ada Sue Henshaw	2/12/01	Kingsgate Conference Center	1.2
Overview of Basic Genetics Chromosomes, DNA, genes	2/06/01	University of Cincinnati Cindy Prows, MSN, RN	1.2
Human Genome Project Implications for Nursing	1/09/01	University of Cincinnati College of Nursing	1.2
What Happened at the 2000 ANA Convention?	11/13/00	Xavier University	2.0
Cultural Awareness in Healthcare	11/2000	The University Hospital	1.3

Bridging the Worlds of Practice, Education and Scholarship in Nursing	10/20/00	Kingsgate Conference Center	6.8
Give a Lecture, Don't Apologize, Do It Right!	5/30/00	University of Cincinnati	1.6
Update: Oncology Drugs and Treatment	5/22/00	Quality Central Inn	1.8
ACLS Provider Course	3/24/00	University Hospital	11.0
A Journey Through the Lilly Conference	2/15/00	University of Cincinnati College of Nursing	1.6

College of Nursing Committee Memberships

Faculty Affairs Council, term commencing January, 2010

College of Nursing 2/3 Student Enrollment Task Force, 2009

Chair, BSN Curriculum Revision Task Force for combining ambulatory care course with leadership course, completed in 2009.

Student Affairs Council, Secretary from 2005-present

BSN curriculum revisions:

Contemporary Adult Ambulatory Care, coordinator, 2003-present

Adult Complex Health Concerns, 2003-2004

Adult Health Personnel Committee Chair, 2001-2004

College of Nursing Grievance Committee, 2001-2004

Elected to serve as Secretary of College of Nursing Faculty Organization for the academic year 2001-2002

Affirmative Action Committee, Adult Health representative, 2000-2002

Spero Lectureship Planning Committee, 2000-2002

Formal Teaching Experience

Practicum: Accelerated Health Pattern Integration/Synthesis, Autumn 2009

Practicum: Contemporary Ambulatory Care of the Adult, Course Coordinator Autumn 2005, 2006, 2007, 2008 and Winter 2006, 2007

Practicum: Complex Care of the Adult, Winter and Spring 2005, 2006, 2007, 2009 and Winter (only) 2008

Lecture: Accelerated Health Pattern Integration/Synthesis, Spring and Autumn 2009

Seminar: Accelerated Health Pattern Integration/Synthesis, Spring 2006, 2007, and 2008

Lab: BSN Nursing Health Assessment (two sections), Spring 2005 and (one section) 2008

Practicum: Accelerated Health Patterns B, Winter 2005
Practicum: Foundations of Nursing I, Winter 2005 and 2009
Practicum: Nursing Care of the Adult, Autumn 2004, 2005, 2006, 2007, and 2008
Practicum: Foundations of Nursing II, Spring 2004
Practicum: Transition to Professional Practice in Acute Care Environment, Spring 2004
Practicum: Health Patterns B, Part1, Spring 2004
Practicum: Transition to Professional Practice in Acute Care Environment, Winter 2004
Practicum: Health Patterns B, Part1, Winter 2004
Practicum: Professional Nursing Care, Autumn 2003
Practicum: Health Pattern Integration, Part 2, Autumn 2003
Practicum: Transition to Professional Practice in Acute Care Environment, Spring 2003
Practicum: Health Patterns B, Part1, Spring 2003
Practicum: Transition to Professional Practice in Acute Care Environment, Winter 2003
Practicum: Health Patterns B, Part1, Winter 2003
Practicum: Professional Nursing Care, Autumn 2002
Practicum: Health Pattern Integration, Part 2, Autumn 2002
Practicum: Transition to Professional Practice in Acute Care Environment, Spring 2002
Practicum: Transition to Professional Practice in Acute Care Environment, Winter 2002
Practicum: Health Patterns B, Part 2, Winter 2002
Seminar: Accelerated Health Patterns B, Winter 2002
Practicum: Professional Nursing Care, Autumn 2001
Practicum: Health Pattern Integration, Parts 1 & 2, Autumn 2001
Practicum: Nursing Interventions Accelerated, Summer 2001
Practicum: Transition to Professional Practice in Acute Care Environment, Spring 2001
Practicum: Health Patterns B Part I & II, Winter 2001
Practicum: Health Patterns Integration, Part II, Autumn 2000
Practicum: Professional Nursing Care, Autumn 2000
Practicum: Nursing Interventions Accelerated, Summer 2000
Practicum: Transition to Professional Practice in Acute Care Environment, Spring 2000
Practicum: Health Patterns B Accelerated Parts I & II, Winter 2000