Modeling the Predictors of Nurses' Research Use in Canadian Long-Term Care Homes

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Thesis Abstract

Factors affecting the use of research evidence by nurses in long-term care (LTC) settings are largely unknown. In this thesis nurses referred to registered nurses (RNs) and licensed practical nurses (LPNs). A secondary analysis of data (*n*=756 nurses) from the Translating Research in Elder Care program was performed to construct Generalized Estimating Equation models of the predictors of nurses' self-reported instrumental, conceptual and persuasive research use. Positive attitudes towards research and better access to structural and electronic resources predicted all three kinds of research use. Additional statistically significant predictors suggest that individual variables play a more prominent role than contextual variables in predicting conceptual and persuasive use of research evidence, while instrumental research use is predicted equally by individual and organizational variables.

Dedication

This thesis is dedicated to all of the hardworking and caring nurses I have had the privilege to meet and work with throughout my studies and nursing career. Without the support of two of my clinical instructors (Angela and Bing), and friends from both undergraduate and graduate nursing school (Karina, Kathryn and Dannie among many others), I may not have persevered through my studies. My preceptors (Chris and My-Nguyen) helped me to prioritize and think critically about nursing and evidence-based care. The nursing professors at the University of Ottawa have inspired me to continue my graduate studies. Finally, to my past and current colleagues on 7West at The Ottawa Hospital and 4East/5East at CHEO, I admire and am inspired by your commitment to your patients and coworkers. Keep persevering through the long days and know that you really do make a difference in the lives of your patients.

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There are many individuals who made this thesis possible. Without their support, encouragement, and belief in me, I would not have gotten to this point.

First and foremost, I would like to thank my thesis supervisor Dr. Janet Squires. You have provided me with countless opportunities to learn and grow as a researcher and have answered my multitude of questions with insight and patience. Working with you has inspired me to continue my studies and has broadened my insights into nursing research. I would also like to acknowledge my supervisory committee members, Drs. Jennifer Baumbusch and Dawn Stacey. Thank you for your insights, support, encouragement, and valuable feedback.

To my family and friends, thank you for your support, laughs, and much needed distraction from writing. I would especially like to thank my mom for always believing in me and supporting me in whatever I wished to pursue. Christine and Rebecca, thank you for your help with editing my chapters. My peers have also been an invaluable support in sharing our experiences, celebrations, and frustrations.

Finally, to my fiancé Mitchell, thank you for being there when I needed you most, and for the late-night edits and brainstorming sessions. I am excited to start the next chapter of our lives this fall, and for us to be PhD-gym buddies.

Personal Impetus

As a nursing student, my first clinical placement was in a long-term care setting. I was privileged to care for, and interact with, a variety of older persons with unique life histories and engaging stories to tell. During that initial nursing school placement, I noted many different ways of caring for residents. It was during that placement that I began to wonder what the best ways to care for residents were, and whether common practices were truly evidence-based.

As I progressed through my studies, I became more interested in evidence-based practice and use of research evidence in practice. When beginning my master's studies, I knew that I wanted to focus on the use of evidence-based findings in practice. I was presented with the opportunity to conduct a secondary analysis of a large database, examining the relationship between individual and organizational context factors with nurse research use in long-term care. I was drawn to the project as it presented a unique opportunity to link my interest in long-term care and evidence-based practice. Additionally, it would allow me to gain valuable research skills in statistical data analysis.

Co-Authorship

Several authors have contributed to this thesis manuscript, submitted in partial fulfillment of the requirements for a Master's Degree in Nursing at the University of Ottawa. The authors and their contributions are summarized below.

Melissa Demery Varin (MDV) was the thesis candidate and primary author of this thesis. MDV conceived and designed the literature review and secondary data analysis study, with feedback from co-authors. MDV drafted the thesis proposal, ethics application and request for data from the University of Alberta. All statistical analyses were performed by MDV. MDV drafted all chapters and edited the final version of this thesis.

Dr. Janet E. Squires, RN, PhD (JES) was the thesis supervisor for this project and participated in all stages of thesis development. JES was involved in conception and design of the study, thesis proposal development and approval, ethics application formulation, and aided in the request for data. JES directed all statistical analysis and interpretation, guided and approved all chapters of this thesis, and oversaw final approval of this thesis.

Drs. Dawn Stacey, RN, PhD (DS) and Jennifer Baumbusch, RN, PhD (JB) were thesis committee members, and were engaged throughout the thesis development process. Both DS and JB approved the thesis proposal, gave feedback on draft thesis chapters and the draft manuscript, provided insight into the integrated discussion, and approved the final version of this thesis including the manuscript chapter.

Dr. Carole Estabrooks, RN, PhD (CE) provided approval of the research topic and granted permission to undertake a secondary data analysis of the Translating Research in Elder Care dataset. CE provided feedback on drafts of the manuscript chapter, and final approval of the manuscript chapter.

Summary of Contributions of Co-Authors

	MDV	JES	DS	JB	CE
Conception and Design	✓	✓	✓	✓	✓
Data analysis and interpretation	✓	✓	✓	✓	✓
Final approval of proposal and thesis chapters	✓	✓	✓	✓	
Final approval of manuscript	✓	✓	✓	✓	✓
Responsibility for all content	✓				

Table of Contents

List of Tables

Chapter Two

Chapter Three

Chapter Four

Chapter Four: Supplemental File

Chapter Five

List of Figures

Chapter One

Chapter Two

List of Abbreviations

CRU: Conceptual Research Use

GEE: Generalized Estimating Equations

IRU: Instrumental Research Use

LTC: Long-Term Care

LPN: Licensed Practical Nurse

PARiHS: Promoting Action on Research Implementation in Health Services

PRU: Persuasive Research Use

RN: Registered Nurse

TREC: Translating Research in Elder Care

Chapter One

Introduction

Introduction

The population of Canadian seniors is increasing at a rapid rate, which has implications for the Canadian health care system, including an increased demand for residential long-term care [1]. Residential long-term care facilities or "nursing homes" are institutions where care staff provide personal and nursing care to vulnerable residents 24/7. The proportion of seniors living in long-term care facilities increases with age. It is estimated that by 2056 there will be 2.9 million Canadians aged 85 and older (compared to 702,000 in 2013) [2]. Of those 85 and older, 21.1% of women and 12.8% of men reside in long-term care [1]. Currently, almost two thirds of residents living in long-term care have a diagnosis of dementia [3]. It is predicted that by 2038, there will be 257,800 new dementia cases per year, more than double the rate for 2008 [4]. As a result, Canadian long-term care demands are projected to increase tenfold in the next 30 years due to projected increases in dementia diagnoses coupled with a decreasing supply of home caregivers [2].

Staff who provide nursing and personal care to patients in long-term care homes include care aides and regulated nurses (i.e., registered nurses; and licensed practical nurses, also known as registered practical nurses) [5]. Registered nurses and licensed practical nurses in long-term care are often active in leadership roles in which they help achieve high standards of care through goal setting, mentoring and supervising of care aides, and developing care plans for residents. Regulated nurses in long-term care ensure high quality care for residents through these leadership roles and the use of evidence-based (best) health care practices for residents [6].

Ensuring the provision of evidence-based practice in long-term care is an international research priority [7]. Evidence-based practice refers to the integration of best possible research evidence, clinical expertise, and patient values and needs, in providing resident and patient care

[8-10]. A key element of evidence-based practice is the use of research evidence in practice, which improves patient outcomes and decreases costs to health care systems [10]. The use of research in practice by nurses specifically can also reduce variations in practice, which in turn improves the consistency of, and the quality of care [11].

Why is Evidence-Based Practice Critical to Long-Term Care?

Residents living in long-term care today are older and frailer than in previous generations. The average age of a long-term care resident in Ontario is 85 years old, and one-third of residents are completely dependent on staff for activities of daily living [12]. The needs of residents in long-term care are highly complex, with almost all residents exhibiting multiple chronic conditions (e.g. heart disease and arthritis), and nine out of ten exhibiting some form of mental impairment [12]. Across Canada, quality indicators of care provided in long-term care facilities vary considerably both within and across provinces [3, 13]. For example, the proportion of residents in long-term care homes receiving antipsychotics without the diagnosis of psychosis, varies from one in seven to four in seven across provinces [3]. In order to decrease variation in resident outcomes, and improve resident outcomes overall, practice needs to reflect current best research evidence. Given regulated nurses' key role in resident care planning, it is important to understand factors affecting their use of research evidence to improve resident outcomes in long-term care.

Kinds of Research Use

Research use refers to "the use of research findings in any and all aspects of one's work as a registered nurse" [14]. There are three kinds of research use identified in the literature: instrumental, conceptual, and persuasive [14-16]. Instrumental research use involves the direct application of research evidence in caring for residents, meaning that practice is guided by

guidelines, protocols, routines, care plans, or procedures that are based on research [14-16]. Instrumental research use is often referred to as direct research utilization [15]. Examples of instrumental research use include the use of clinical guidelines or protocols for skin care or wound management (e.g. pressure scores) [16]. Conceptual research use involves the indirect application of research, wherein one thinks about research-based knowledge and uses it to inform their clinical decision making [14-17]. Conceptual research use is often referred to as indirect research utilization. An example of conceptual research use is using your knowledge of behaviours characteristic of Alzheimer's disease to access and plan care for residents exhibiting difficult behaviours [18-20]. Finally, persuasive research use involves using research findings to win an argument or make a case to someone, regardless of whether there has been a thorough assessment of the research [14-17]. Persuasive research use is also referred to as symbolic research use [14]. An example of persuasive research use would be using documented pain assessments to advocate for appropriate analgesic/sedative medications. Some authors also refer to a fourth kind of research use, overall research use, that encompasses any or all of instrumental, conceptual and/or persuasive research use [14].

Study Rationale

The term research use is often used synonymously in the literature with knowledge translation or implementation science [21]. For this thesis, research use was considered a subset of knowledge translation. Knowledge translation is a dynamic process that involves synthesis, exchange and application of knowledge to improve the health of Canadians and strengthen the health care system [22]. Models of knowledge translation arise from the fields of social sciences and organizational behaviour, which suggests that knowledge translation is concerned with an individual's behaviour as well as organizational context [23-27].

Authors of a recent scoping review of knowledge translation literature reported that less than 1% of research articles in knowledge translation related to the care of older adults in long-term care settings [28]. Despite the small proportion of studies conducted with older adults in long-term care, there were some promising results. For example, the authors of several studies report improved resident outcomes in long-term care including: decreased depressive symptoms and antidepressant use [29], reduced falls and recurrent falls [30], and reduced urinary tract infections [31]. Additionally, other studies show that implementation of nursing best practice guidelines by nurses in long-term care homes lead to reductions in the use of restraints [32], reductions in falls [33], increased satisfaction with pain control [34], and improvements in the indicators for venous leg ulcers [35].

Nurses' efforts to translate research evidence into practice are more likely to be successful when they are planned with attention to identified determinants of research use [36]. Therefore, before designing interventions to increase nurses' research use, we should first identify the determinants of their use of research. Two systematic reviews have examined the determinants to nurse research use [17, 37], however, of the 44 studies (published in 46 articles) included in these two systematic reviews only two studies [38, 39] were conducted in long-term care settings. Currently, it is unclear if the factors affecting nurse research use in acute care, and other settings, can be applied to nurse research use in long-term care. Therefore, in my thesis, I sought to determine the factors, individual and organizational, that predict nurse research use in long-term care settings.

Study Purpose

The purpose of my thesis was to identify the factors that influence self-reported levels of research use by nurses in long-term care homes. Specifically, my study aims were to determine

the individual and contextual characteristics that influence self-reported levels of: 1) instrumental, 2) conceptual, and 3) persuasive research use by regulated nurses in Canadian long-term care homes.

Translating Research in Elder Care

To complete this study, I undertook a secondary data analysis of data collected within the Translating Research in Elder Care (TREC) program. TREC is a large-scale, multi-level (province, health region, facility, care units within facilities, staff and residents) and longitudinal applied health research program coordinated from the University of Alberta. TREC, to date, has occurred in two phases: TREC 1.0 (2007-2012) and TREC 2.0 (2014 – ongoing). Data for this project were from TREC 2.0. The purpose of the TREC program is to develop a comprehensive understanding of the effect of organizational context on research use, and the subsequent impact of research use on resident health outcomes (and secondarily on healthcare provider and system outcomes) in Canadian long-term care homes.

In TREC 2.0, data were collected from care providers (care aides, nurses, allied health staff, and practice specialists) and care managers or administrators in 91 long-term care homes in three Canadian provinces: British Columbia, Alberta, and Manitoba. Data were collected from staff through eligible participants completing the TREC survey and were collected from managers and administrators using short structured interviews and facility and unit profile forms. The TREC survey consists of a suite of instruments to measure organizational context, research use, individual factors believed to impact research use, and staff outcomes believed to be sensitive to both organizational context and research use. Data collected from care managers and facility administrators included structural and administrative information such as: number of beds, size of the facility, number of units, and availability of interdisciplinary staff.

There are three reasons for using the TREC 2.0 dataset for this study: 1) the TREC survey was designed to examine the effects of individual determinants and organizational context on research use and therefore included a wide variety of individual and organizational variables thought to be potential determinants of research use; 2) a large number of regulated nurses completed the TREC survey allowing sufficient sample size to conduct multivariate analysis; and 3) TREC data is of high quality due to its extensive quality control and monitoring program [40] (full details on the quality control and monitoring program can be found in Chapter 3).

Significance of Study

This study will make important contributions to the fields of nursing science, knowledge translation science, and long-term care. To my knowledge, this was the first study to conduct a multivariate analysis of individual and organizational predictors of nurses' use of research evidence in long-term care homes, and the first study to compare registered nurses' and licensed practical nurses' mean research use scores. My findings provide insights into nurse research use within the rapidly growing Canadian long-term care sector. In doing this, I provide needed information to develop tailored interventions to increase nurses' research use, which will ultimately improve resident outcomes.

Theoretical Framework - PARiHS

I used the Promoting Action on Research Implementation in Health Services (PARiHS) framework to guide this research study. The PARiHS framework was also used to guide the TREC program [23] as well as the development of the main instrument within the TREC survey – the Alberta Context Tool to measure organizational context [41]. The Alberta Context Tool includes the three concepts of context in the PARiHS model (leadership, culture, and evaluation) as well as seven additional concepts which were operationalized from related literature (e.g. [42-

45]): 1) formal interactions, 2) informal interactions, 3) organizational slack – space, 4) organizational slack – time, 5) organizational slack – staff, 6) social capital, and 7) structural and electronic resources. The Alberta Context Tool has been subjected to psychometric testing with nurses in various multiple settings (long-term care, acute pediatric hospitals, acute adult hospitals, and community/home care) with satisfactory validity and reliability [41, 46].

During its initial development, the Alberta Context Tool was assessed for content validity (do the items embody the content of its respective concept) with an international expert panel and response processes validity (respondents' understanding and interpretation of the various items) with focus groups [47]. Two initial standard reliability and validity assessments were performed: 1) principal components analysis conducted with a sample of pediatric nurses, and 2) confirmatory factor analysis conducted with health care aides in long-term care. In both, the reliability was assessed with Cronbach's alpha – in the study with pediatric nurses 7/10 ACT concepts had an alpha >.70 and in the study with care aides 8/10 concepts had an alpha >.70. Coefficients for Cronbach's alpha range from 0-1 and are considered acceptable at levels >.70 [48].

Additionally, an advanced psychometric assessment of the Alberta Context Tool, guided by the Standards for Educational and Psychological Testing (the Standards), was performed by Squires and colleagues with nurses in 2015 [46], and by Estabrooks and colleagues with health care aides in 2011 [47]. Reliability (assessed with Cronbach's alpha), acceptability (as determined by the amount of missing data and length of time taken to complete the survey), and validity (as determined by the relationship of the Alberta Context tool to established measures of instrumental research use, and the internal structure of the scale using confirmatory factor analysis) were reported as acceptable within these two studies [46, 47].

Overview of the PARiHS framework.

The PARiHS framework provides a broad conceptualization of how research implementation occurs in organizational settings, such as long-term care facilities. It posits that successful implementation results from the interplay and interdependence of three core elements: 1) evidence, 2) facilitation, and 3) context – each positioned on a high to low continuum [49-51]. The most successful implementation is argued to occur when there is robust evidence (high evidence), the context is receptive to change (high context), and there is appropriate facilitation to change (high facilitation) [49].

Evidence, as defined in the PARiHS framework, is knowledge derived from a variety of sources (research, clinical experience, patient experience and local information) that has been tested and deemed credible [51]. In order to be considered on the high end of the low-high spectrum of evidence, the information must be from well conceived and conducted research, experience must be made explicit and verified through reflection and critique, patient experiences must be considered and used as part of the decision-making process, and local data must be collected and evaluated [51].

The element of context is defined in the PARiHS model as the work environment and includes three domains: culture, leadership and evaluation [49, 50]. Culture is defined as the nature and feel of the physical environment [51]. A high level of culture, on the low-high continuum, is operationalized as decentralized decision making and facilitative management, wherein learning is prioritized [51]. Leadership is defined as the nature of human relationships and is conceptualized on a spectrum from control and command leadership (low) to transformational leadership (high) [51]. Transformational leaders can create contexts that are more conducive to the implementation of evidence into practice through encouraging clear role

definitions, teamwork, and a shared vision among staff [51]. Evaluation is described as feedback processes that demonstrate whether changes are effective and appropriate. High levels of evaluation are described as being based on multiple sources of information [51].

Facilitation, in the PARiHS framework, refers to the process of enabling the implementation of evidence into practice, achieved through a facilitator who helps others with the implementation of evidence [51]. High facilitation refers to the presence of an appropriate facilitator; one who addresses persons and situations holistically by adjusting their role and style as needed throughout the implementation process [51].

My Conceptual Model

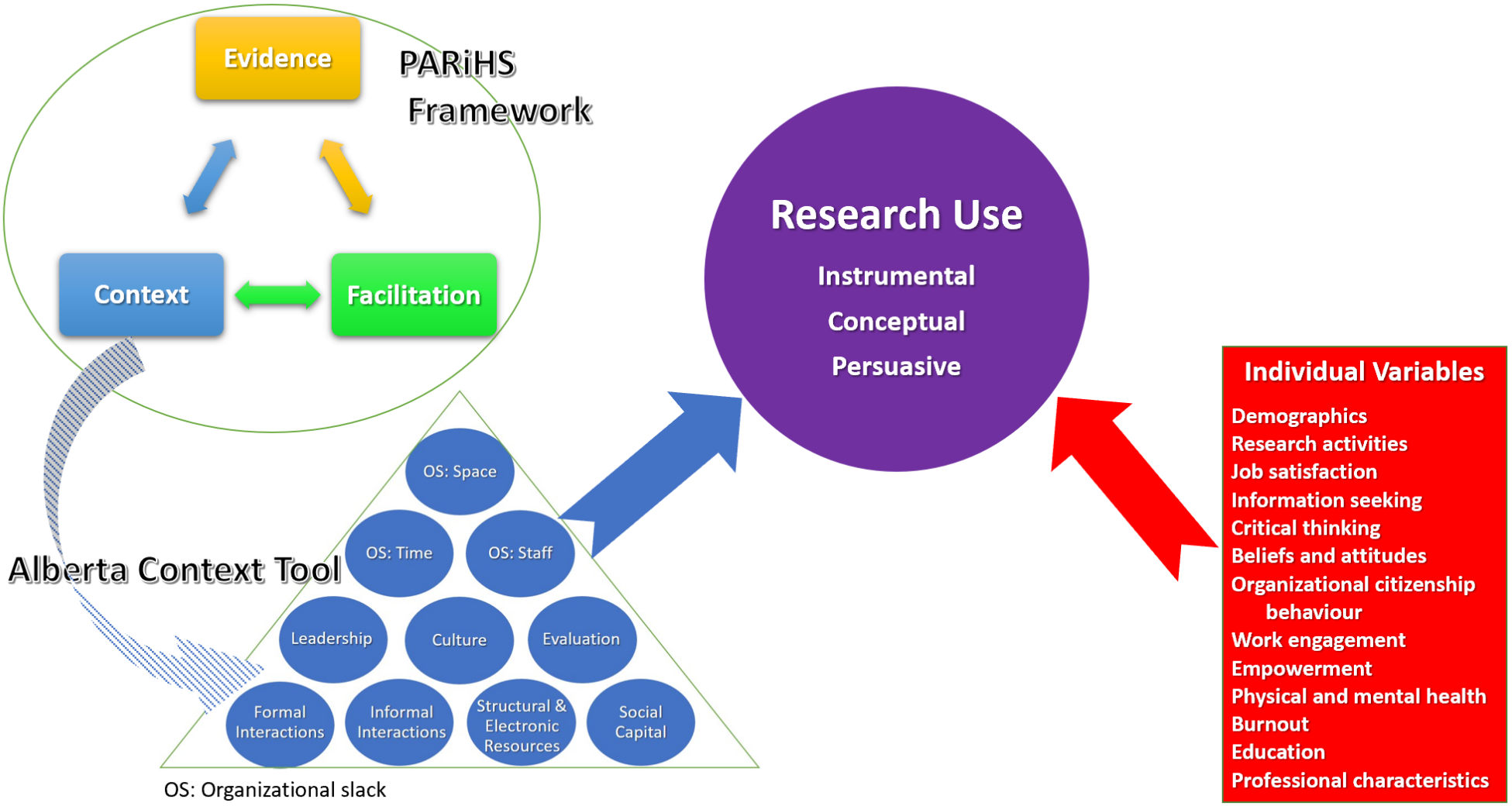
The PARiHS framework was chosen to guide the selection of variables as it is a clear, concise framework that identifies elements of successful implementation of evidence into practice. It was also chosen to guide this study because it is the framework that underlies the TREC program [52] and the Alberta Context Tool [41]. Additionally, the PARiHS framework is not rigidly prescriptive, meaning that it could be used to guide my thinking around research use without limiting the selection of variables to be included.

Facilitation was not actively considered in my models as my study was not an intervention study. Additionally, characteristics of evidence were not considered in the study as they were not measured in the primary data source and therefore could not be entered into the secondary data analysis. In this thesis study, the PARiHS framework guided the identification of three potential context variables to include in my models: culture, leadership, and evaluation. However, because nurses' research is known to be influenced by a wide range of factors, both individual and organizational [53], I developed a conceptual framework to guide my analyses (see **Figure 1-1**).

In my framework, the PARiHS definition of context was expanded beyond the elements of culture, leadership and evaluation to include the additional context elements within the TREC survey (as guided by my literature search – Chapter 2). Further, despite the strong empirical support for a relationship between individual factors and nurses' research use [17], the PARiHS framework does not consider such factors. In my conceptual model, however, I consider the effect of individual factors on nurses' research use.

Demographic characteristics are statistical data about a population (in this case nurses) including age, income and gender [54], and can be considered a subset of individual characteristics [17]. In my thesis study, I considered demographic characteristics to be a subset of individual characteristics. Individual characteristics are personal factors that may or may not be modifiable. A systematic review by Squires and colleagues [17] identified seven categories of individual characteristics that are related to research use by nurses: beliefs and attitudes, involvement in research activities, information seeking, education, professional characteristics, other socio-economic factors, and critical thinking. Individual variables from this systematic review, and additional variables with empirical support in my literature review (Chapter 2), were included in my conceptual model.

Figure 1-1: Conceptual Model – PARiHS Framework with Modifications for this Study



Thesis Outline

This thesis is composed of five chapters:

- **Chapter one** includes the introduction to the thesis, study rationale and aims, introduction to Translating Research in Elder Care, central concepts, conceptual model, and significance of the study.
- **Chapter two** provides a detailed literature review of the individual and contextual factors that have been previously studied in relation to regulated nurses' research utilization or use of research.
- **Chapter three** describes the methodology of this thesis including the study design, study sample, data collection, data measures, data analysis, modeling approach, and an ethics statement.
- **Chapter four** is a version of the manuscript entitled "Predictors of Nurses' Research Use in Canadian Long-Term Care Homes" which is formatted for submission to the journal: *Journal of American Medical Directors Association.*
- **Chapter five** summarizes the thesis and findings from my literature review (chapter 2) and the manuscript (chapter four). This chapter also provides an integrated discussion, regarding variables associated with nurses' research use. Finally, nursing implications for practice, leadership, education, and research, and a conclusion are presented.

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Chapter Two

Literature Review

Literature Review

The purpose of this chapter is to provide a review of the literature on variables associated with research use by nurses (registered nurses and licensed/practical nurses), where nurses' research use is the dependent variable. An overview of the search strategy, inclusion and exclusion criteria, a PRISMA flow diagram, and an overview of included studies are presented first. This is followed by three sections: 1) nurses' research use in long-term care; 2) individual variables associated with nurses' research use; and 3) contextual variables associated with nurses' research use. In each section I present characteristics of the included studies followed by their findings in relation to associations with research use. A summary of the literature review and the results tables conclude this chapter.

Methods

Search strategy.

I first performed an initial scoping search of the literature limited to nurses' research use in long-term care. Due to a paucity of articles, in consultation with my thesis supervisor, I expanded the search to include all settings. My final search strategy was developed in consultation with a health science librarian. The purpose of my search was to identify factors associated with nurses' research use. In addition to general research use, this search strategy included the different kinds of research use: instrumental, conceptual, persuasive, or overall [1, 2]. The search strategy included two sets of keywords:

1. ***keywords related to nurses*** (nurse, nursing, nurses, RN, LPN, RPN);
2. ***keywords related to research use*** (research utilization, research utilisation, utilization of research, utilisation of research, research use, use of research, research adoption, adoption of research, research dissemination, dissemination of research, research

uptake, uptake of research, research implementation, implementation of research, research translation, translation of research, research transfer, transfer of research, research diffusion, diffusion of research, research exchange, exchange of research).

The search for factors associated with nurses' research use (both general research use and the kinds of research use) was carried out in nine online databases (EMBASE, PsycINFO, CINHAL, SCOPUS, Web of Science, ProQuest: Nursing and Allied Health Source, Joanna Briggs Institute EBP Database, Cochrane Library (OVID), Medline) from the earliest date in the respective database to the date of the search (September 27, 2017 or October 13, 2017.) **Table 2-1a** outlines the full search strategy for EMBASE/ MEDLINE/ PsychINFO, which all have the same search platform. **Table 2-1b** is a summary of the search strategies employed with all databases.

In addition to database searching, I performed hand searching of: two key journals (*Implementation Science* and *Worldviews on Evidence-Based Nursing*), articles included in two previous systematic reviews of factors associated with nurses' research use [1, 3], and publications by authors identified as an international expert panel on research utilization. Squires and colleagues [4] identified the international expert panel though their knowledge of the field and a literature search. The panel included: Dr. Tracey Bucknall, Dr. Donna Ciliska, Dr. Maureen Dobbins, Dr. Alison Kitson, Dr. Kirstin Nilsson Kajermo, Dr. Judith Ritchie, Dr. Shelia Rodgers, Dr. Jo Rycroft-Malone, Dr. Cheryl Stetler, and Dr. Lars Wallin. Hand searching was also performed of publications by Dr. Janet Squires and Dr. Carole Estabrooks, known authors of nurse research utilization literature. A final search included screening the reference lists of all included articles from the above searches.

Table 2-1a: Example of a Full Search Strategy – EMBASE/MEDLINE/PsychINFO

1. "research utili?ation".ti. or "research utili?ation".ab. or "research utili?ation".hw.
2. "utili?ation of research".ti. or "utili?ation of research".ab. or "utili?ation of research".hw.
3. "research use".ti. or "research se".ab. or "research use".hw.
4. "use of research".ti. or "use of research".ab. or "use of research".hw.
5. "research adoption".ti. or "research adoption".ab. or "research adoption".hw.
6. "adoption of research".ti. or "adoption of research".ab. or "adoption of research".hw.
7. "research dissemination".ti. or "research dissemination".ab. or "research dissemination".hw.
8. "dissemination of research".ti. or "dissemination of research".ab. or "dissemination of research".hw.
9. "research uptake".ti. or "research uptake".ab. or "research uptake".hw.
10. "uptake of research".ti. or "uptake of research".ab. or "uptake of research".hw.
11. "research implementation".ti. or "research implementation".ab. or "research implementation".hw.
12. "implementation of research".ti. or "implementation of research".ab. or "implementation of research".hw.
13. "research translation".ti. or "research translation".ab. or "research translation".hw.
14. "translation of research".ti. or "translation of research".ab. or "translation of research".hw.
15. "research transfer".ti. or "research transfer".ab. or "research transfer".hw.
16. "transfer of research".ti. or "transfer of research".ab. or "transfer of research".hw.
17. "research diffusion".ti. or "research diffusion".ab. or "research diffusion".hw.
18. "diffusion of research".ti. or "diffusion of research".ab. or "diffusion of research".hw.
19. "research exchange".ti. or "research exchange".ab. or "research exchange".hw.
20. "exchange of research".ti. or "exchange of research".ab. or "exchange of research".hw.
21. 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14 or 15 or 16 or 17 or 18 or 19 0r 20
22. LPN.ti. or LPN.ab. or LPN.hw.
23. RPN.ti. or RPN.ab. or RPN.hw.
24. RN.ab. or RN.ti. or RN.hw.
25. nurs*.ab. or nurs*.ti. or nurs*.hw.
28. 22 or 23 or 24 or 25
29. 21 and 28

Table 2-1b: Search Strategy Summary for All Databases

Database	Search through to	Area Search
CINAHL	Sept 27, 2017	[Title OR Abstract OR Subject] of **keywords related to research use** AND [Title OR Abstract OR Subject] of **keywords related to nurses**
Cochrane Library	Sept 27, 2017	[Title OR Abstract OR Keywords] of **keywords related to research use** AND [Title OR Abstract OR Keywords] of **keywords related to nurses**
Joanna-Briggs	Sept 27, 2017	**"keywords related to research use"** mp. [mp=text, heading word, subject area node, title]
EMBASE/ Medline/ PsychINFO	Oct 13, 2017	[Title OR Abstract OR heading word] of **keywords related to research use** AND [Title OR Abstract OR heading word] of **keywords related to nurses**
SCOPUS	Oct 13, 2017	(TITLE-ABS-KEY "**keywords related to research use")** AND (TITLE-ABS-KEY *"***keywords related to nurses***"*)
Web of Science	Oct 13, 2017	(TS OR TI) of **keywords related to research use** AND [(TS OR TI) of **keywords related to nurses** OR SU=nursing)]
Proquest: Nursing and Allied Health	Oct 13, 2017	[ti OR ab OR su] of **keywords related to research use** AND [ti OR ab OR su] of **keywords related to nurses**

Inclusion and exclusion criteria.

A summary of the inclusion and exclusion criteria is provided in **Table 2-2.**

Inclusion criteria.

Eligible studies examined the relationship between individual or contextual variables and nurses' research use. Nurses were defined as regulated professionals who provide care in a clinical setting including registered nurses, licensed practical nurses and registered practical nurses. All individual and contextual variables were considered – both modifiable and non-modifiable. The dependent variable was research use. Research use was defined as the use of research findings in any and all aspects of one's work as a nurse [2]. Studies were required to report on a quantitative measure of nurses' research use, which was tested statistically. Eligible study types included: systematic reviews, randomized control trials, clinical trials, and

observational studies (e.g. quasi-experimental, cross-sectional, before and after, case-control) and dissertations. Although dissertations are not peer-reviewed, they were included to allow for a broader representation of the literature. There were no restrictions placed on country of origin.

Exclusion criteria.

Studies were excluded if the authors examined factors related to the use of best-practice guidelines if it was not explicitly stated that the guideline was based on research evidence [1]. This is due to the fact that my literature review was focused on research use by nurses exclusively, and that it would not be feasible to examine all best practice guidelines to determine if they were truly research-based. Qualitative studies were excluded as the purpose of the literature review was to identify factors that have been previously associated with nurses' research use to inform variable selection for my models. Additionally, studies were excluded if the authors focused on a single research-based practice and did not also examine research use in general, as results may not be transferrable to research use in general. Reports, commentaries and conference abstracts were also excluded. Language was limited to English articles.

Data extraction.

All individual and contextual variables related to nurses' research use were extracted. The significance of the relationship, magnitude, direction, and kind of research use (general, overall, instrumental, conceptual or persuasive) were also extracted. For articles that were included within the two previously published systematic reviews, data extraction was compared to what was previously extracted by the review authors, and discrepancies were resolved by referring to the original article's text for clarification.

Additionally, characteristics of the eleven articles (of which two are a second report of articles published in the individual determinants systematic review [5, 6], making for nine unique

additional studies) not included in the individual determinants systematic review were extracted. Characteristics extracted were: first author, journal, year of publication, study design, sample, setting, framework used, and the research utilization instrument's name, description, scoring, reliability and validity.

Table 2-2: Inclusion and Exclusion Criteria

	Inclusion Criteria	**Exclusion Criteria**
Study Variables	• Quantitative measure of research use or research utilization as the dependent variable • Factors related to research use as the independent variables	• Qualitative measures of research use • No statistical test or unclear • Reports of psychometric validation of scales with no measure of factors related to research use
Concept of Research Use	• The use of empirical research-based evidence in clinical practice	• Use of clinical practice guidelines (unless explicitly evidence-based) • Implementation of a single evidence-based practice (e.g. pain control) without research use generally
Types of Publications	• Published studies including: systematic reviews, randomized control trials, clinical trials, and observational studies (e.g. quasi-experimental, cross-sectional, before and after, case-control) • Dissertations	• Qualitative Studies • Duplicates • Commentaries • Abstracts • Editorials • Full text was not retrievable
Date, Location, Language	No restrictions were placed on date or on the studies' country of origin, was limited to English	
Types of Participants	• Registered Nurse • Licensed Practical Nurse or Registered Practical Nurse	• Nurse-Teacher • Nurse Researcher • Nursing Student • Nurse Practitioner • Respiratory Therapist • Physician Assistant • Nursing Assistant • Bedside Attendant • Orderly • Physician • Other health care professional • Nurses are not separately analyzed.

Quality assessment.

The quality ratings for all studies included within the individual determinants systematic review were extracted from additional files published with the review. All studies that were included in the contextual determinants systematic review were also included in the individual

determinants review, therefore only the quality assessments from the individual determinants review were extracted as they were more robust. Quality assessments, in the individual determinants review, were performed by two reviewers with disagreement resolved by consensus. I performed quality assessments on the eleven articles that were not included in the individual determinants systematic review with the National Heart, Lung, and Blood Institute's Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies [7].

Synthesis.

Categories for individual determinants from the additional studies were aligned with those used in the systematic review by Squires and colleagues [1] to facilitate comparison of findings. Categories for the context determinants were based on the Alberta Context Tool [8] and thematic analysis. Additionally, I applied the same vote counting rules as applied by Squires and colleagues to facilitate comparison between the systematic review and my literature review. The vote counting rules were: 1) a variable had to be assessed in four articles (otherwise it was coded as inconsistent); 2) studies were then coded as significant, non-significant or equivocal (mixed findings) based on where 60% or more of studies fell; and 3) if both multivariate and bivariate statistics were presented, multivariate statistics were used in the synthesis.

Results

Overview of included studies.

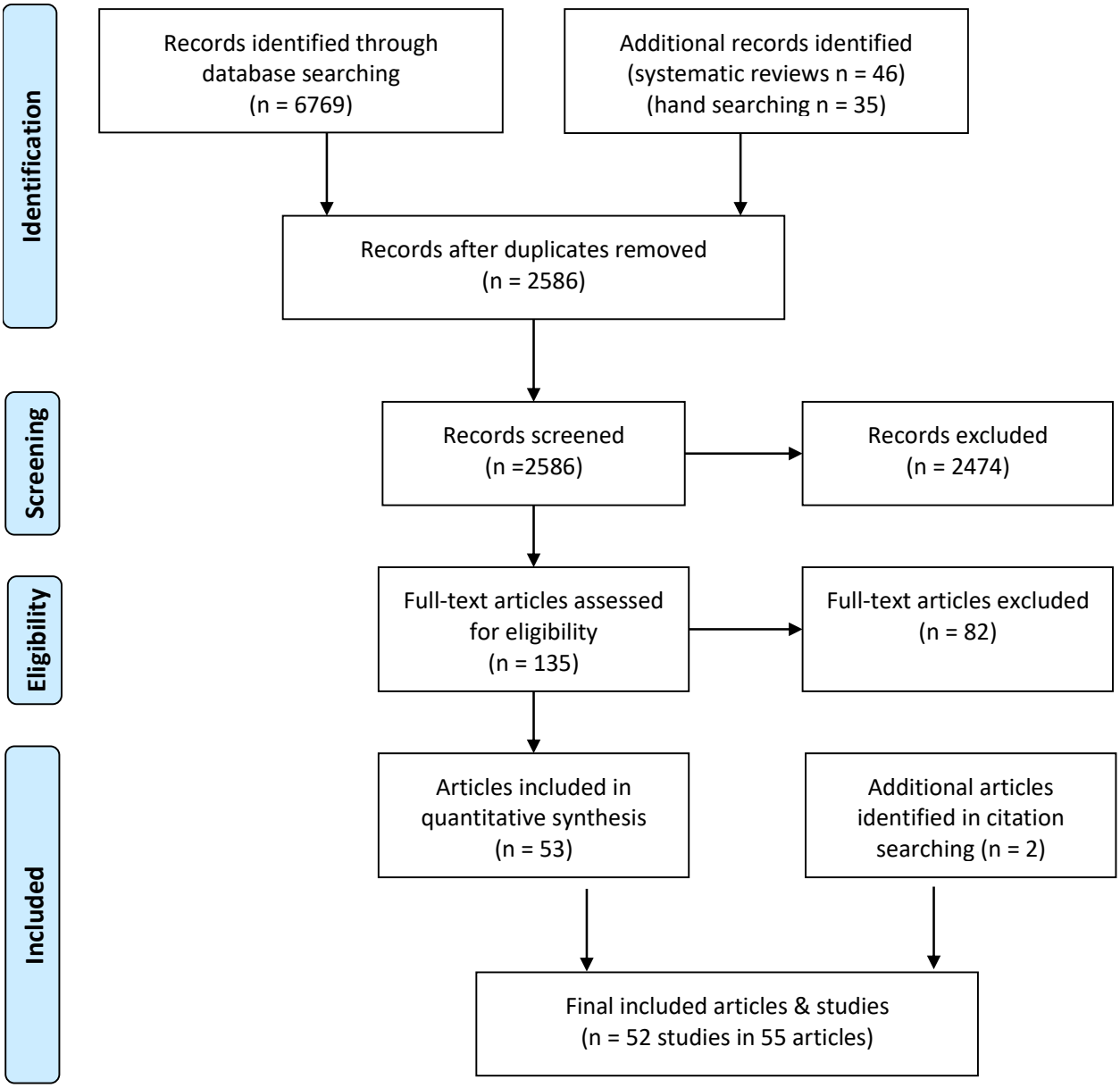
I identified 6769 articles through database searching, 35 articles from hand searching journals and publications by the expert knowledge translation panel, and 46 articles included within the two systematic reviews. After removal of duplicates, I identified a total of 2586 articles (see **Figure 2-1**). After title and abstract screening, 135 articles remained for full text screening, of which 53 were relevant. Additionally, I searched reference lists of the included

articles and searched for studies citing any of the included articles. This identified an additional two relevant articles. In total there were 52 relevant studies reported in 55 relevant articles, and two relevant systematic reviews.

Of the 52 included studies (in 55 articles), there were three studies (in four articles) that were conducted in the long-term care setting [6, 9-11] (see **Table 2-3**.) Of the 52 included studies (in 55 articles), there were 44 included studies (in 45 articles) that were included in the individual determinants systematic review [2, 5, 9, 11-51] (see **Table 2-3**.) The authors of the contextual determinants review reported on ten studies [16, 17, 23, 29, 41, 45-47, 49, 52] all of which were also included in the individual determinants systematic review (see **Table 2-3**.) Nine [16, 17, 23, 29, 41, 45-47, 49] of the ten articles included in the contextual determinants review were the same as the ones in the individual determinants review, and one article [52] was a second report of a study included in the individual determinants review (see **Table 2-3**).

Additionally, 16 articles (one article was a second report of a study in the context review [5]) [5, 11, 13, 14, 19, 21, 22, 25, 26, 30, 33, 34, 42-44, 48] that were included in the individual determinants systematic review, and not included in the contextual determinants systematic review, reported on contextual determinants (see **Table 2-3**). The literature search also included nine articles [10, 53-60] were not part of either of the systematic reviews, and one article [6] that was a second report of a study included in the individual determinants systematic review, for a total of 10 articles (9 studies) of the 55 articles (reporting on 52 studies) included in the literature review that were not included in either systematic review (see **Table 2-3**.)

Figure 2-1: PRISMA flow diagram for included articles and studies.



Reasons for Full Text Exclusion	
• BARRIERS scale only (N=24) • Dependent variable not research use (N=23) • Does not look at predictors of research use (N=16) • Not full study article (abstract, quiz, or summary; N=5) • Specific practice, not research use generally (N=3) • Nurses not analyzed separately from other health care providers (N=3)	• Participants not clinical nurses (N=3) • Dissertation that has published paper (N=1) • Newer review exists (N=1) • Not in English (N=1) • No test statistic (N=1)

Table 2-3: Included Articles - Overview

First Author (Year) *Journal*	Source (is it incl. in a SR?)	Same Study (published in 2+ articles)?	LTC	Variables		Research Use	
				Individual	Contextual	Kinds	General
Systematic Reviews (N=2)							
Meijers (2006) [3] *Journal of Advanced Nursing*	(Context SR)	n/a			X		X
Squires (2011) [1] *Implementation Science*	(Indiv. SR)	n/a		X		X	X
Individual Articles (N=55)							
Barta (1995) [12] *Journal of Professional Nursing*	Indiv. SR	No		X			X
Bonner (2008) [13] *Journal of Nursing Management*	Indiv. SR	No		X	X		X
Boström (2008) [9] *Implementation Science*	Indiv. SR	Boström, 2009	X	X			X
Boström (2009) [6] *Journal of Clinical Nursing*	Literature Search	Boström, 2008	X	X	X		X
Brett (1987) [14] *Journal of Continuing Education in Nursing*	Indiv. SR	No		X	X		X
Brown (1997) [15] *Journal of Continuing Education in Nursing*	Indiv. SR	No		X			X
Bunpin (2014) [53] *PhD Dissertation*	Literature Search	No		X	X		X
Butler (1995) [16] *The Canadian Journal of Nursing Research*	Both SRs	No		X	*		X
Champion (1989) [17] *Journal of Advanced Nursing*	Both SRs	No		X	X		X
Chen (2013) [54] *Research in Nursing & Health*	Literature Search	No		X	X		X
Connor (2006) [11] *Masters Dissertation*	Indiv. SR	No	X	X	X	X	
Coyle (1990) [18] *Nursing Research*	Indiv. SR	No		X			X
Cummings (2007) [19] *Nursing Research*	Indiv. SR	No		X	X		X
Erier (2000) [20] *Air Medical Journal*	Indiv. SR	No		X			X
Estabrooks (2007) [21] *Research in Nursing and Health*	Indiv. SR	No		X	X	X	

First Author (Year) *Journal*	Source (is it incl. in a SR?)	Same Study (published in 2+ articles)?	LTC	Variables		Research Use	
				Individual	Contextual	Kinds	General
Estabrooks (1999) [2] *Western Journal of Nursing Research*	Indiv. SR	No		X			X
Forbes (1997) [22] *Journal of Nursing Measurement*	Indiv. SR	No		X	X		X
Forsman (2012a) [55] *Implementation Science*	Literature Search	No		X	X		X
Forsman (2012b) [56] *IJNS*	Literature Search	No		X		X	
Hatcher (1997) [23] *Canadian Journal of Nursing Administration*	Both SRs	No		X	X		X
Humphris (1999) [24] *Practical Diabetes International*	Indiv. SR	No		X			X
Kenny (2005) [25] *Canadian Journal of Nursing Leadership*	Indiv. SR	No		X	X	X	
Lacey (1994) [26] *Journal of Advanced Nursing*	Indiv. SR	No		X	X		X
Logsdon (1998) [27] *Kentucky Nurse*	Indiv. SR	No		X			X
Manraj (2015) [10] *Masters Dissertation*	Literature Search	No	X	X	X	X	
Mastrilli (2012) [57] *PhD Dissertation*	Literature Search	No		X	X	X	
McCleary (2002) [28] *Journal of Nursing Measurement*	Indiv. SR	No		X			X
McCleary (2003) [29] *Nurse Education Today*	Both SRs	No		X	*		X
McCloskey (2008) [31] *Journal of Nursing Scholarship*	Indiv. SR	McCloskey, 2005		X			X
McCloskey (2005) [30] *PhD Dissertation*	Indiv. SR	McCloskey, 2008		X	X		X
Michel (1995) [32] *Journal of Professional Nursing*	Indiv. SR	No		X			X
Milner (2005) [33] *IJNS*	Indiv. SR	No		X	X	X	
Nash (2005) [34] *Masters Dissertation*	Indiv. SR	No		X	X		X
Ofi (2008) [35] *International Journal of Nursing Practice*	Indiv. SR	No		X			X

First Author (Year) *Journal*	Source (is it incl. in a SR?)	Same Study (published in 2+ articles)?	LTC	Variables		Research Use	
				Individual	Contextual	Kinds	General
Parahoo (1999) [36] *Journal of Advanced Nursing*	Indiv. SR	No		X			X
Parahoo (2001) [37] *Journal of Nursing Management*	Indiv. SR	No		X			X
Prin (1997) [38] *Studies in Health Technology and Informatics*	Indiv. SR	No		X			X
Profetto-McGrath (2009) [40] *Nurse Education in Practice*	Indiv. SR	No		X		X	
Profetto-McGrath (2003) [39] *Western Journal of Nursing Research*	Indiv. SR	No		X		X	
Rodgers (2000a) [5] *Journal of Advanced Nursing*	Indiv. SR	Rodgers, 2000b		X	X		X
Rodgers (2000b) [52] *Nurse Education Today*	Context SR	Rodgers, 2000a		X	X		X
Rutledge (1996) [41] *Oncology Nursing Forum*	Both SRs	No		X	X		X
Squires (2013) [58] *BMC Health Services Research*	Literature Search	No		X	X	X	
Squires (2007) [42] *Implementation Science*	Indiv. SR	No		X	X		X
Stiefel (1996) [43] *PhD Dissertation*	Indiv. SR	No		X	X		X
Tranmer (2002) [44] *Canadian Journal of Nursing Leadership*	Indiv. SR	No		X	X		X
Tsai (2000) [46] *IJNS*	Both SRs	No		X	*		X
Tsai (2003) [45] *IJNS*	Both SRs	No		X	*		X
Varcoe (1995) [47] *Canadian Journal of Nursing Research*	Both SRs	No		X	X		X
Wallin (2003) [49] *Journal of Advanced Nursing*	Both SRs	No		X	*		X
Wallin (2006) [48] *Nursing Research*	Indiv. SR	No		X	X		X
Wallin (2012) [59] *Worldviews on Evidence-Based Nursing*	Literature Search	No		X		X	

First Author (Year) *Journal*	Source (is it incl. in a SR?)	Same Study (published in 2+ articles)?	LTC	Variables		Research Use	
				Individual	Contextual	Kinds	General
Wangensteen (2011) [60] *Journal of Clinical Nursing*	Literature Search	No		X	X		X
Wells (1994) [50] *The Journal for Advanced Nursing Practice*	Indiv. SR	No		X			X
Wright (1996) [51] *Australian Journal of Advanced Nursing*	Indiv. SR	No		X			X
Total Number of Articles (studies)			4 (3)	55 (52)	29 (28)	11 (11)	44 (41)

Legend: Ind. = Individual Determinants, SR = systematic review, IJNS = International Journal of Nursing Studies, * = studies from context systematic review that did not assess contextual variables (n=5)

Overview of systematic reviews.

Two systematic reviews, whose authors examined factors related to nurse research use, were included [1, 3]. Squires and colleagues published the first systematic review in 2011 [1] as an update of the Estabrooks review published in 2003 [61] and examined individual determinants of research use by nurses. The second systematic review, by Meijers and colleagues [3], was published in 2006. Meijers and colleagues examined relationships between contextual factors and research use by nurses. A summary of the characteristics of the systematic reviews and critical appraisal of the systematic reviews with the AMSTAR 2 tool [62] can be found in **Tables 2-4a, 2-4b** and **2-5** (located at the end of this chapter.)

Nurses' research use in long-term care.

Characteristics of included studies conducted in long-term care.

Two of the four articles (reporting on studies conducted in LTC) were based on the same cross-sectional study by Boström and colleagues [6, 9] – in one study the authors examined the relationship of registered nurses' research use and subscales of the BARRIERS scale [9], and the in the second study the authors examined the relationship between nurses' use of research and individual and organizational characteristics [6]. The other two studies conducted in the long-

term care setting were unpublished dissertations at the master's and PhD level: Manraj [10] examined the relationship between problem solving and conceptual research use in long-term care and pediatric settings; and Connor [11] examined the relationship between organizational culture and research utilization by registered nurses, licensed practical nurses and care aides in long-term care homes. Both authors of these dissertations utilized a cross-sectional design.

Boström and colleagues [6, 9] measured nurses' research use generally, whereas Manraj [10] reported only on conceptual research use and Connor [11] reported on the kinds of research use (instrumental, conceptual, persuasive and overall research use).

Results of studies conducted in long-term care.

Next, I present the results for the three studies that reported on nurses' use of research in long-term care settings, organized by the kind of research use assessed. I first summarize the studies where nurses' research use was measured generally and then I summarize the studies where the kinds of nurses' research use were reported.

General research use.

The authors of one study measured nurses' use of research generally. Boström and colleagues [6, 9] studied a sample of 210 registered nurses from eight municipalities in the southern region of Stockholm, Sweden. Using multivariate analysis, Boström and colleagues found the following individual-level variables to be positively and significantly related to nurses' general research use: completing a nursing programme at university level; longer years employed as a registered nurse; working as a specialized geriatric nurse at multiple homes as opposed to working in a single nursing home; positive attitude towards research; and fewer perceived barriers related to the nurse (such as the nurse's research values, skills, and awareness), communication of the research (such as presentation and accessibility), and the innovation itself

(quality of the research being implemented). Only two contextual variables were significantly related to nurses' general research use: access to research findings and access to a librarian.

Kinds of research use.

The authors of two studies, both unpublished theses, reported on one or more kinds of nurses' research use. Manraj [10] conducted their study with 160 long-term care nurses working in 36 residential long-term care facilities across the Canadian prairie provinces (Alberta, Saskatchewan and Manitoba). Manraj only assessed one kind of research use – conceptual research use. Using multivariate analysis, Manraj [10] revealed only one significant variable. A positive attitude towards research had a positive significant relationship with conceptual research use.

Connor [11] reported on a sample of 39 registered nurses and 31 licensed practice nurses from 12 long-term care homes in Eastern Canada. Connor also used multivariate analysis and found a significant relationship between registered nurses' attitudes towards research and overall research use. Additional significant relationships reported by Connor [11] for overall research use were: current role (registered nurses versus licensed practical nurse), access to research resources for registered nurses, clan culture for licensed practical nurses, amount of support available to use research for licensed practical nurses, and time to use research for registered nurses. A significant relationship was also reported by Connor for instrumental research use and number of continuing education sessions for registered nurses. Significant relationships were also reported by Connor for conceptual research use and: number of in-services attended for licensed practical nurses, market and hierarchy culture for licensed practical nurses, and time to use research for registered nurses. Finally, Connor reported significant relationships between persuasive research use and: current role (registered nurses versus licensed practical nurse),

belief suspension for licensed practical nurses, and availability of research resources for licensed practical nurses.

Nurses' research use – all settings.

Individual variables associated with nurses' research use.

Characteristics of included studies.

The authors of all 52 included studies (in 55 articles) report on individual variables that are associated with nurses' research use. This section provides a summary and appraisal of the individual determinants systematic review by Squires and colleagues [1], and characteristics of the ten articles published since the individual determinants systematic review and one article included in the contextual determinants review that was not included in the individua determinants review. Then I present a summary of individual variables related to nurses' research use from the systematic review, the 11 articles not included within the systematic review, and this literature review overall.

Characteristics of the individual determinants of nurses' research use systematic review.

Squires and colleagues [1], the authors of the systematic review of individual determinants of nurses' research use, searched 12 online bibliographic databases and performed hand searching of specialized journals and reference lists of their included studies. Their review included 44 studies (in 45 articles), of which 42 were cross-sectional and two were quasi-experimental in design.

Squires and colleagues [1] divided the studies into two categories depending on the measure of research use - 39 studies assessed research use in general (with varying instruments), and six studies assessed kinds of research use (instrumental, conceptual, persuasive and/or overall research use) using Estabrooks' measures [1, 2] (see **Table 2-3**.) The authors completed a

quality assessment of the included articles with two tools and did not exclude any studies based on quality. The majority of the studies (N=31, 69%) were rated as "weak" or "moderate weak" with only one study [33] rated as "strong." The authors performed data synthesis with a vote counting approach supplemented by extracting the direction and magnitude of effect.

I assessed the systematic review by Squires and colleagues [1] using the AMSTAR 2.0 tool (see **Table 2-5**). I found their review to have 8 of 16 fully fulfilled criteria, 4 of 16 partially fulfilled criteria, 1 of 16 criteria not fulfilled (did the review authors report on the sources of funding for the studies included in the review) and three criteria that were not applicable. Strengths of the systematic review by Squires and colleagues [1] included: having a clearly stated, a priori, list of rules for data synthesis; having clearly defined question and search criteria; the duplication of study selection and data extraction by a second person; and not having excluded studies based on low quality, but rather discussing the results in light of this. A limitation of the systematic review is that although a list of excluded studies was reported from the larger parent review, on which this systematic review was based, this systematic review does not list the additional studies that were excluded between the original parent review and this review.

Characteristics of articles not included in the individual determinants systematic review.

All ten studies reported by authors in the ten articles published since the individual determinants systematic review utilized a cross-sectional design. Additionally, the one article included in the contextual determinants review that was not included in the individual determinants review utilized a cross-sectional design [52]. In total, there were 11 articles included in my literature review that were not included in the individual determinants systematic review. A summary of the characteristics of these articles is available in **Table 2-6.**

Of the 11 articles not included in the individual determinants systematic review, five articles' authors [6, 52-54, 60] used a general measure of research use, five studies' authors [10, 56-59] quantified the instances of the different kinds of research use to measure research use, and one study's authors (Forsman and colleagues [55]) used a cut-off value for individuals with overall high research use compared against those with low research use. For the purposes of my analysis, the study by Forsman and colleagues [55] was analyzed with data from studies that reported on research use in general (see **Table 2-3**.) Critical appraisal of the studies can be found in **Table 2-7,** located at the end of this chapter. The majority (N=10, 91%) of 11 articles were rated as "fair" on the quality assessment, with only one article rated as "good" [54]. No studies were excluded based on quality.

Results.

I first present results from the systematic review by Squires and colleagues [1], followed by results from studies not included within the systematic review, and finally a synthesis of findings from all studies reporting on individual variables. I then compare the findings of my literature review and Squires and colleagues systematic review with respect to individual factors associated with research use.

Systematic review findings.

Squires and colleagues [1] concluded that there were positive significant relationships between nurses' general research use and the following: attitude towards research, attending conferences/in-services, having a graduate degree versus a diploma or bachelors, current role (leadership and/or advanced practice compared to staff nurse), working in critical care areas (compared to general wards), and job satisfaction. There were also non-significant relationships between nurse research use and: completion of research classes, experience (in years), age, and

having a bachelor degree versus a diploma. An equivocal relationship (mixed findings) was found between nurses' general research use and reading practices (journals). For kinds of research use, the authors concluded that attitude towards research had a positive significant relationship with instrumental research use, and overall research use. The findings from Squires and colleagues systematic review are integrated into **Tables 2-8** and **2-9** (located at the end of this chapter.)

Findings from studies not within the individual determinants systematic review.

The authors of nine additional studies, in eleven articles (10 from my literature review, of which one is a second report of a study included in the individual determinants systematic review, and one article from the contextual determinants systematic review that was a second report of a study in the individual determinants systematic review) reported relationships between individual variables and nurses' research use (see **Table 2-3**.) The authors of the studies reported on very few of the same variables, making comparisons across studies difficult. The authors of five studies, measuring general research use, reported on age [5, 6, 53, 55, 60] and four of the studies reported a non-significant relationship [5, 6, 53, 55]. Additionally, the authors of three studies [6, 55, 60] reported on gender, with two [55, 60] of three reporting a significant relationship. Finally, the authors of three studies [6, 53, 60] reported a significant relationship between nurses' general research use and attitudes towards research. All other variables were measured by authors in two or fewer studies. For authors' reporting on kinds of research use, only one variable was measured in three studies – attitude towards research. Attitude towards research was shown to have a significant relationship with instrumental research use in one study [58], conceptual research use in a second study [10], and overall research use in a third study [57].

Synthesis of systematic review and additional studies.

Results from the eleven articles (nine articles reporting unique studies and two reporting additional information on studies included in the individual determinants systematic review – of which one was from my literature search and one was included in the contextual determinants systematic review) not included in the systematic review were interpreted in combination with results from articles included within the individual determinants systematic review [1].

In total, the authors of 41 studies (in 44 articles: 38 from the individual determinants systematic review, one from the context systematic review, and five published since the systematic review) reported individual variables related to general research use by nurses, and the authors of 11 studies (in 11 articles, six included in the individual determinants systematic review and five published since the systematic review) reported individual variables related to the kinds of research use (see **Table 2-3**.)

General research use. I identified sixteen individual-level variables reported by study authors in enough articles (four or more) to be classified as equivocal (mixed results), non-significant, or significant. The remaining variables were not assessed in four studies and were therefore not coded. Six individual-level variables had a significant, positive relationship with research use: attitude towards research, autonomy, attendance at conferences or in-services, job satisfaction, being in a leadership or advanced-practice role versus a staff role, and working in critical care versus other specialities. Seven individual-level variables had a non-significant relationship with research use: participation in a research study, completion of research classes, age, gender, full or part time status, completion of a bachelor's degree versus a diploma, and years employed as a registered nurse. Three individual-level variables were rated as having mixed results: reading journals, increasing levels of education, and having a graduate degree.

Full results of individual variables and predictors related to nurses' general research use can be found in **Table 2-8** (located at the end of this chapter.)

Kinds of research use. I identified only four variables that were reported in enough studies (as per the vote counting rules) to classify them according to my decision rules. Age was non-significant for nurses' conceptual research use but was reported in fewer than four studies for the remainder of the kinds of research use, and therefore not coded for instrumental, persuasive and overall research use. Attitude towards research was found to have a positive significant relationship with instrumental and overall research use but was not significantly related to conceptual research use and was not measured in enough studies to assess persuasive research use. Belief suspension had a positive significant relationship to overall research use, but was not assessed in four or more studies for the remaining kinds of research use. Finally, trust was coded as non-significant for overall research use and was not assessed in enough studies to be classified for the remaining kinds of research use. Full results of individual variables and predictors related to nurses' instrumental, conceptual, persuasive and overall research use can be found in **Table 2-9** (located at the end of this chapter.)

Comparison of the systematic review and my literature review.

I compared the findings from my literature review (all included articles) to the systematic review by Squires and colleagues [1] to determine the contribution of the additional literature.

General research use. In comparison with the review by Squires and colleagues [1], there are two notable differences. The first difference is that there were five additional individual-level variables that were assessed in enough studies (four or more) to draw conclusions when the individual studies from that review were combined with the additional studies identified in my literature review. These additional five variables were: participation in a research study (non-

significant), autonomy (positively significant), increasing levels of education (mixed findings), gender (non-significant), and full or part time status (non-significant). Secondly, in my literature review, the possession of a graduate degree was found to have an equivocal (mixed findings) relationship with general research use, whereas in the review by Squires and colleagues it was found to have a positive, significant relationship with general research use.

Kinds of research use. In the review by Squires and colleagues [1], only one variable was assessed in enough studies to be classified as significant, non-significant or equivocal (mixed findings). Squires and colleagues found attitude towards research to have a positive significant relationship with instrumental and overall research use but found the relationship to be inconsistent for conceptual and persuasive research use due to too few studies. This literature review adds to the review by Squires and all by determining relationships between four additional variables a kind of research use. These variables were: age (non-significant for conceptual research use), attitude towards research (non-significant for conceptual research use), belief suspension (positively significant for overall research use) and trust (non-significant for overall research use.)

Contextual variables associated with nurses' research use.

Characteristics of included studies.

The authors of 28 studies (in 29 articles) report on contextual variables that are associated with nurses' research use. This section provides a summary and critical appraisal of the systematic review by Meijers and colleagues [3]. I then present a summary of contextual variables related to nurses' research use from the systematic review, the literature published after the systematic review, and this literature review overall.

Characteristics of the contextual determinants of nurses' research use systematic review.

Meijers and colleagues [3] published a systematic review examining the contextual factors related to nurses' research use in 2006. The authors included ten articles (nine cross-sectional studies and one quasi-experimental study), located through a search of five electronic databases and a manual search of specific journals, websites and research institutes. The authors included studies if they were published in English, reported primary research, and measured or analyzed the relationship between contextual factors and clinical nurses' research use. Meijers and colleagues [3] appraised the quality of the included studies with two tools and excluded studies deemed to be of "low quality." The authors did not report how many, or which studies were excluded.

I assessed the systematic review by Meijers and colleagues [3] using the AMSTAR 2.0 tool (see **Table 2-5**). I found their review to have 3 of 16 fully fulfilled criteria, 3 of 16 partially fulfilled criteria, 7 of 16 criteria not fulfilled and 3 criteria that were not applicable. Strengths of the systematic review by Meijers and colleagues [59] include that it had a comprehensive search strategy and that it had a clearly stated research question. Limitations of the review include: a lack of duplication in both study selection and data extraction, exclusion of studies based on low quality with no list of excluded studies, and lack of clarity in regards to what elements were considered context.

Meijers and colleagues [3] used the PARiHS framework to guide their understanding of context, however, they included some elements (e.g. time spent studying off-duty, extent of research related job responsibility) that are measured at the individual level and therefore may be argued to be individual determinants instead. In the review of individual determinants of research use previously discussed, Squires and colleagues [1] considered these two examples to be

individual determinants. Additionally, the authors did not report what rule they used to determine if a feature was considered consistently significant (e.g. must be reported in at least four studies with more than half statistically significant).

Characteristics of studies from the individual determinants systematic review not included in the context review.

The authors of a total of 15 studies [11, 13, 14, 19, 21, 22, 25, 26, 30, 33, 34, 42-44, 48] included in the individual determinants systematic review, but not the context systematic review, reported on contextual variables related to nurses' research use (see **Table 2-3**.) Additionally, there was a second article [5] of a study by Rodgers and colleagues, not included in the context review, but included within the individual review, making the total 16 articles. Of the studies reported in the 16 articles, 15 were cross-sectional [5, 11, 13, 14, 19, 21, 22, 25, 26, 30, 33, 34, 42, 43, 48], and one was quasi-experimental [44]. Squires and colleagues rated the quality of the studies in their systematic review, and of the 16 studies, one (6.25%) was rated as strong [33], seven (43.75%) were rated as moderate-strong [5, 13, 14, 19, 21, 22, 42], three (18.75%) were rated as moderate-weak [25, 44, 48], and five (31.25%) were rated as weak [11, 26, 30, 34, 43]. Authors of 12 of the studies measured nurses' research use generally [5, 13, 14, 19, 22, 26, 30, 34, 42-44, 48] and authors of four of the studies measured the kinds of nurses' research use [11, 21, 25, 33].

Results.

For my literature review, five studies from the systematic review by Meijers and colleagues [3] were reclassified as having only individual determinants [16, 29, 45, 46, 49]. I report findings of the systematic review, as originally reported by Meijers and colleagues, in

systematic review findings; however, for the *findings from all included studies* I report findings using the vote counting rules used in my literature review.

Systematic review findings.

Meijers and colleagues [3] reported only on studies whose authors measured nurses' research use generally. They found six statistically significant context features: role of the nurse, multi-faceted access to resources, organizational climate, multifaceted support, time for research activities, and provision of education. Two additional features were reported by the authors but were deemed equivocal (mixed results) by the review authors due to limited replication - access to human services and access to material resources. Meijers and colleagues [3] determined that the strength of relationship between the six contextual factors and general research use by nurses was still largely unknown and that few of the studies were of sufficient quality due to methodological limitations.

Findings from studies not within the context systematic review.

Contextual factors related to nurse research use were extracted from the additional 23 studies not included in the systematic review by Meijers and colleagues [3] – eight of these studies were from literature published since both systematic reviews [6, 10, 53-55, 57, 58, 60] and 15 studies (16 articles – one was a second article [5] of a study by Rodgers and colleagues, not included in the context review, but included within the individual review) were from the individual determinants systematic review [5, 11, 13, 14, 19, 21, 22, 25, 26, 30, 33, 34, 42-44, 47, 48](see **Table 2-3**.) The total of additional studies reporting relationships between nurses' research use and contextual variables was 23 studies in 24 articles. The same vote counting rules as applied by Squires and colleagues [1] and used in the interpretation of the individual variables associated with research use in my literature review, were applied. For the 23 studies (in 24

articles) not included in the systematic review by Meijers and colleagues [3], there were no contextual variables reported in enough studies (four or more) to be assessed for general research use and the kinds of research use with the vote counting rules.

Synthesis of systematic review and additional studies.

I report findings from all 28 studies (the 23 studies not included in the systematic review by Meijers and colleagues [3], and the five studies included in Meijers and colleagues' review [17, 23, 41, 47, 52]) whose authors reported on relationships between contextual variables and nurses' research use next. One study was reported in two articles [5, 52], therefore there were 29 articles total. Of these 28 studies, the authors of 21 reported on the relationship between contextual variables and nurses' general research use [5, 6, 13, 14, 17, 19, 22, 23, 26, 30, 34, 42-44, 47, 48, 53-56], and the authors of seven reported on the relationship between contextual variables and nurses' kinds of research use [10, 11, 21, 25, 33, 57, 58].

General research use. The authors of 21 included studies (in 22 articles) reported on the relationship between contextual variables and research use by nurses measured generally. Study authors reported two context-level variables in enough articles (four or more) for these variables to be classified as equivocal (mixed-findings), non-significant, or significant. Support from colleagues, administrators and other health care professionals had a positive significant relationship with nurses' general research use, and size of the organization was not significantly related to research use. The remaining variables were not assessed by authors in four or more studies and were therefore not classified. Full results of contextual variables related to nurses' general research use can be found in **Table 2-10** (located at the end of this chapter.)

Kinds of research use. There were no contextual variables reported by enough authors for any variables to be classified as significant, non-significant or mixed; therefore, all of the

variables related to kinds of nurses' research use were not classified. Full results of contextual variables related to nurses' instrumental, conceptual, persuasive and overall research use can be found in **Table 2-11** (located at the end of this chapter).

Comparison of the systematic review and my literature review.

The review by Meijers and colleagues [3] did not report any rules for data synthesis, nor did they report using a framework to determine what variables were considered contextual. Additionally, Meijers and colleagues only reported studies that measured nurses research use generally. As a result, the findings from my literature review differ from the Meijers and colleagues' findings.

Meijers and colleagues [3] reported six context variables that were significantly related to nurses' general research use: role of the nurse, multi-faceted access to resources, organizational climate, multifaceted support, time for research activities, and provision of education. Of these features, two were reclassified as individual determinants in my literature review: role of the nurse and provision of education. Due to the vote counting rules applied in my literature review, multi-faceted access to resources, organizational climate, and time were not considered significant as they were reported in fewer than four studies. In my literature review, support was broken down into categories and only one study remained in the multi-faceted support category.

My literature review provides support for a significant relationship between nurses' general research use and support from colleagues, administrators and other health care professionals. Additionally, my literature review concludes that nurses' general research use was not significantly related to organizational size. Meijers and colleagues [3] did not include any studies measuring the kinds of research use by nurses; however, this literature review did. There

were no contextual variables reported in enough studies (four or more) to be classified as significant, non-significant or mixed.

Summary of the Literature Review

In this literature review I sought to identify variables associated with nurses' general research use and kinds of research use. After employing vote counting rules utilized by Squires and colleagues [4], six individual-level variables were found to have a significant, positive relationship with nurses' general research use: attitude towards research, autonomy, attendance at conferences or in-services, job satisfaction, being in a leadership or advanced-practice role versus a staff role, and working in critical care versus other specialities. Seven individual-level variables had a non-significant relationship with nurses' general research use: participation in a research study, completion of research classes, age, gender, full or part time status, completion of a bachelor's degree versus a diploma, and years employed as a registered nurse. One context-level variable, support from colleagues, administrators and other health care professionals, had a positive significant relationship with nurses' general research use; and a second context-level variable, size of the organization, was not significantly related to research use.

With respect to the kinds of research use, the individual-level variable age was non-significant for nurses' conceptual research use; and had mixed findings for instrumental, persuasive and overall research use. Attitude towards research was found to have a positive significant relationship with instrumental and overall research use, but was not significantly related to conceptual research use, and had mixed findings with persuasive research use. Belief suspension, had a positive significant relationship with overall research use, but findings were mixed for the remaining kinds of research use. Finally, trust was non-significant with overall research use but mixed findings with the remaining kinds of research use.

Table 2-4a: Characteristics of Included Systematic Reviews (N=2)

First Author (Year)	Studies included (N) & Search Methods	Inclusion & Exclusion Criteria	Critical appraisal performed?	Results Summary	Author's Conclusions	Comments
Meijers (2006)	N=10 – 9 cross-sectional and 1 quasi-experimental. Five electronic bibliographic databases (CINAHL, MEDLINE, Healthstar, Psych-INFO and Cochrane library) and manual search of specific journals, websites and research institutes. Up to March 2005	**Inclusion**: English; nurses working in clinical practice; primary research; studies report a measure or analysis of relationship between contextual factors and research use, research use DV and contextual factors IVs **Exclusion:** reported use of Barrier Scale (Funk et al. 1991) but no measurement of research use	Yes, 9 studies excluded due to low quality. All included studies were of "medium quality" Quality Assessment and Validity Tool for Correlation Studies Quality Research Appraisal Checklist for qualitative studies.	**Six statistically significant context features (S:NS)** role of the nurse (2:0); multi-faceted access to resources (2:0); organizational climate (1:1); multifaceted support (5:3), time for research activities (1:1) and provision of education (2:3). **Equivocal features** access to human services, access to material resources.	Strength of relationship between the six contextual factors and research use still largely unknown. Few studies of sufficient quality - methodological limitations. Results in reviewed studies were mixed. Need more robust methods in future work.	Mapped contextual features onto PARiHS framework, with exception of evaluation. Findings were clustered into six contextual features and may not have same measurement. No rules concerning when a feature was statistically significant (e.g. must be reported in at least 4 studies, more than half statistically significant).

First Author (Year)	Studies included (N) & Search Methods	Inclusion & Exclusion Criteria	Critical appraisal performed?	Results Summary	Author's Conclusions	Comments
Squires (2011)	N=45 (*44 included in my literature review) Two studies used a quasi-experimental design and 43 used a cross-sectional design. 39 studies assessed research use in general, and 6 studies assessed kinds of research use (IRU, CRU, PRU and/or overall) 12 online bibliographic databases were searched. Hand searching of specialized journals (*Implementation Science, Nursing Research)* and an ancestry search were also conducted. Up to October 2008	**Inclusion:** RCTs, clinical trials, and observational studies; published in English, Danish, Swedish, and Norwegian; the relationship between individual characteristic(s) and research use expressed quantitatively (and tested statistically); registered nurses, licensed practical nurses, nurse leaders, and clinical nurse educators; research use defined as empirically derived research-based information; if study involved a protocol, the authors were required to make the research-basis apparent in the report. **Exclusion:** Case reports and editorials; articles that reported on: the adherence to clinical practice guidelines (can be based on non-research evidence, e.g., expert opinion) and the use of one specific-research-based practice if the purpose was not to examine nurses' use of research in practice generally.	Estabrooks' Quality Assessment and Validity Tool for Cross-Sectional Studies Quality Assessment Tool for Quantitative Studies (used for quasi-experimental studies) No studies were excluded based on quality. 1 (2%) "strong" 13 (29%) "moderate-strong" 18 (40%) "moderate-weak" 13 (29%) "weak"	<u>General research use</u> **Positive significant relationships for:** attitude towards research, attending conferences/in-services, having a graduate degree versus a diploma or bachelors, current role (leadership and/or advanced practice compared to staff nurse), working in critical care areas (compared to general wards), and job satisfaction. **Non-significant relationship with:** completion of research classes, experience (in years), age, and having a bachelor degree versus a diploma. **Equivocal (mixed) relationship with:** reading practices All others found in <4 studies (inconsistent) <u>Kinds of Research Use</u> Attitude towards research had positive significant relationship with IRU and overall research use; all others inconsistent	Findings are potential targets of future research utilization interventions. Methodological problems in many of the studies. Further research using more robust study designs and multivariate assessment methods needed to replicate and confirm results. Recommend targeting the most modifiable factors for research use interventions: attitude towards research and attendance at conferences and/or in-services. Recommend that programmatic research in research use be undertaken (i.e. breaking a large research program into smaller more manageable pieces, with researchers building on one another). For example, programs would have concurrent streams examining different settings, different classes of determinants (individual, contextual, organizational), and interventions to increase research use and subsequently patient outcomes.	Data synthesis was conducted with a vote counting approach supplemented by extracting direction and magnitude of effect. A priori rules were: had to be assessed in four articles (otherwise coded as inconsistent), studies were then coded as significant, non-significant or equivocal based on where 60% or more of studies fell, if both multivariate and bivariate statistics were presented, multivariate were used in the synthesis.

Table 2-4b: Factors Coded as "Inconsistent" by Squires and Colleagues in 2011 Systematic Review

Studies reporting research utilization in general*

1. Beliefs and Attitudes (S:NS) – perceived support for research (0:1), expectation of self to use research (1:0), expressed interest in research (1:0), problem solving ability (0:1), cosmopoliteness (0:1), autonomy (2:1), dogmatism (0:1), activism (0:1), belief suspension (1:0), theoretical orientation (0:1), trust (0:1), confidence (0:1), career commitment (1:0), perception of nurse as a research use barrier (1:0), awareness (overall) of practice (1:0), awareness of practice by regular use (1:0), research awareness (0:1), persuaded (believe in) of the practice (1:0)
2. Involvement in Research Activities (S:NS) – current data collection for others (1:0), participation in research-related activities (1:1), participation in research as subject (0:1), past use of research (1:0), job related research activities (1:0), participation in research study (0:2), education for research participation (1:0), research participation (1:0), involvement in research projects (0:1), research experience (1:0), participation in quality management (1:0), participation in quality improvement (1:0), completion of the research study (0:1)
3. Information Seeking (S:NS) – nursing texts as information (0:1), nursing journals as information (1:0), education by specialty groups (0:1), personal experience as information (1:0), P&P manual as information (0:1), in-services as a source of knowledge (0:1), attended education program (0:1), critical reading skills (1:0), use computer (1:0), time per week on the internet (0:1), internet use (0:1), have a personal computer (0:1), hours of continuing education (0:2), number of study days attended (1:0), time spent studying (on duty) (0:1), time spent studying (off duty) (1:0), MEDLINE usage (1:0)
4. Education (S:NS) – working toward a degree (0:2), current enrolment (0:1), well prepared in education process (1:0), number of degrees (0:1), courses attended (0:1), completion of statistics course (0:1), completion of research design course (2:0), number of statistics courses taken (1:0), years since basic education (0:1), years since last degree (0:1), taught a topic based on research (1:0), having project 2000 training (0:1)
5. Professional Characteristics (S:NS) –full or part-time status (1:1), years in post (hospital) (0:1), number of memberships held (0:1), oncology nursing society status (1:0), oncology certification (0:1), CFRN certification (1:0), emotional exhaustion (1:0), stress (2:0), affiliation (0:1), dependant care hours (0:1), hours/week worked (0:2), shift usually worked (0:1), shift satisfaction (0:1), national certification (0:1)
6. Socio-demographic and socio-economic factors (S:NS) – married or partnered/marital status (0:1), family income (0:1), health/lifestyle activity (0:1), gender (0:3)

Studies reporting kinds of research utilization*

Instrumental Research Utilization
1. Beliefs and Attitudes (S:NS) – importance of access to research (0:1), cosmopoliteness (0:1), localite (orientation within one's immediate social context) (0:1), interest or organizational groups belonged to (0:1), adaptiveness (0:1), belief suspension (2:1)[a], trust (0:3), research awareness (1:0), importance of various factors to decision-making (0:1)
2. Involvement in Research Activities (S:NS) – research involvement (1:0)
3. Information Seeking (S:NS) – number of nursing journals read (0:2), sources of knowledge (0:3), mass media (0:1), number of journals read (1:0), number of continuing education sessions (0:1), in-services attended (0:2)
4. Education (S:NS) – increasing levels (0:2), type of degree (0:1), possessing a degree (0:1)
5. Professional Characteristics (S:NS) – years employed as a registered nurse (1:2)[a], length of time at job title (0:1), years in post (hospital) (0:2), current role (0:6), number of memberships held (0:1)
6. Socio-demographic and Socio-economic Factors (S:NS) – age (0:2), gender (0:2)
7. Critical Thinking (S:NS) – Critical thinking skills (total CCTDI score) (2:0)

Conceptual Research Utilization
1. Beliefs and Attitudes (S:NS) – attitude towards research (0:3), importance of access to research (0:1), cosmopoliteness (0:1), localite (orientation within one's immediate social context) (1:0), interest or organizational groups belonged to (0:1), adaptiveness (0:1), belief suspension (0:1), trust (0:2), research awareness (0:1), importance of various factors to decision-making (1:0)
2. Involvement in Research Activities (S:NS) – research involvement (0:1)
3. Information Seeking (S:NS) – number of nursing journals read (0:2), sources of knowledge (0:2), mass media (0:1), number of journals read (0:1), number of continuing education sessions (1:0), in-services attended (0:1)

4. Education (S:NS) – increasing levels (0:2), possessing a degree (0:1)
5. Professional Characteristics (S:NS) – years employed as a registered nurse (0:1), length of time at job title (0:1), years in post (hospital) (0:2), current role (1:5), number of memberships held (0:1)
6. Socio-demographic and Socio-economic Factors (S:NS) – age (0:2), gender (0:1)
7. Critical Thinking (S:NS) – Critical thinking skills (total CCTDI score) (2:0)

Persuasive Research Utilization
1. Beliefs and Attitudes (S:NS) – attitude towards research (1:2), importance of access to research (1:0), cosmopoliteness (0:1), localite (orientation within one's immediate social context) (0:1), interest or organizational groups belonged to (0:1), adaptiveness (0:1), belief suspension (0:1), trust (1:1), research awareness (1:0), importance of various factors to decision-making (0:1)
2. Involvement in Research Activities (S:NS) – research involvement (1:0)
3. Information Seeking (S:NS) – number of nursing journals read (0:2), sources of knowledge (0:2), mass media (1:0), number of journals read (0:1), number of continuing education sessions (1:0), in-services attended (0:1)
4. Education (S:NS) – increasing levels (0:2), possessing a degree (0:1)
5. Professional Characteristics (S:NS) – years employed as a registered nurse (0:1), length of time at job title (0:1), years in post (hospital) (0:2), current role (1:5), number of memberships held (0:1)
6. Socio-demographic and Socio-economic Factors (S:NS) – age (0:2), gender (0:1)
7. Critical Thinking (S:NS) – Critical thinking skills (total CCTDI score) (2:0)

Overall Research Utilization
1. Beliefs and Attitudes (S:NS) – importance of access to research (0:1), cosmopoliteness (0:1), localite (orientation within one's immediate social context) (0:1), interest or organizational groups belonged to (1:0), adaptiveness (0:1), belief suspension (2:1)[b], trust (1:3)[a], research awareness (1:0), importance of various factors to decision-making (0:1)
2. Involvement in Research Activities (S:NS) – research involvement (1:0)
3. Information Seeking (S:NS) – number of nursing journals read (0:2), sources of knowledge (0:3), mass media (0:1), number of journals read (0:1), number of continuing education sessions (1:0), in-services attended (1:2)[a]
4. Education (S:NS) – increasing levels (0:2), type of degree (0:1), possessing a degree (0:1)
5. Professional Characteristics (S:NS) – years employed as a registered nurse (0:2), length of time at job title (0:1), years in post (hospital) (0:2), current role (1:5), number of memberships held (0:1)
6. Socio-demographic and Socio-economic Factors (S:NS) – age (1:1), gender (0:2)
7. Critical Thinking (S:NS) – Critical thinking skills (total CCTDI score) (2:0)

Legend: DV, dependent variable; IV, independent variable; S, statistically significant; NS, not significant; IRU, instrumental research use; CRU, conceptual research use; PRU, persuasive research use
* Berggren, 1996 was conducted with midwives and therefore excluded from my literature review.
[a] one study had two samples, one significant and one not significant
[b] one study had two samples, both significant

Table 2-5: Quality Appraisal of Included Systematic Reviews (N=2)

AMSTAR Item	Study	
	Meijers	Squires
1. Did the research questions and inclusion criteria for the review include the components of PICO?	Y	Y
2. Did the report of the review contain an explicit statement that the review methods were established prior to the conduct of the review and did the report justify any significant deviations from the protocol?	N	Y
3. Did the review authors explain their selection of the study designs for inclusion in the review?	N	Y
4. Did the review authors use a comprehensive literature search strategy?	P	P
5. Did the review authors perform study selection in duplicate?	N	Y
6. Did the review authors perform data extraction in duplicate?	N	Y
7. Did the review authors provide a list of excluded studies and justify the exclusions?	N	P
8. Did the review authors describe the included studies in adequate detail?	P	P
9. Did the review authors use a satisfactory technique for assessing the risk of bias (RoB) in individual studies that were included in the review?	Y	Y
10. Did the review authors report on the sources of funding for the studies included in the review?	N	N
11. If meta-analysis was performed did the review authors use appropriate methods for statistical combination of results?	N/A	N/A
12. If meta-analysis was performed, did the review authors assess the potential impact of RoB in individual studies on the results of the meta-analysis or other evidence synthesis?	N/A	N/A
13. Did the review authors account for RoB in individual studies when interpreting/ discussing the results of the review?	P	P
14. Did the review authors provide a satisfactory explanation for, and discussion of, any heterogeneity observed in the results of the review?	Y	Y
15. If they performed quantitative synthesis did the review authors carry out an adequate investigation of publication bias (small study bias) and discuss its likely impact on the results of the review?	N/A	N/A
16. Did the review authors report any potential sources of conflict of interest, including any funding they received for conducting the review?	N	Y

Legend: Y=yes, N=no, P=partial yes, N/A=no meta-analysis conducted, RoB=Risk of Bias

Table 2-6: Characteristics of Included Articles Not in the Individual Determinants Systematic Review (N=11)

First Author, Journal, Year	Design	Sample/Subjects	Setting/Location	Framework	Research Utilization Instrument			
					Name	Description/Scoring	Reliability	Validity
Rodgers *Journal of Advanced Nursing* 2000	Cross-sectional	**Sample size:** n = 680 **Subjects:** Registered nurses-general medical and surgical wards	**Setting:** 25 hospitals in the Scottish Health Service **Country:** Scotland	Roger's (1983) Theory of Diffusion of Innovations	Modified Nursing Practice Questionnaire (NPQ)	Multiple items. Dichotomous yes/no for all questions and sometimes/always for the question on use	α (mean research utilization score over all of the 14 practices) = 0.631	**Content**-panel of nurse researchers and educators. **Construct-** authors report that, as the 14 practices and influencing factors identified in the earlier exploratory study, the survey felt to have construct validity **Content**: pilot with 20 nurses
Boström *Journal of Clinical Nursing* 2009 *note is second report of a study included in the individual determinants systematic review	Cross-sectional survey	**Sample size:** n=210 **Subjects:** Registered nurses working in older people care	**Setting:** Eight municipalities in southern region of Stockholm **Country:** Sweden	Rogers' (2003) Diffusion of Innovations	Slightly modified version of the RUQ (Research Utilisation Questionnaire)	Multiple items. Scored yes/no on Likert scale from 1 to 5 (strongly disagree to strongly agree).	Attitudes towards research α=0.88 Research use in daily practice α=0.84	Not reported.
Wangensteen Journal of Clinical Nursing 2011	Cross-sectional survey	**Sample size:** n=617 **Subjects:** nurses who had graduated from university colleges, working as a nurse	**Setting:** Eighteen university colleges in Norway **Country:** Norway	Not reported.	Research Utilization Questionnaire (RUQ) California Critical Thinking Disposition Inventory (CCTDI)	Multiple items. Scored yes/no on Likert scale from 1 to 5 (strongly disagree to strongly agree).	Attitudes towards research α=0.84 Availability and support to implement research findings α=0.71 Research use in daily practice α=0.90	Cites a systematic review (Frasure 2008) as concluding hat RUQ is a psychometrically sound instrument.

First Author, Journal, Year	Design	Sample/Subjects	Setting/Location	Framework	Research Utilization Instrument			
					Name	Description/Scoring	Reliability	Validity
Wallin *Worldviews on Evidence-Based Nursing* 2012	Cross-sectional survey	**Sample size:** n=1256 **Subjects:** newly graduated nurses, 2 years after graduating	**Country:** Sweden	Not reported.	Three single items - measuring IRU, CRU, PRU (Estabrooks 1999)	Definition provided prior to item. Asked to estimate extent of research use during past 4 working weeks. 5-point time scale (e.g. on some shifts)	Not applicable.	Not reported.
Forsman *Implementation Science* 2012a	Cross-sectional survey	**Sample size:** n=845 **Subjects:** newly graduated nurses, 2 years after graduating	**Setting:** graduates from bachelor of science in nursing programs in Sweden, working as nurses in the healthcare sector **Country:** Sweden	Not reported.	Three single items - measuring IRU, CRU, PRU (Estabrooks 1999) Author created outcome variable using cut-off.	Definition provided prior to item. Asked to estimate extent of research use during past 4 working weeks. 5-point time scale (e.g. on some shifts).	Not applicable.	Cited systematic review (Squires, 2011) as concluding Estabrooks' instrument has evidence of validity.
Forsman *International Journal of Nursing Studies 2012b*	Cross-sectional survey	**Sample size:** n=1191 **Subjects:** newly graduated nurses, 1 year after graduating	**Country:** Sweden	Not reported.	Single item - measuring instrumental (direct) research use (Estabrooks 1999)	Definition of IRU was provided and followed by 3 examples, participants rated their research use behaviour on a 5-point time scale (e.g. on some shifts).	Not applicable.	States item was used in previous LANE studies.
Mastrilli *PhD Dissertation* 2012	Cross-sectional survey	**Sample size:** n= 220 **Subjects:** rural and urban nurses working in acute care hospitals	**Setting:** Acute care hospitals within the South West Local Health Integration Network. **Country:** Canada	PARiHS (2008)	Shortened version of Estabrooks (1997) Research Utilization Survey (RUS)	39 items, including 14 items measuring the aspects of research evidence use, and 25 items measuring individual and contextual factors. Research use items were measured on a 7-point Likert scale ranging from 1) never, to 7) nearly every shift.	Overall research utilization (same measure applied at three points in the survey): α=0.89	"The reliability and validity of this instrument had been reported, including its construct validity (Connor, 2006; Estabrooks, 1997; Estabrooks, Chong, et al., 2003; Kenny, 2002)" p.73

First Author, Journal, Year	Design	Sample/Subjects	Setting/Location	Framework	Research Utilization Instrument			
					Name	Description/Scoring	Reliability	Validity
Chen *Research in Nursing & Health 2013*	Cross-sectional survey	**Sample size:** n= 510 **Subjects:** nurses	**Setting:** general medical and surgical wards, intensive and emergency care, gynecological /pediatric wards, and psychiatric wards of four hospitals in Taiwan. **Country:** Taiwan	Not reported.	Author-developed Research Utilization Experience Scale	Three items: 1) indirect use of research findings 2) direct use 3) methodological use. Scale from 0 (never) to 100 (very often). The total score (0 to 300) for is a sum of the three items.	Not reported.	Not reported.
Squires *BMC Health Services Research* 2013	Cross-sectional (survey) design	**Sample size:** n= 735 **Subjects:** pediatric nurses	**Setting:** Canadian pediatric hospitals with four or more distinct units, with 30 or more beds **Country:** Canada	Not explicit. A main instrument (Alberta Context Tool) uses the PARiHS framework.	Single items - IRU and CRU (Estabrooks 1999)	Single items scored on five-point frequency scales from '10% or less of the time' to 'almost 100% of the time.	Not applicable.	Cites systematic review (Squires, 2011) indicates that measures used previously to obtain reliable and valid assessments.
Bunpin *PhD Dissertation* 2014	Cross-sectional survey	**Sample size:** n= 229 **Subjects:** full time registered nurses working in acute care hospitals	**Setting:** acute care hospitals in California **Country:** USA	Individual innovative behavior; diffusion of innovations; resource-based view of the firm	Research use instrument (Champion & Leach, 1989)	Ten items, all rated on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).	Cronbach's alpha for this study was 0.93.	Cites other studies showing evidence of reliability and validity.
Manraj *Masters Dissertation* 2015	Cross-sectional (survey) design.	**Sample size:** 766 pediatric nurses and 160 long-term care nurses. **Subjects:** registered nurses working in pediatric acute-care and adult long-term care settings.	**Settings:** 36 residential long-term care facilities across Canadian Prairie Provinces and 8 acute-care Canadian pediatric hospitals **Country:** Canada	PARiHS & Rogers' Diffusion of Innovations	Single item (Estabrooks, 1999) Conceptual Research Utilization Scale (5 item)	Single item: Likert scale from 1 (less than 10% of the time) to 5 (almost 100% of the time). Scale: definition provided, 5 items, all on same 5-point Likert scale as for single item.	Not applicable for single item measure. The CRU scale had alpha coefficients of 0.97 and 0.98 for the pediatric and long-term care nurses respectively.	Cites previous studies reporting reliability and validity (Estabrooks, 2009; Squires et al 2011).

Table 2-7: Critical Appraisal of Included Articles Not in the Individual Determinants Systematic Review (N=11)

First Author (Year)	1. Research question clearly stated?	2. Study population clearly defined?	3. Participation rate at least 50%?	4. Subjects from similar population with prespecified inclusion and exclusion criteria?	5. Sample size justification, power description or variance and effect estimates provided?	6. Were the exposures of interest measured prior to the outcomes being measured?	7. Was the timeframe sufficient to see an association between exposure and outcome if it existed?	8. For exposures that can vary in amount or level, did the study examine different levels of the exposure?	9. Were the independent variables clearly defined, valid, reliable and implemented consistently?	10. Was the exposure assessed more than once over time?	11. Were the outcome measures (DV) clearly defined, valid, reliable, and implemented consistently?	12. Were outcome accessors blinded to the exposure status of participants?	13. Was loss to follow-up after baseline 20% or less?	14. Were key potentially confounding variables measured and adjusted for statistically?	Quality Rating
Rodgers (2000)	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	N/A	N/A	N	Fair
Boström (2009)	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Wangensteen (2011)	Y	Y	N	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Wallin (2012)	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N/A	N/A	N	Fair
Forsman (2012a)	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Forsman (2012b)	Y	Y	Y	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Mastrilli (2012)	Y	Y	N	Y	Y	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Squires (2013)	Y	Y	N	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Chen (2013)	Y	Y	Y	Y	Y	N	N	Y	Y	N	Y	N/A	N/A	Y	Good
Bunpin (2014)	Y	Y	N	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair
Manraj (2015)	Y	Y	NR	Y	N	N	N	Y	Y	N	Y	N/A	N/A	Y	Fair

Legend: Y, yes; N, no; CD, cannot determine; N/A, not applicable; NR, not reported

The authors of this tool state that for cross-sectional studies, the answer to questions 6 and 7 should be "no" [6].

Table 2-8: Summary of Individual Variables Related to Nurses' General Research Use

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
1. EDUCATION				
Increasing levels (multiple levels: diploma, bachelor's, masters, PhD; post-hoc analysis not provided)	Brett (1987)	NS		Diploma, bachelor's, masters
	Chen (2013)	NS		
	Coyle (1990)	NS		
	Lacey (1994)	S	+ (r = .554)	
	Logsdon (1998)	S	+ (χ^2 = 7.99)	Willingness to use research to change practice
	Nash (2005)	NS		
	Rodgers (2000a)	S	+ (rho = .12)	Registration only, diploma, degree
	Rutledge (1996)	S	- (All Practices r = -.1205, 2 of 8 practices (-.1094, -.1158))	Diploma/associate, bachelor's, masters, doctorate Suggested in article to be spurious due to multiple tests (Bonferroni correction applied by authors)
Type of degree	Brown (1997)	S	+ (χ2 = 36.1)	Without bachelor's vs. with bachelor's vs. graduate degree.
	Bonner (2008)	S	+ (H = 11.16) Kruskal Wallis	Masters degree vs. lower
	Bunpin (2014)	NS		Bachelor's degree vs. less than a bachelor's degree
	Bunpin (2014)	NS		Graduate degree vs. less than a bachelor's degree
	Butler (1995)	S	+ (OR = 1.75)	Diploma, bachelor's degree (higher for degree)
	Champion (1989)	NS		Graduate compared to basic education (BN)
	Erler (2000)	NS		For using lit searches in practice and in policies, Diploma vs. degree
	Estabrooks (1999)	NS		Diploma, degree
	Forbes (1997)	NS		Diploma, degree
	McCleary (2002)	S	+ (F = 8.8)	Bachelor's vs. community college & graduate vs. community college
	McCloskey (2005)	S	+ (F = 11.34)	Diploma, bachelor's, masters
	Michel (1995)	S	+ (U = 2345.0)	BSN, MSN
	Ofi (2008)	NS		Diploma, degree
	Squires (2007)	NS		Diploma, degree
	Stiefel (1996)	NS		Bachelor's, graduate degree

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Tranmer (2002)	NS		Diploma, degree
	Varcoe (1995)	NS		Diploma, degree
	Wallin (2006)	S	+ (r = 0.229)	Diploma, degree
Specialist nursing programme	Boström (2009)	NS		
Nursing programme at university level	Boström (2009)	S	+ (OR = 5.05)	
Number of degrees	Brett (1987)	NS		
Working toward a degree	Brett (1987)	NS		
	Coyle (1990)	NS		
Current enrolment	Brett (1987)	NS		
Well prepared in education process	Logsdon (1998)	S	+ (r = .32)	With willingness to change one's practice based on research
No previous assistant nurse training	Forsman (2012a)	NS		
Courses attended	Estabrooks (1999)	NS		
Completion of research class(es)	Brett (1987)	NS		
	Butler (1995)	NS		
	Champion (1989)	NS		
	Coyle (1990)	NS		
	McCleary (2003)	NS		
	Nash (2005)	NS		
	Rodgers (2000a)	S	+ (U = 4.44)	
Completion of statistics course	Butler (1995)	NS		
	Nash (2005)	NS		
Completion of research design course	McCleary (2002)	S	+ (t=3.9)	
	McCleary (2003)	S	+ (t = 3.5)	
Number of statistics courses taken	Wells (1994)	S	+ (β = 0.48)	
Years since basic education	Brett (1987)	NS		
Years since last degree	Estabrooks (1999)	NS		
Taught a topic based on research	Rodgers (2000a)	S	+ (U = 4.93)	
Having project 2000 training	Parahoo (1999)	NS		
In-services and CE	Bunpin (2014)	S	+ β=0.004	

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Further study after nursing degree	Forsman (2012a)	NS		
2. CERTIFICATIONS AND MEMBERSHIPS				
National certification	Stiefel (1996)	NS		
Oncology certification	Rutledge (1996)	NS		
CFRN certification	Erler (2000)	S	+ (χ^2 = 9.6 - use research literature); (χ^2= 11.2 - translate findings to policies & procedures)	
Speciality certification	Bunpin (2014)	NS		
Certification (yes/no)	Bunpin (2014)	NS		
Number of memberships held	Coyle (1990)	NS		
Oncology nursing society	Rutledge (1996)	NS		
3. OTHER DEMOGRAPHICS				
Age	Boström (2009)	NS		
	Bunpin (2014)	NS		
	Butler (1995)	NS		
	Champion (1989)	NS		
	Cummings (2007)	NS		
	Estabrooks (1999)	NS		
	Forsman (2012a)	NS		
	Lacey (1994)	NS		
	McCleary (2002)	NS		
	Rodgers (2000a)	NS		
	Stiefel (1996)	NS		
	Wallin (2006)	NS		
	Wangensteen (2011)	S	+ (β = 0.073)	Age >30 years
Married or partnered/marital status	Chen (2013)	NS		
	Estabrooks (1999)	NS		
Family income	Estabrooks (1999)	NS		
Health/lifestyle activity	Estabrooks (1999)	NS		
Gender	Boström (2009)	NS		
	Estabrooks (1999)	NS		

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Forsman (2012a)	S	+ (OR = 1.88)	(ref=men)
	Stiefel (1996)	NS		
	Wallin (2006)	NS		
	Wangensteen (2011)	S	- (β = -0.093)	
Full or part-time status	Butler (1995)	NS		
	Forbes (1997)	NS		
	Squires (2007)	NS		For 'low user' (Full time, part time, or temporary/casual)
	Wallin (2006)	S	+ (β = 0.228)	For work full time
Years employed as a registered nurse	Boström (2009)	S	- (OR = 0.94)	
	Butler (1995)	NS		
	Champion (1989)	NS		
	Coyle (1990)	NS		
	Estabrooks (1999)	NS		
	McCleary (2002)	NS		
	McCloskey (2005)	NS		
	Michel (1995)	NS		
	Rodgers (2000a)	NS		
	Squires (2007)	S	+ (β = 0.07)	For 'consistent research user'
	Stiefel (1996)	NS		
	Tranmer (2002)	NS		
	Wallin (2006)	NS		
Years in post (hospital)	Butler (1995)	NS		
	Stiefel (1996)	NS		
	Tranmer (2002)	NS		
Current role	Bonner (2008)	S	+ Kruskal Wallis (H = 12.67)	Nurse unit managers and consultant report more use than staff nurses
	Boström (2009)	NS		Consultant vs. team
	Chen (2013)	NS		Managerial vs. non-managerial
	Butler (1995)	S	+ (OR = 5.01)	Those in leadership or advanced roles report more use than staff nurses
	Hatcher (1997)	S	+ (t = 5.57)	Those in leadership of advanced roles report more use as compared to staff nurses (nursing advisory committee)
	McCloskey (2005)	S	+ (F = 7.901)	Management position or advanced practice nurses vs. staff nurses

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Rodgers (2000b)	NS		Charge nurse vs. staff nurse
	Wallin (2006)	S	- (β = -0.395)	Staff nurse vs. other (staff nurses use less research)
	Wells (1994)	NS		Staff nurse, nurse manager
Clinical specialty	Boström (2009)	S	+ (OR= 2.85)	Specialist vs. nursing home
	Bunpin (2014)	NS		Critical care areas
	Estabrooks (1999)	NS		
	Forsman (2012a)	NS		Elder care (ref=hospital care)
	Forsman (2012a)	NS		Primary care (ref=hospital care)
	Forsman (2012a)	S	+ (OR 3.67)	Psychiatric care (ref=hospital care)
	Michel (1995)	NS		Clinical, administration or education
	Forbes (1997)	S	+ ANOVA (F = 5.370)	Higher research use for critical care nurses as compared to medical/surgical or obstetrical/gynecological
	Humphris (1999)	S	+ χ^2 (test value not reported)	Greater number of diabetic nurse specialists implement specific findings into practice as compared to the non-nurse specialist group
	Nash (2005)	S	+ ANOVA (F= 2.35)	Area worked (highest research use mean to lowest): Education, other, hospital inpatient, outpatient clinic, office
	Parahoo (2001)	NS		Medical vs. surgical nurses
	Squires (2007)	S	- (β = -0.42)	Med-surg compared to critical care unit (med-surg use less than CC)
	Stiefel (1996)	S	+ (Wilk's lambda = 0.76, F = 2.23)	Critical care higher research use than medicine, surgery, oncology
	Wright (1996)	NS		Analyzed groups by practice area (general hospital, psychiatric hospital, or community mental health)
	Wangensteen (2011)	S	- (β = -0.078)	Specialist health care vs. community health care
Shift usually worked	Estabrooks (1999)	NS		
Hours/week worked	Boström (2009)	NS		
	Estabrooks (1999)	NS		
	Wallin (2006)	NS		
Time allocated to studies	Forsman (2012a)	S	+ (OR = 0.68)	>Full-time (ref=full-time)
	Forsman (2012a)	NS		≤75% of full-time (ref=full-time)
Work >75% of full-time	Forsman (2012a)	NS		>75% of full-time

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Shift work	Forsman (2012a)	NS		Monday to friday (days, evenings) (ref=day, evenings, nights)
	Forsman (2012a)	NS		Night (ref=day, evenings, nights)
Work overtime several times per week	Forsman (2012a)	S	- (OR = 0.70)	
Permanent employment position	Forsman (2012a)	NS		
4. BELIEFS AND ATTITUDES				
Perceived support for research	Butler (1995)	S	+ (OR = 2.0)	
	Wells (1994)	NS		
Attitude toward research	Boström (2009)	S	+ (OR = 17.40)	
	Bunpin (2014)	S	+ (β = 0.312)	
	Champion (1989)	S	+ (r = .55)	
	Estabrooks (1999)	S	+ LISREL	Chi square = 55.91 p = .263 for model with attitude, belief suspension and in-services
	Hatcher (1997)	S	+ (r = .65 - .82)	
	Lacey (1994)	S	+ (r = .674)	
	Prin (1997)	S	+ (r = .58)	Authors state that regression assumptions may have been violated so findings to be interpreted cautiously.
	Tranmer (2002)	S	+ (β = .64)	
	Varcoe (1995)	S	+ (r = .41)	S for general research use (RUQ); NS for specific practices ("own value")
	Wangensteen (2011)	S	+ (β =0.298)	
	Wells (1994)	S	+ (β = 1.62)	
Expectation of self to use research	Varcoe (1995)	S	+ (r = .51)	With general use of research (not specific findings)
Expressed interest in research	Varcoe (1995)	S	+ (r = .50)	With general use of research (not specific findings)
Problem solving ability	Estabrooks (1999)	NS		
Cosmopoliteness	Estabrooks (1999)	NS		
Autonomy	Bunpin (2014)	NS		
	Forbes (1997)	S	+ (r = 0.08)	
	McCloskey (2005)	S	+ (β = 0.135)	
	Wallin (2006)	S	- (β = - 0.369)	

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Dogmatism	Estabrooks (1999)	NS		
Activism	Estabrooks (1999)	NS		
Belief suspension	Estabrooks (1999) Bunpin (2014)	S NS	+ (LISREL)	Chi square = 55.91 p = .263 for model with attitude, in-services, belief suspension
Theoretical orientation	Estabrooks (1999)	NS		
Trust	Estabrooks (1999)	NS		
Confidence	Butler (1995) Wells (1994)	NS NS		Confidence in research related activities (e.g., reading research, discussing research)
Career commitment	Stiefel (1996)	S	+ (R^2 = 0.13)	MANOVA
Perception of nurse as a research use barrier	Boström (2008) Chen (2013)	S S	+ (t = 2.512) - (β= -0.266)	Research user reports less individual barriers
Perception of the organization as a research use barrier	Boström (2008) Chen (2013)	NS NS		
Perception of the communication (presentation and accessibility of the research) as a research use barrier	Boström (2008) Chen (2013)	S S	+ (t=3.422) - (β= -0.139)	
Perception of the characteristics of the innovation (qualities of the research)	Boström (2008) Chen (2013)	S S	+ (t=2.139) + (β= 0.234)	
Awareness (overall) of practice	Squires (2007)	S [1] NS [2]	+ (β = 2.52)	[1] For 'user of research' [2] For 'low user of research'
Awareness of practice by regular use	Squires (2007)	S [1] NS [2]	+ (β = 3.49)	[1] For 'user of research' [2] For 'low user of research'
Research awareness	Wells (1994)	NS		
Persuaded (believe in) of the practice	Squires (2007)	S [1] NS [2]	+ (β = 2.11)	[1] For 'user of research' [2] For 'low user of research'
Nurses' value for research	Butler (1995)	NS		
Nurses perceptions about the existence of organizational policy	Brett (1987)	S	+ (r = .626)	
	Squires (2007)	NS [1] S [2]	'low user' - + (β = 0.58)	[1] For 'user of research' [2] For 'low user of research'

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Correct perception that organization has a policy	Squires (2007)	NS		For 'user of research'
Perceived expectations of head nurse or nursing directors to use research	Varcoe (1995)	NS		
Perception of purpose of policies and procedures - guide practice	Squires (2007)	NS		For 'low user of research'
Nurse unaware of legal implications	Squires (2007)	NS		For 'user of research'
Responsibility for practice development	Boström (2009)	NS		
Inquisitiveness	Wangensteen (2011)	S	+ ($\beta = 0.112$)	
Critical thinking self confidence	Wangensteen (2011)	S	+ ($\beta=0.205$)	
Analyticity	Wangensteen (2011)	S	+ ($\chi2=16.341$)	
Open-mindedness	Wangensteen (2011)	S	+ ($\beta = 0.143$)	
Truth-seeking	Wangensteen (2011)	S	+ ($\beta = 0.088$)	
Often think about leaving the profession	Forsman (2012a)	NS		
Feel unprepared to manage work as nurse	Forsman (2012a)	S	+ (OR = 1.42)	
5. INVOLVEMENT IN RESEARCH ACTIVITIES				
Data collection for others	Butler (1995) Butler (1995)	S NS	+ (OR = 4.04)	Current Past
Job related research activities	Rutledge (1996)	S	- (r = -.1272)	S for 1 of 8 practices (Bonferroni correction)
Participation in research-related activities	McCleary (2002)	S	+	Test statistic not given
Past use of research	Butler (1995)	S	+ (OR = 20.0)	
Education for research participation	Logsdon (1998)	S	+ (r = .32)	
Participation in research study	Brett (1987) Butler (1995) Butler (1995)	NS NS NS		 Current participation in a research study as a subject Past participation in a research study as a subject

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Nash (2005) Tsai (2000)	NS S	+ (r = .3268)	Research participation
Awareness of research being conducted in nursing units	Butler (1995)	NS		
Research experience	Chen (2013) Varcoe (1995)	S S	+ (β= 0.305) + (r = .37)	In years With general use of research (not specific findings)
Participation in quality management	McCleary (2002)	S	+	Test statistic not given
Participation in quality improvement	Boström (2009) Wallin (2003)	NS S	+ (χ^2= 11.1)	
Completion of the research study	Tsai (2003)	NS		
Journal club participation	Rutledge (1996)	NS		
Previous participation in designing or conducting research	Butler (1995) Tranmer (2002)	NS NS		Involvement in research projects in past year
6. INFORMATION SEEKING				
Nursing texts as information	Barta (1995)	NS		
Nursing journals as information	Barta (1995)	S	+ (t = -2.36)	
Education by specialty groups	Barta (1995)	NS		
Personal experience as information	Squires (2007)	S	+ (β = 0.55)	For 'consistent research user'
P&P manual as information	Squires (2007)	NS		
In-services as a source of knowledge	Squires (2007)	NS		
Critical reading skills	Tranmer (2002)	S	+ (β = 0.19)	Pre-test & post-test respondents combined
Use computer	Wallin (2006)	S	+ (β =.375)	
Time per week on the internet	Wallin (2006)	NS		
Internet use	Cummings (2007)	NS		
Have a personal computer	Wallin (2006)	NS		
Reading activities: read journals Hours reading journals	Brett (1987)	S	+ (r = .163)	

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Coyle (1990)	NS		
	Michel (1995)	NS		
Hours reading non-research journals	Michel (1995)	NS		
Number of journals read	Rodgers (2000a)	S	+ (Z = 2.98)	Mann Whitney u
	Rutledge (1996)	S	+ (r = .0901)	1 of 8 practices
	Wells (1994)	NS		
Reads Heart & Lung	Coyle (1990)	S	+ (χ^2= 3.795)	
	Michel (1995)	S	+ (U = 1422.0)	
Reads Nursing Research	Brett (1987)	S	+ (χ^2= 12.422)	
Reads RN	Brett (1987)	S	+ (χ^2= 8.925)	
	Michel (1995)	S	+ (U = 1961)	
Reading activities: Other				
Read research reports	Boström (2009)	NS		
Frequency of reading professional literature	Chen (2013)	S	- (β= -0.113)	
Attendance at conferences/in-services	Butler (1995)	NS		
	Coyle (1990)	S	+ (χ^2 = 5.179)	To total TIAB score
	Estabrooks (1999)	S	+ (LISREL)	Chi square = 55.91 p = .263 for model with attitude, belief suspension and in-services
	Michel (1995)	S	+ (U = 1291.5)	
	Rutledge (1996)	S	+ (r = .1168)	All 8 practices combined
Hours of continuing education	Brett (1987)	NS		
	Coyle (1990)	NS		
Number of study days attended	Rodgers (2000a)	S	+ (r = .095)	
Time spent studying (on duty)	Rodgers (2000a)	NS		
Time spent studying (off duty)	Rodgers (2000a)	S	+ (r = .1)	
MEDLINE usage	Prin (1997)	S	+ (r = .2526)	
Actively seeking research	Boström (2009)	NS		
7. PROFESSIONAL CHARACTERISTICS				
Job satisfaction	Coyle (1990)	S	+ (r = .18)	
	Estabrooks (1999)	NS		

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
	Forbes (1997)	S	+ (r = 0.13)	
	Wallin (2006)	S	+ (β = 0.264)	
Emotional exhaustion	Cummings (2007)	S	- (magnitude varied by context)	Coefficients significant but model not. High context estimated effect = -.109; partially high context estimated effect = -.191; partially low context estimated effect = -.334; low context estimated effect = -.251
Stress	Forbes (1997)	S	- (r = -0.13)	Personal job stress: juggling expectations of other professionals and of clients
	Forbes (1997)	S	- (r = -0.08)	Situational job stress: issues such as equipment, time, and staffing
Affiliation	Estabrooks (1999)	NS		
Dependant care hours	Estabrooks (1999)	NS		
Shift satisfaction	Estabrooks (1999)	NS		
High disengagement	Forsman (2012a)	S	+ (OR = 1.57)	
High exhaustion	Forsman (2012a)	NS		
High job demands	Forsman (2012a)	NS		
Low challenge at work	Forsman (2012a)	S	+ (OR = 2.03)	
Low control at work	Forsman (2012a)	NS		
Low global importance of studies	Forsman (2012a)	S	+ (OR = 1.52)	
Low mastery at work	Forsman (2012a)	NS		
Low student activity: asking questions in class	Forsman (2012a)	NS		When was a student, now registered nurse
Low student activity: contribution to discussions in class	Forsman (2012a)	S	+ (OR = 1.66)	When was a student, now registered nurse
Individual innovative behaviour	Bunpin (2014)	S	+ (β = 0.168)	
No/unknown individual plan for competence development	Forsman (2012a)	S	+ (OR = 1.40)	
8. CRITICAL THINKING				
California Critical Thinking Disposition Inventory total score	Wangensteen (2011)	S	+ (β = 0.135)	

Legend: S = statistically significant (p<.05), NS = not significant.

Table 2-9: Summary Individual Variables Related to Kinds of Nurses' Research Use

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
1. EDUCATION						
Increasing levels	Connor (2006)	NS	NS	NS	NS	
	Kenny (2005)	NS	NS	NS	NS	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.154	
Type of degree	Estabrooks (2007)	NS	Not Assessed	Not Assessed	NS	Associate, bachelor
	Manraj (2015)	Not assessed	Pediatrics (1 item) S +, β=.099 Pediatrics (scale) NS Long-term care NS	Not assessed	Not assessed	Bachelor's degree (ref = diploma)
	Manraj (2015)	Not assessed	Pediatrics NS Long-term care N/A	Not assessed	Not assessed	Master's degree (ref = diploma)
	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	No formal education (ref = diploma)
Possessing a degree	Milner (2005)	NS	NS	NS	NS	
Highest education	Squires (2013)	NS	NS	Not assessed	Not assessed	Diploma/ certificate (ref = master or higher)
	Squires (2013)	NS	NS	Not assessed	Not assessed	Bachelor degree (ref = master or higher)
Specialized course	Squires (2013)	NS	NS	Not assessed	Not assessed	(ref = no)
2. CERTIFICATIONS AND MEMBERSHIPS						
Number of memberships held	Connor (2006)	NS	NS	NS	NS	
Interest or organizational groups belonged to	Kenny (2005)	NS	NS	NS	S + (β not reported)	
3. OTHER DEMOGRAPHICS						
Age	Manraj (2015)	Not assessed	Pediatrics (1 item) S +, β=.131 Pediatrics (scale) NS Long-term care NS	Not assessed	Not assessed	
	Milner (2005)	NS	NS	NS	S -, β = -0.011	
	Profetto-McGrath (2003)	NS	NS	NS	NS	
	Squires (2013)	NS	NS	Not assessed	Not assessed	

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
Gender	Connor (2006)	NS	NS	NS	NS	
	Estabrooks (2007)	NS	Not assessed	Not Assessed	NS	
	Manraj (2015)	Not assessed	Pediatrics (1 item) S -, β=-.097 Pediatrics (scale) NS Long-term care NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	(ref = female)
Years employed as a registered nurse	Estabrooks (2007)	Canadian: NS // US military: S +, OR = 0.97	Not Assessed	Not Assessed	NS	
	Kenny (2005)	NS	NS	NS	NS	
	Profetto-McGrath (2003)	NS	NS	NS	NS	
Length of time at job title	Connor (2006)	NS	NS	NS	NS	
Years in post (hospital)	Connor (2006)	NS	NS	NS	NS	
	Kenny (2005)	NS	NS	NS	NS	
	Manraj (2015)	Not assessed	Pediatrics (1 item) NS Pediatrics (scale) S -, β=-.121 Long-term care NS	Not assessed	Not assessed	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S -, r= - .142	
Current role	Connor (2006)	NS	NS	NS	NS	Management position
	Connor (2006)	NS	NS	S, F value not given	S, F value not given	Registered nurse vs. licensed practical nurse (registered nurse higher)
	Kenny (2005)	S, r=.190	S, r=.180	NS	S, r=.262	Advanced practice nurse
	Kenny (2005)	NS	NS	S - r=.139	NS	Management position
	Milner (2005)	NS	NS	S -, β = -0.268	S -, β = -0.265	Managers vs educators
	Milner (2005)	NS	S -, β = -0.382	S -, β = -0.345	NS	Registered nurses vs educators
Employment Status	Squires (2013)	NS	NS	Not assessed	Not assessed	Full time (ref = casual)
	Manraj (2015)	Not assessed	Pediatrics (1 item) NS Pediatrics (scale) S -, β=-.072 Long-term care NS	Not assessed	Not assessed	Part time (ref = full time)
	Squires (2013)	NS	NS	Not assessed	Not assessed	Part time (ref= casual)
	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	Casual (ref = full time)

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
Clinical Speciality	Manraj (2015)	Not assessed	S -, t = -2.31	Not assessed	Not assessed	Long-term care vs. Pediatric
	Manraj (2015)	Not assessed	Pediatrics NS Long-term care N/A	Not assessed	Not assessed	Critical care unit (ref = medicine unit)
	Manraj (2015)	Not assessed	Pediatrics NS Long-term care N/A	Not assessed	Not assessed	Surgery unit (ref = medicine unit)
	Squires (2013)	NS	NS	Not assessed	Not assessed	Critical care unit (ref = surgical care unit)
	Squires (2013)	NS	S +, β=0.211	Not assessed	Not assessed	Medicine unit (ref = surgical care unit)
4. BELIEFS AND ATTITUDES						
Attitude toward research	Connor (2006)	NS	NS	NS	RN: S +, β=.234 RPN: NS	
	Estabrooks (2007)	Canadian: S +, OR = 1.17 // US Military: NS	Not assessed	Not assessed	Canadian: S +, OR = 1.21 // US Military: S +, OR = 1.16	
	Kenny (2005)	S + (β not reported)	NS	NS	NS	
	Manraj (2015)	Not assessed	Pediatrics NS Long-term care (1 item) S +, β=.330 Long-term care (scale) NS	Not assessed	Not assessed	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, B= .20	
	Milner (2005)	S +, β = 0.120	NS	S +, β = 0.075	S +, β = 0.098	
	Squires (2013)	S +, β=0.168	NS	Not assessed	Not assessed	
Importance of access to research	Kenny (2005)	S +, β not reported	NS	S +, β not reported	NS	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.246	
Cosmopoliteness	Milner (2005)	NS	NS	NS	NS	
Localite (orientation within one's immediate social context)	Milner (2005)	NS	S + (β = 0.031)	NS	NS	
Importance of decision-making	Connor (2006)	NS	NS	NS	NS	
Adoptiveness	Milner (2005)	NS	NS	NS	NS	

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
Belief suspension	Connor (2006)	NS	NS	RN - NS RPN - S, β=.424	NS	
	Estabrooks (2007)	Canadian: NS // US Military: S +, OR = 1.11	Not assessed	Not assessed	Canadian: S +, OR = 1.07 // US Military: S +, OR = 1.08	
	Kenny (2005)	S +, β not reported	S +, β not reported	NS	S +, β not reported	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.321	
Belief suspension – willingness	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
Belief suspension – implement	Manraj (2015)	Not assessed	Pediatrics (1 item) S +, β=.114 Pediatrics (scale) NS Long-term care NS	Not assessed	Not assessed	
	Squires (2013)	S +, β=0.159	S +, β=0.142	Not assessed	Not assessed	
Trust	Connor (2006)	NS	NS	NS	NS	
	Estabrooks (2007)	NS	Not assessed	Not assessed	NS	
	Kenny (2005)	NS	NS	S +, β not reported	NS	
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.282	Trust in research
Research awareness	Milner (2005)	S + (β = 0.037)	NS	S + (β = 0.076)	S + (β = 0.063)	
Importance of various factors to decision-making	Kenny (2005)	NS	S +, β not reported	S +, β not reported	NS	
Perceived support	Estabrooks (2007)	NS	Not assessed	Not assessed	NS	
	Kenny (2005)	NS	NS	NS	NS	
Perceived innovation	Milner (2005)	NS	NS	NS	NS	Perceptions of the characteristics of research findings
EBP capability beliefs (6 item scale)	Wallin (2012)	S +, r=0.20	S +, r=0.17	S +, r=0.16	Not assessed	
Intention in the final semester of undergraduate study	Forsman (2012b)	S +, r=0.21	Not assessed	Not assessed	Not assessed	
5. INVOLVEMENT IN RESEARCH ACTIVITIES						
Research involvement	Milner (2005)	S +, β = 0.142	NS	S +, β = 0.176	S +, β = 0.170	

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
Research use in past	Squires (2013)	S +, β=0.221	S +, β=0.248	Not assessed	Not assessed	
6. INFORMATION SEEKING						
Number of nursing journals read	Connor (2006)	NS	NS	NS	NS	
	Kenny (2005)	S +, β not reported	NS	NS	NS	
Number of non-nursing journals read	Kenny (2005)	NS	NS	NS	NS	
Mass media	Milner (2005)	NS	NS	S +, β = 0.194	NS	
Sources of knowledge	Connor (2006)	NS	NS	NS	NS	
	Estabrooks (2007)	NS	Not assessed	Not assessed	NS	
	Kenny (2005)	NS	NS	NS	NS	
Number of continuing education sessions	Connor (2006)	RN: S, β=.455 RPN: NS	NS	NS	NS	
In-services attended	Connor (2006)	NS	RN: NS RPN: S, β not reported	NS	NS	
	Estabrooks (2007)	NS	Not Assessed	Not Assessed	Canadian: S +, OR = 1.03 // US Military: NS	
7. CRITICAL THINKING						
Critical thinking skills (total CCTDI score)	Profetto-McGrath (2003)	S +, r = .24	S +, r = .27	NS	S +, r = .35	
	Profetto-McGrath (2009)	S +, r = .222	S +, r = .205	S +, r = .237	S +, r = .146	
8. PROFESSIONAL CHARACTERISTICS						
Level of competence in critically reviewing research	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, B=.77	
Physical health status	Squires (2013)	NS	NS	Not assessed	Not assessed	
Mental health status	Squires (2013)	NS	NS	Not assessed	Not assessed	
Burnout – exhaustion	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
Burnout – cynicism	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	S -, β=-0.118	NS	Not assessed	Not assessed	

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
Burnout – efficacy	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
Adequate orientation	Squires (2013)	NS	NS	Not assessed	Not assessed	
Job satisfaction	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
Problem solving	Manraj (2015)	Not assessed	Pediatrics (1 item) S +, β=.095 Pediatrics (scale) NS Long-term care NS	Not assessed	Not assessed	
	Squires (2013)	NS	S +, β=0.290	Not assessed	Not assessed	

Legend: S = statistically significant (p<.05), NS = not significant.

Table 2-10: Summary of Contextual Variables Related to Nurses' General Research Use

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
1. ACCESS & AVAILABILITY				
a) Multi-faceted research related resources				
Access (availability)	Champion (1989) Hatcher (1997)	S S	+ (r=.52, F=19.5) Not reported	
Availability - index	Wangensteen (2011)	S	+ (β = 0.225)	
Availability of hospital resources	McCloskey (2005)	NS		
b) Human resources				
Access to clinical nurse specialist	Rutledge (1996)	S	+ (r=.1168)	All practices combined
Access to an in-house nurse researcher or research committee	Rutledge (1996) Boström (2009)	NS NS		
Access to librarian	Boström (2009)	S	+ (OR = 3.03)	
c) Material resources				
Access to library	Boström (2009) Rodgers (2000a) Rutledge (1996)	NS NS NS		
Availability of organizational facilities (e.g. search engines, meeting spaces)	McCloskey (2005)	NS		
Access to nursing journals	Rodgers (2000a) Rutledge (1996)	S NS	- (z=-2.68)	On ward
Access to summaries or titles	Rodgers (2000a)	S	- (z=-3.37)	
Access to the internet	Boström (2009)	NS		
Access to research findings	Boström (2009) Tranmer (2002)	S S	+ (OR = 4.88) + (β = .20)	At the workplace
Access to R&D resources	Boström (2009)	NS		
d) Access to training				
Education in research is arranged in my municipality	Boström (2009)	NS		

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Low educational quality (scientific theory and method)	Forsman (2012a)	NS		
2. ORGANIZATIONAL CLIMATE				
Research climate	Varcoe (1995)	S	+ (r=.33) (only with specific findings, not general)	
Nursing training area (ward)	Rodgers (2000a)	NS		Ward where nurses trained
Role ambiguity	Forsman (2012a)	NS		
Group cohesion	Forbes (1997)	S	+ (r=.07)	
3. ORGANIZATIONAL CULTURE				
Nursing unit culture	Stiefel (1996)	NS		Organizational culture inventory
Unit participation in research	Tranmer (2002)	NS		
Support for innovation	Bunpin (2014)	NS		
Unit autonomy	Cummings (2007)	NS		Each patient care unit determines its own policies and procedures)
Authority (degree of deferral to higher authorities)	McCloskey (2005)	NS		
Formality of hospital structures and policies	McCloskey (2005)	S	+ (β = .235)	
4. SUPPORT				
a) Human support				
Support from colleagues, administrators and other health care professionals	Boström (2009) Champion (1989) Champion (1989) Hatcher (1997) Tranmer (2002)	NS NS S S S	 + (unit director: r=0.35; chairperson: r=0.32; director of nursing: r=.44) + (r=.45 to .48) + (β = .20)	Support from colleagues Support from colleagues and physicians Support from key administrative persons Not reported separately
Support from a mentor	McCloskey (2005)	NS		
Facilitation	Cummings (2007)	NS		Opportunity for staff to consult with clinical nurse specialists or expert nurse clinicians/educators

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Nurse to nurse collaboration	Boström (2009) Boström (2009) Cummings (2007)	NS NS High context - NS Partially high context - S Partially low context - NS Low context - S	 Partially high context: + (β= .186) Low context: (β= .250)	Nurses on your unit Nurses on another unit Coefficients significant for 2/4 contexts, but model not significant.
b) Material support				
Supportive infrastructure of the organization (library, ethics committee)	Varcoe (1995)	S	+ (r=.31)	Only with specific findings, not general
c) Multi-faceted support				
Staff development	Cummings (2007)	High context - S Partially high context - NS Partially low context - NS Low context - NS	High context: + (β=.243)	Coefficients significant for 1/4 contexts, but model not significant.
5. ORGANIZATIONAL CHARACTERISTICS				
Size (organization)	Brett (1987) Bunpin (2014) Bunpin (2014) Rodgers (2000b) Varcoe (1995	NS NS NS NS NS		 Medium hospitals (ref=small) Large hospitals (ref= small)
Number of research-based policies a hospital reported	Brett (1987) Squires (2007)	NS NS [1] S [2]	 + (β=.024)	 [1] for 'non-user of research' [2] for 'low user of research'
Type of hospital	Brett (1987) Chen (2013) Lacey (1994) Rodgers (2000a)	NS S S NS	 + (β= 0.125) p=.0027 (t test)	"Kind of institution" no details provided Medical centers vs. district hospitals (ref=non-teaching hospital) test statistics not reported Teaching vs. non-teaching

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Location of organization	Bonner (2008) Brett (1987)	NS NS		rural vs. urban
Affiliation with nursing school	Brett (1987)	NS		
Patient adverse events	Cummings (2007)	High context - NS Partially high context - NS Partially low context - S Low context - S	Partially low context: + (β =.172) Low context: + (β =.148)	Coefficients significant for 2/4 contexts, but model not significant.
Staff adverse events	Cummings (2007)	High context - NS Partially high context - NS Partially low context - NS Low context - S	Low context: + (β = .194)	Coefficients significant for 1/4 contexts, but model not significant.
Primary patient population	Nash (2005)	S	+ (F =2.43)	Critical care was the highest, then in order – ambulatory, intermediate, long term, other
Nursing research committee	Rutledge (1996)	NS		Present or not in organization
Use of research dissemination networks by organization	McCloskey (2005)	NS		
Quality of nursing care in unit	Bunpin (2014)	S	+ (r = 0.19)	
Quality of nursing care last Shift	Bunpin (2014)	NS		
Patient safety grade	Bunpin (2014)	S	+ (r = 0.17)	
6. STAFF MIX				
Number of clinical specialists	Brett (1987)	S	+ (r = -.237)	
% diploma nurses on staff	Brett (1987)	NS		
% associate degree nurses on staff	Brett (1987)	NS		
% nurses with baccalaureate	Brett (1987)	S	+ (r = .123)	
% non-nursing baccalaureate degree nurses on staff	Brett (1987)	NS		
% nurses with master's	Brett (1987)	S	+ (r = -.201)	
% nurses with non-nursing master's	Brett (1987)	S	+ (r = .133)	
Unit supervisor is a nurse	Wallin (2006)	NS		

Determinant	First Author (year)	Significance	Direction and Magnitude	Comment
Director of nursing's position tenure	Brett (1987)	NS		
Director of nursing's position education	Brett (1987)	NS		
Director of nursing's position certification	Brett (1987)	NS		
7. ORGANIZATIONAL SLACK				
Organizational slack	Wallin (2006)	S	+ (β = 0.202)	
Lack of time	Squires (2007)	S	- (β = -.069)	For 'low user of research'
Time to nurse	Cummings (2007)	NS		
Adequate staffing compared with patients' needs of care	Forsman (2012a)	S	+ (OR = 1.43)	
Time to read about research	Boström (2009)	NS		
Salary (paid work time for research use activities)	McCloskey (2005)	NS		
8. LEADERSHIP				
Deficient leadership	Forsman (2012a)	NS		
Leader-member exchange	Bunpin (2014)	NS		
Support from the unit manager	Boström (2009)	NS		

Legend: S = statistically significant (p<.05), NS = not significant.

Table 2-11: Summary of Contextual Variables Related to Kinds of Nurses' Research Use

Individual Determinant	First Author (year)	Research Use Findings - Significance (Direction and Magnitude)				Comment
		Instrumental	Conceptual	Persuasive	Overall	
1. ACCESS AND AVAILABILITY						
a) Multi-faceted research related resources						
Access (availability)	Connor (2006)	NS	NS	RN: NS RPN: S +, β=.529	RN: S, S +, β=.206 RPN: NS	To "research resources"
	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.273	
b) Material resources						
Access to library	Estabrooks (2007)	NS	Not assessed	Not assessed	NS	
2. ORGANIZATIONAL CULTURE						
Clan culture	Connor (2006)	NS	NS	NS	RN: NS RPN: S +, β=.463	
Adhocracy culture	Connor (2006)	NS	NS	NS	NS	
Market culture	Connor (2006)	NS	RN: NS RPN: S +, β=.335	NS	NS	
Hierarchy culture	Connor (2006)	NS	RN: NS RPN: S +, β=.453	NS	NS	
Traditional norms	Milner (2005)	NS	NS	NS	NS	
Organizational innovativeness	Kenny (2005)	NS	NS	NS	S +, β not reported	
Organizational respect for rules	Kenny (2005)	NS	NS	NS	S +, β not reported	
Organizational purposive information flow	Kenny (2005)	NS	NS	NS	NS	
Organizational supportiveness	Kenny (2005)	S +, β not reported	NS	NS	NS	
Support for innovation	Squires (2013)	NS	NS	Not assessed	Not assessed	
ACT – culture	Manraj (2015)	Not assessed	Pediatrics (1 item) NS Pediatrics (scale) S +, β=.131 Long-term care NS	Not assessed	Not assessed	
	Squires (2013)	S +, β=0.834	S -, β=-0.654	Not assessed	Not assessed	

3. SUPPORT						
a) Human support						
Presence of research champion	Estabrooks (2007) Kenny (2005) Mastrilli (2012)	NS S +, r=.250 Not assessed	Not assessed NS Not assessed	Not assessed S +, r=.158 Not assessed	Canada: S +, OR=1.47 USA: NS NS S +, r=.232	
Supportive organizational relationships for research use	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, B=.06	
ACT – formal interactions	Manraj (2015) Squires (2013)	Not assessed NS	NS S -, β=-0.342	Not assessed Not assessed	Not assessed Not assessed	
ACT – informal interactions	Manraj (2015) Squires (2013)	Not assessed NS	Pediatrics (1 item) β=.125 Pediatrics (scale) NS Long-term care NS S +, β=0.286	Not assessed Not assessed	Not assessed Not assessed	
ACT – social capital	Manraj (2015) Squires (2013)	Not assessed NS	Not assessed NS	Not assessed Not assessed	Not assessed Not assessed	
b) Multi-faceted support						
Amount of support available to use research	Connor (2006)	NS	NS	NS	RN: NS RPN: S, β not reported	
4. ORGANIZATIONAL CHARACTERISTICS						
Location of organization	Manraj (2015) Mastrilli (2012)	Not assessed NS	Pediatrics (1 item) N/A Pediatrics (scale) S -, β=-.121 Long-term care NS NS	Not assessed NS	Not assessed NS	(ref = urban) Urban/rural
Average Patient Stay	Squires (2013)	NS	NS	Not assessed	Not assessed	
Average (mean) Number of Occupied Beds	Squires (2013)	NS	NS	Not assessed	Not assessed	
5. STAFF MIX						
% nurses with baccalaureate	Squires (2013)	S +, β=0.629	NS	Not assessed	Not assessed	

6. ORGANIZATIONAL SLACK						
Time (individual)	Connor (2006)	NS	RN: S +, β=.362 RPN: NS	NS	RN: S +, β=.227 RPN: NS	Time to use research
	Estabrooks (2007)	NS	Not assessed	Not assessed	NS	Availability of time to do activities that could positively influence research use
	Kenny (2005)	NS	NS	NS	NS	
Time (organization)	Estabrooks (2007)	Canada: S +, OR=1.25 USA: NS	Not assessed	Not assessed	Canada: S +, OR=1.20 USA: NS	The frequency of time provided by the organization for involvement in projects and research activities
Organizational time for research use	Mastrilli (2012)	Not assessed	Not assessed	Not assessed	S +, r=.226	
ACT – organizational slack: staff	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
ACT – organizational slack: space	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	S +, β=0.247	Not assessed	Not assessed	
ACT – organizational slack: time	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	NS	Not assessed	Not assessed	
7. ORGANIZATIONAL DEMOGRAPHICS						
Regional size (size of center)	Milner (2005)	NS	NS	NS	NS	
8. LEADERSHIP						
ACT – leadership	Manraj (2015)	Not assessed	NS	Not assessed	Not assessed	
	Squires (2013)	NS	S +, β=0.437	Not assessed	Not assessed	
9. EVALUATION						
ACT – evaluation	Manraj (2015)	Not assessed	Pediatrics (1 item) S +, β=.092 Pediatrics (scale) S +, β=.158 Long-term care NS	Not assessed	Not assessed	
	Squires (2013)	NS	S +, β=0.353	Not assessed	Not assessed	

Legend: S = statistically significant (p<.05), NS = not significant, ACT = Alberta Context Tool

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Chapter Three

Methods

Methods

The purpose of this chapter is to describe the methodology of the secondary analysis study in this thesis including the study design and sample; data collection, measures, and analysis; modeling approach, and ethical considerations.

Strengths and Limitations of Secondary Data Analysis

Secondary data analysis was performed within this thesis after careful consideration of its advantages and disadvantages. The use of secondary data analysis to answer research questions has several advantages [1]. Secondary data analysis is cost and resource efficient as it utilizes previously collected data, saving time and staffing requirements. Secondary data analysis also presents a low risk to participants and allows for access to large data sets and longitudinal data, which minimizes data collection problems [1]. Large databases may have data that is of high depth and breadth, beyond the scope of an individual researcher, allowing for more robust analysis [2]. Finally, new insights and revelations can be generated through the use of secondary data analysis, and this may lead to refinement of hypotheses prior to primary studies being conducted.

Despite the many advantages of secondary data analysis, limitations do exist and must be considered. Researchers may have difficulty with analysis if documentation is not complete or accurate - mistakes made in initial survey collection may be difficult to identify [3]. Additionally, not all variables that a researcher would want to include in their analysis will be included in the original study – there is no control over the selection of variables studied – and transformations may be required prior to data use [2]. Cole and Trinh [2] suggest that transparent approaches are vital to ensure the validity of any research involving secondary data analysis; therefore, methods were reported in detail in this chapter and the manuscript (Chapter 4).

Study Design

I performed a secondary data analysis on data collected during the second phase of the TREC program, from the regulated nurses' (registered nurses' and licensed practical nurses') surveys and from facility and unit profile forms. While TREC is a multi-level, longitudinal applied research program, analysis for this study was preformed on data from one-time period (year one of phase two), making this study a cross-sectional (survey) design.

Study Sample

TREC is a multi-level (province, health region, facility, care units within facilities, staff and residents) longitudinal research program. For my thesis study, I utilized survey data from regulated nurses (registered nurses and licensed practical nurses) in the second phase of the TREC program (TREC 2.0; Year 1: September 2014 – May 2015). In TREC 2.0 data were collected from 91 long-term care facilities in three Western Canadian provinces: British Columbia, Alberta, and Manitoba. Facilities were selected to be part of TREC using stratified random sampling; stratification was by healthcare region (within province), owner-operator model (public, private, voluntary) and size (small: 1 to 79 beds; medium: 80 -120, large >120 beds). Facility inclusion and exclusion criteria are presented in **Table 3-1.** For this secondary analysis, the facility sample was comprised of 89 of the 91 TREC facilities; two facilities were omitted due to there being no nurse survey data collected in those facilities.

Table 3-1: Facility Inclusion and Exclusion Criteria

Inclusion Criteria	Exclusion Criteria
1. Registered by the provincial government 2. 90% of residents over 65 3. Conducted RAI-MDS 2.0 assessment since September 2007 4. Facility operation conducted in the English language 5. Urban facilities must be within designated health regions (i.e., Alberta – Edmonton, Calgary, or East Central; Manitoba – Winnipeg) 6. Stable or minimal level of organizational flux	1. Facilities integrated with acute care 2. Facilities with a sub-acute service 3. Rural facilities within the Capital Health Region (Edmonton, AB), Calgary Health Region (Calgary, AB), and Winnipeg Regional Health Authority (Winnipeg, MB) that resided in places with populations of 10,000 people or less 4. Facilities with less than 35 long-term care beds 5. Dementia special needs facilities 6. Facilities undergoing (or expected to undergo) a degree of organizational flux within the proposed five-year lifespan of the TREC program

Note. Adapted from "Study protocol for the translating research in elder care (TREC): building context – an organizational monitoring program in long-term care project (project one)," by C. A. Estabrooks, J. E. Squires, G. G. Cummings, G. F. Teare, and P. G. Norton, 2009, *Implementation Science,* 4, 52. Copyright 2009 Estabrooks et al. Adapted with permission.

Data Collection

In TREC phase 2.0, data were collected at three levels: facility, unit, and individual (staff and resident). Facility-level data were collected annually from facility administrators and unit level data, quarterly from care managers or facility administrators, both using standardized TREC unit and facility profile forms and through short structured interviews. Staff-level data were collected through eligible participants (healthcare aides, nurses, allied health providers, specialists, care managers) completing the TREC survey after being recruited through a "volunteer, census like sampling technique" [4, 5]. The TREC survey, which varies in number of items based on which health care provider the survey targets, consists of instruments to measure organizational context, research use, individual factors believed to impact research use, and staff outcomes believed to be sensitive to both organizational context and research use. The nurse survey used in TREC 2.0 had 188 items.

The TREC survey was designed with brevity and feasibility in mind, and was negotiated with facility managers and administrators to be less than 30 minutes in length. Additionally, as nurses completed the survey online, they were able to complete the survey at home if desired, and were able to re-enter the survey as many times as desired. In a study conducted in the acute pediatric setting, with a survey almost identical to the one utilized in the TREC study, nurses took an average of 22 minutes to complete the survey online [6].

Regulated nurse (registered nurse and licensed practical nurse) surveys were completed online using a vendor (Nooro). The vendor was responsible for secure, accurate and reliable data collection and transfer to the University of Alberta central servers. All survey data were thoroughly cleaned by TREC data analysts in accordance with the TREC quality control and monitoring program [7]. A five-step protocol was implemented by a data analyst for the study: (1) data cleaning (determination if eligibility criteria met and examination of valid and invalid scores by item), (2) pre-derivation processing (recoding count variables), (3) derivation of scale scores, (4) descriptive assessment of derived scores, and (5) assessment of missing data. Reports on the cleaning process as well as the missing data were generated, with all reports being reviewed by the TREC lead investigator.

Data, for the secondary data analysis, were accessed through the central study server at the University of Alberta through the Health Research Data Repository, with secure online proxy access. Data is only able to leave the Health Research Data Repository in aggregate output form through Igloo, which is a secure intranet file sharing system used by the TREC to share and manage files. All data analysis was completed within the Health Research Data Repository system.

The secondary analysis for this thesis study used survey data collected from registered nurses (n = 308) and licensed practical nurses (n = 448) as well as facility level data collected from facility administrators (n=89). Inclusion criteria for registered nurses and licensed practical nurses is provided in **Table 3-2.**

Table 3-2: Inclusion and Exclusion Criteria for Nurses

Inclusion Criteria	Nurse Exclusion Criteria
1. Identify a unit within a facility where they have worked for at least three months and are now working 2. Worked a minimum of six shifts per month on this unit	1. Licensed practical nurse/registered nurse student 2. Nursing instructors whose primary role is supervising students

Note. Adapted from "Study protocol for the translating research in elder care (TREC): building context – an organizational monitoring program in long-term care project (project one)," by C. A. Estabrooks, J. E. Squires, G. G. Cummings, G. F. Teare, and P. G. Norton, 2009, *Implementation Science,* 4, 52. Copyright 2009 Estabrooks et al. Adapted with permission.

Sample Size

In the literature, there are many suggestions for sample size calculations for multiple linear modeling (GEE is one kind of multiple linear modeling). One approach for estimating minimum sample size is to apply the 50 +8k rule [8], where in k represents the number of independent variables. This formula was used to determine if the sample size available in the TREC dataset (n=756 nurses) was appropriate for the number of independent variables that could potentially be entered into the GEE models if significant. There were a total of 63 potential variables to be entered into the models (categorical variables were counted as multiple variables where the number included was the number of categories minus one), which would require a minimum sample size of 554 nurses.

Measures

A complete listing of the dependent and independent variables used in this secondary analysis, along with their definition, measurement and reliability is in **Table 3-3.** A summary of the included variables is described next.

Dependent variables.

The dependent variables for this study were instrumental research use, conceptual research use, and persuasive research use.

Instrumental research use involves the direct application of research evidence in caring for long-term care residents, meaning that practice is guided by guidelines, protocols, routines, care plans, or procedures based on research. Instrumental research use, in TREC, was measured with a single item on the TREC nurse survey; nurses were asked to indicate the percentage of time (in five categories: 10% or less of the time, about 25% of the time, about 50% of the time, about 75% of the time, almost 100% of the time) that they used research directly to care for residents during their last typical work day. On the TREC survey, the item was preceded by a definition and examples of instrumental research use. This item was reported as a valid measure of instrumental research use in a systematic review of psychometric properties of self-report research use measures [9].

Table 3-3: Descriptions, Measurements and Reliability of Independent and Dependent Variables

Category	Variable	Definition	Measurement	α
Dependent Variables	Instrumental Research Use **(1 item)**	Using observable research-based practices when caring for residents. By this we mean that practice may be guided by guidelines, protocols, routines, care plans, or procedures based on research.	Single item, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day.	N/A
	Conceptual Research Use **(5 items)**	Thinking about research-based knowledge and using it to inform your clinical decision making.	Conceptual Research Utilization Scale [10]. Five items, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day. An overall score is derived by taking the mean of the 5 items.	0.965
	Persuasive Research Use **(1 item)**	Using research findings to *win* an argument or *make a case* to someone, regardless of whether you have made a thorough assessment of the research.	Single item, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day.	N/A
Individual Variables	Sex	An individual's sex.	Asked for sex: male or female.	N/A
	Age	An individual's age.	Asked to indicate age category.	N/A
	Highest Education	Highest level of education obtained (recoded from individual education responses)	Asked if completed: diploma/certificate, bachelor's certificate, master's degree and/or PhD (yes/ no).	N/A
	Specialized Courses	Specialized courses completed in addition to previously listed post-secondary education.	Asked to answer: yes/no.	N/A
	Current Enrolment Status	Current enrolment in an educational program.	Asked to answer: yes/no.	N/A
	Shift Worked	Shift worked most of the time.	Asked to indicate if they work primarily day, evening or night shifts.	N/A
	Employment Status	Employment status on that unit.	Full time, part time or casual.	N/A
	Hours Worked	In the last typical two-week period, how many hours that were worked.	Numerical response (number of hours).	N/A
	Years Worked as Nurse	Total number of years worked as a nurse.	Asked for number of years and months worked as a nurse.	N/A

Category	Variable	Definition	Measurement	α
	Research Activities *(note: analyzed as 5 separate variables)*	Involvement in a series of five research related activities.	Asked to answer: yes/no for all five activities 1. Research as part of a post-graduate study 2. Data collector for someone else's research project 3. Journal club 4. Education/courses/workshops in research e.g. statistics 5. Presenting research results from the literature (defined by respondents, informal or formal)	N/A
	Job Satisfaction	An individual's perception of whether they are "satisfied" in their job.	Michigan Organizational Assessment Questionnaire, Job Satisfaction Subscale [11]. Three items, all scored on a five-point Likert agreement scale (ranging from 1) strongly disagree to 5) strongly agree).	0.859
	Problem Solving	The cognitive, affective and behavioural processes and the particular set of skills employed in order to find solutions for the challenges of everyday life.	Abbreviated Heppner's Problem Solving Inventory [12]. 10 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 10 items.	0.708
	Attitude Towards Research	An individual's perception of their attitude toward research knowledge expressed along a continuum of negative to positive.	Adapted from Lacey's Attitudes to Research scale [13]. 6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 6 items.	0.806
	Belief Suspension – Willingness	The degree to which an individual is able to suspend previously held beliefs in order to implement a research-based change. It taps personal beliefs of the healthcare worker (i.e. those beliefs that originate in the family of origin (the home), in school/training, or within the work context.	Adapted from Estabrook's Research Utilization Survey [12]. A total of 6 items with 3 items per subscale scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 3 items in each subscale.	0.813
	Belief Suspension – Implement			0.830
	Organizational Citizenship Behaviour	Reflects constructive efforts by individuals to identify and implement changes with respect to work methods, policies and procedures to improve situation and performance.	Measured using a version of Choi's 2007 Organizational Citizenship Behaviour – Organization scale [11.14]. 4 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 4 items.	0.780
	Work Eng. – Vigor	Commitment to one's job. Nine statements, related to how one feels at work, form three subscales: dedication, vigor and absorption.	UWES-9 (Utrecht Work Engagement Scale) [15]. Nine items on 6-point Likert frequency scales (ranging from never to daily) rating how often they have experienced feelings related to their job.	0.876
	Work Eng. – Dedication			0.828
	Work Eng. – Absorption			0.755

Category	Variable	Definition	Measurement	α
	Emp. – Competence	Feelings about work life.	Spreitzer's Psychological Empowerment scale [16]. 12 items with 3 items/subscale; all scored on a 5-point Likert agreement scale (ranging from 1) strongly disagree to 5) strongly agree).	0.870
	Emp. – Meaning			0.914
	Emp. – Self Determination			0.895
	Emp. – Impact			0.821
	Physical Health Status	An individual's perception of their health status over past 4 weeks.	SF-8™ health survey [17]. 8 items scored on 5- or 6-point Likert scales. Scoring was done using a proprietary algorithm (granted with permission to use the scale) to produce a summary mental and physical health score (0% to 100%).	N/A
	Mental Health Status			N/A
	Burnout – Exhaustion	Burnout is a debilitating psychological condition brought about by unrelieved work stress.	The Maslach Burnout Inventory General Survey (short form) [18]. 3 items/subscale; all scored on a 7-point Likert frequency scale (never to daily). A mean was calculated for each subscale.	0.800
	Burnout – Cynicism			0.707
	Burnout – Efficacy			0.621
Context Variables	Adequate Orientation	An individual's perception of whether they had enough orientation to do their job safely and effectively.	A single item scored on a 5-point Likert agreement scale (strongly disagree to strongly agree).	N/A
	Dementia Related Responsive Behaviours	Aggressive behaviours towards staff by residents.	Sum of six items: threat of assault, emotional abuse, physical abuse, verbal sexual harassments, sexual assault, and forced sexual intercourse. Each item was scored as yes or no based on if the respondent had experienced the behaviour during their last five shifts.	N/A
	ACT: Leadership	The actions of formal leaders in an organization (unit) to influence change and excellence in practice, items generally reflect emotionally intelligent leadership.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 6 items.	0.879
	ACT: Culture	The way that "we do things" in our organizations and work units, items generally reflect a supportive work culture.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.857
	ACT: Evaluation	The process of using data to assess group/team performance and to achieve outcomes in organizations or units.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.914
	ACT: Social Capital	The stock of active connections among people. These connections are of 3 types: bonding, bridging, and linking.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.849

Category	Variable	Definition	Measurement	α
	ACT: Formal Interactions	Formal exchanges that occur between individuals working within an organization (unit) through scheduled activities that can promote the transfer of knowledge.	4 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 4 item scores to "0" (no interaction) and "1" (interaction). An overall score was derived by taking a count of the 4 recoded items.	0.689
	ACT: Informal Interactions	Informal exchanges that occur between individuals working within an organization (unit) that can promote the transfer of knowledge.	9 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 9 item scores to "0" (no interaction) and "1" (interaction). An overall score was derived by taking a count of the 9 recoded items.	0.786
	ACT: Structural and Electronic Resources	The structural and electronic elements of an organization (unit) that facilitate the ability to assess and use knowledge.	10 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 10 item scores to 0 (no resource) or 1 (resource). An overall score was derived by taking a count of the 10 items.	0.801
	ACT: Organizational Slack-Staff	The cushion of actual or potential resources which allows an organization (unit) to adapt successfully to internal pressures for adjustments or to external pressures for changes.	3 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 3 items.	0.936
	ACT Organizational Slack-Time		4 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 4 items.	0.814
	ACT Organizational Slack-Space		2 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall was derived by taking the mean of the 2 items.	0.834
	Province	Province in which the nursing home is located.	Alberta, Manitoba, or British Columbia.	N/A
	Health Region	Health region within the province in which the nursing home is located.	Alberta: Region 1 and 2. BC: Region 1 and 2.	N/A
	Owner Operator Model	Ownership and operation model of the facility.	Public: publicly funded, operated and managed by the province (or regional equivalent). Private: owned and managed by a corporate for-profit corporation or chain. Voluntary: publicly funded, operated and managed by a not-for-profit organization other than government (e.g. faith based, municipal, board of directors).	N/A
	Beds in Facility	Total number of beds for residents in facility.	Sum of long-term care beds and non-long-term care beds.	N/A
	Facility Size	Size of facility based on three bed number categories.	Small (<80 beds), medium (80-120 beds), large (>120 beds).	N/A

Note. Work Eng = Work Engagement, Emp = Empowerment, ACT= Alberta Context Tool, α= Cronbach's alpha

Conceptual research use involves the indirect application of research, wherein one thinks about research-based knowledge and uses it to inform their clinical decision making. Conceptual research use was measured with the Conceptual Research Utilization Scale [4] which consists of five items. Nurses were asked to indicate the percentage of time (in the same five categories as indicated above for instrumental research use) that they used research conceptually during their last typical work day. As with instrumental research use, the item was preceded by a definition and examples of conceptual research use. An overall conceptual research use score was derived by taking a mean of the five items. The Cronbach's alpha for the Conceptual Research Use Scale in this study was 0.965.

Persuasive research use involves using research findings to win an argument or make a case to someone, regardless of whether there has been a thorough assessment of the research. Persuasive research use was measured with a single item. Nurses were asked to indicate the percentage of time (in the same five categories as indicated above for instrumental research use) that they used research persuasively during their last typical work day. This item was also reported as a valid measure of persuasive research use the systematic review of psychometric properties of self-report research use measures [9].

Independent variables.

Independent variables were chosen based on their availability in the TREC data, along with consideration for theoretical (PARiHS framework) and/or empirical support of a relationship with instrumental, conceptual and/or persuasive research use. Independent variables were broken down into two categories (individual and contextual (i.e. organizational) and are described below.

Individual-level variables.

Individual variables included were: a) ***demographic variables*** (sex, age, education (data were recorded to highest level of education – diploma, bachelors or graduate studies), specialized courses, current enrolment status, shift worked, employment status, average hours worked in a two-week period, and years worked as a nurse); b) ***research activities*** (research as part of a post-graduate study, data collector for someone else's research project, journal club, education/ courses/workshops in research, presenting research results from the literature); c) ***job satisfaction***, measured using the Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale [11]; d) ***problem solving ability***, measured using an abbreviated version of Heppner's Problem Solving Inventory [12]; e) ***attitude towards research***, measured using a modified version of Lacey's Attitude to Research scale [13]; f) two dimensions of ***belief suspension*** (willingness and implement), measured using Estabrooks' Research Utilization Survey [12]; g) ***organizational citizenship behaviour***, measured using an adapted version of Choi's 2007 Organizational Citizenship Behaviour – Organization scale [11,14]; h) three dimensions of ***work engagement*** (vigor, dedication, absorption), measured with the Utrecht Work Engagement Scale [15]; i) four dimensions of ***empowerment*** (competence, meaning, self-determination and impact), measured using Spreitzer's Psychological Empowerment Scale [16]; j) ***physical health status*** and ***mental health status***, measured using the SF-8 Health Survey [17]; and k) three dimensions of ***burnout*** (exhaustion, cynicism, efficacy), measured using the Maslach Burnout Inventory-Short Form [18].

Context-level variables.

Context outcomes included were primarily from the Alberta Context Tool [19] and were collected from nurses using the TREC provider survey. The Alberta Context Tool is a tool

designed to study organizational context and was modified for the long-term care setting in TREC 1.0 [20]. The Alberta Context Tool is comprised of 10 concepts: 1) leadership, 2) culture, 3) evaluation, 4) social capital, 5 – 7) organizational slack: staff, time, and space, 8) formal interactions, 9) informal interactions, and 10) structural and electronic resources. Other contextual variables collected on the nurse survey included: adequate orientation, and dementia related responsive behaviours (aggression towards staff from residents). Some facility variables collected from facility administrators using TREC facility profile forms were also included: province, health region, owner operator model, number of beds in facility, and facility size.

Data Analysis and Modeling Approach

TREC data has a natural hierarchical structure [21], meaning that nurses are nested within facilities, regions, and provinces. Each facility has a unique work context that is shared by the nurses of that institution, therefore nurse responses may be correlated [22]. For this thesis, Generalized Estimating Equation modeling was used, although other multiple linear regression models such as two-level hierarchical linear modelling (individual and nursing home level) could have also been used [23].

Generalized Estimating Equation modeling is an appropriate method as it is designed to be used with clustered data and provides the ability to model similarities between nurses that arise from individual similarities, similarities resulting from measured facility characteristics, and similarities potentially arising from unmeasured facility characteristics [22]. Additionally, GEE allows the researcher to have data remain at the individual level, rather than aggregating it up, which retains variability [24]. Several steps were taken to determine which variables to enter into the Generalized Estimating Equation models, the details of which follow. All analyses were completed in SPSS v24 for Windows (Chicago, IL, USA).

First, descriptive statistics and bivariate tests were used to compare registered nurses and licensed practical nurses with respect to the dependent variables (instrumental, conceptual and persuasive research use). There were no significant differences in the scores obtained between registered nurses and licensed practical nurses on any of the three dependent variables (**Table 3-4**). Therefore, for this thesis, registered nurses and licensed practical nurses were combined and a single model run with all nurses together for each kind of research use.

Table 3-4: Comparison of Independent Variables by Nursing Role

Variables [Mean, (SD)]	Registered Nurse *n= 308*	Licensed Practical Nurse n= *448*	Total *n= 756*	p value (t-test)
Instrumental Research Use (1-5)	3.46 (1.28)	3.33 (1.32)	3.38 (1.31)	.160
Conceptual Research Use (1-5)	3.27 (1.27)	3.12 (1.24)	3.18 (1.25)	.093
Persuasive Research Use (1-5)	3.17 (1.42)	2.99 (1.46)	3.06 (1.44)	.103

Second, a theoretical and empirical approach was used to determine a preliminary list of all possible independent variables to be included in my thesis. The PARiHS framework [25], the Alberta Context Tool [19], and the literature search (Chapter 2, empirical evidence) guided the selection of contextual variables, and the literature search guided the selection of individual variables. Demographic variables were selected, even if they did not have an empirical relationship with nurses' research use in the literature, to allow for a description of the sample of nurses. All variables that were selected along with their reason for inclusion are listed in **Table 3-5**, where T means theoretical reasoning, E means empirical reasoning (references are listed), and O means other. Other reasons included: demographic characteristics, variables that were predictive of care aides best practice use, and variables that been thought to be related to nurses' research use in the literature but have not yet been empirically tested.

Third, all potentially relevant variables were categorized by their level of measurement and the most appropriate bivariate test was determined. Bivariate analysis of all independent variables was conducted for each of the three dependent variables separately (instrumental, conceptual and persuasive research use) to determine if a statistically significant relationship existed between the variable and any of the three kinds of research use (see **Table 3-6**.)

Fourth, Generalized Estimating Equation models were constructed separately for each kind of research use, with all bivariate factors that were significant at $p<.05$ being entered into the models (see **Table 3-7**.) Variables indicated by a X in table 3-7 were entered into the respective (for the kind of research use) General Estimating Equation model. Generalized Estimating Equation models were run with list-wise deletion and had a significance level of $p<.05$.

Table 3-5: Potential Independent Variables for Inclusion in the Models and Appropriate Bivariate Tests

Category	Variable	Empirical (E), Theoretical (T) or Other (O)	Measurement	Bivariate Test
Individual Variables	Sex	O (demographic)	Nominal	Independent Group t-test
	Age	O (demographic)	Ordinal	One-way ANOVA
	Highest Education	E [26]	Ordinal	One-way ANOVA
	Specialized Courses	E [27, 28]	Nominal	Independent Group t-test
	Current Enrolment Status	O (demographic)	Nominal	Independent Group t-test
	Shift Worked	O (demographic)	Nominal	One-way ANOVA
	Employment Status	O (demographic)	Nominal	One-way ANOVA
	Hours Worked	O (demographic)	Ratio	Pearson's *r*
	Years Worked as Nurse	O (demographic)	Ratio	Pearson's *r*
	Research Activities (treated as separate) 1. Research as part of a post-graduate study 2. Data collection for someone else 3. Participation in a journal club 4. Education, courses, or workshops in research 5. Presented research results	E [22, 28, 29]	Nominal	Independent Group t-test
	Job Satisfaction	E [26]	Interval	Pearson's *r*
	Problem Solving	E [30]	Interval	Pearson's *r*
	Attitude Towards Research	E [26, 29-33]	Interval	Pearson's *r*
	Belief Suspension – Willingness	E [22, 26, 30]	Interval	Pearson's *r*
	Belief Suspension – Implement	E [22, 26, 30]	Interval	Pearson's *r*
	Organizational Citizenship Behaviour	O [11, 14]	Interval	Pearson's *r*
	Work Engagement – Vigor	O [11, 15]	Interval	Pearson's *r*
	Work Engagement – Dedication	O [11, 15]	Interval	Pearson's *r*
	Work Engagement – Absorption	O [11, 15]	Interval	Pearson's *r*
	Empowerment – Competence	O [11, 16]	Interval	Pearson's *r*
	Empowerment – Meaning	O [11, 16]	Interval	Pearson's *r*

Category	Variable	Empirical (E), Theoretical (T) or Other (O)	Measurement	Bivariate Test
	Empowerment – Self Determination	O [11, 16]	Interval	Pearson's *r*
	Empowerment – Impact	O [11, 16]	Interval	Pearson's *r*
	Physical Health Status	O [17]	Interval	Pearson's *r*
	Mental Health Status	O [17]	Interval	Pearson's *r*
	Burnout – Exhaustion	O [18]	Interval	Pearson's *r*
	Burnout – Cynicism	E [22]	Interval	Pearson's *r*
	Burnout – Efficacy	O (care aides) [21]	Interval	Pearson's *r*
Contextual Variables	Adequate Orientation	E [34]	Interval	Pearson's *r*
	Dementia Related Responsive Behaviours *	O [35]	Interval*	Spearman's *rho*
	Alberta Context Tool: Leadership	T [19, 20, 25]	Interval	Pearson's *r*
	Alberta Context Tool: Culture	T [19, 20, 25]	Interval	Pearson's *r*
	Alberta Context Tool: Evaluation	T [19, 20, 25]	Interval	Pearson's *r*
	Alberta Context Tool: Formal Interactions *	T [19, 20]	Interval*	Spearman's *rho*
	Alberta Context Tool: Informal Interactions *	T [19, 20]	Interval*	Spearman's *rho*
	Alberta Context Tool: Social Capital	T [19, 20]	Interval	Pearson's *r*
	Alberta Context Tool: Structural and Electronic Resources *	T [19, 20]	Interval	Spearman's *rho*
	Alberta Context Tool: Organizational Slack-Staff	T [19, 20]	Interval	Pearson's *r*
	Alberta Context Tool: Organizational Slack-Space	T [19, 20]	Interval	Pearson's *r*
	Alberta Context Tool: Organizational Slack-Time	T [19, 20]	Interval	Pearson's *r*
	Province	O (demographic)	Nominal	One-way ANOVA
	Health Region	O (demographic)	Nominal	One-way ANOVA
	Owner Operator Model	O (demographic)	Nominal	One-way ANOVA
	Beds in Facility	O (demographic)	Ratio	Pearson's r
	Facility Size	O (demographic)	Ordinal	One-way ANOVA

* - item involves count, not Likert scale

Table 3-6: Bivariate Analysis

Category	Variable	Bivariate Test	IRU		CRU		PRU	
			test value	p-value	test value	p-value	test value	p-value
Individual Variables	Sex	t-test	1.661	.097	**2.122**	**.034**	1.852	.064
	Age (10 years)	ANOVA	1.622	.152	**3.170**	**.008**	1.324	.252
	Role (RN vs. LPN)	t-test	1.405	.160	1.684	.093	1.633	.103
	Education (Highest Level)	ANOVA	0.793	.453	**6.118**	**.002**	1.359	.258
	Specialized Courses	t-test	0.641	.522	-1.357	.157	.174	.862
	Current Enrolment Status	t-test	-0.707	.480	-0.026	.979	-.093	.926
	Shift Worked	ANOVA	0.785	.457	2.469	.085	.406	.667
	Employment Status	ANOVA	2.890	.056	1.608	.201	2.639	.072
	Hours Worked	Pearson's *r*	-0.013	.724	0.074	.054	**.078**	**.041**
	Years Worked as Nurse	Pearson's *r*	0.055	.149	**-0.121**	**.002**	-.043	.260
	Research as Part of a Post-Graduate Study	t-test	0.917	.359	1.223	.222	.241	.810
	Data Collection for Someone Else	t-test	0.679	.497	0.290	.772	1.307	.192
	Participation in a Journal Club	t-test	0.071	.943	0.268	.789	1.187	.236
	Education, Courses, or Workshops in Research	t-test	0.850	.396	**2.319**	**.021**	**2.197**	**.028**
	Presented Research Results	t-test	**2.743**	**.012**	0.302	.763	0.397	.691
	Job Satisfaction	Pearson's *r*	**0.222**	**<.001**	**0.285**	**<.001**	**0.228**	**<.001**
	Problem Solving	Pearson's *r*	**0.266**	**<.001**	**0.149**	**<.001**	**0.182**	**<.001**
	Attitude Towards Research	Pearson's *r*	**0.292**	**<.001**	**0.365**	**<.001**	**0.281**	**<.001**
	Belief Suspension – Willingness	Pearson's *r*	**0.136**	**<.001**	**0.161**	**<.001**	**0.089**	**.016**
	Belief Suspension – Implement	Pearson's *r*	**0.198**	**<.001**	**0.238**	**<.001**	**0.178**	**<.001**
	OCB	Pearson's *r*	**0.170**	**<.001**	**0.267**	**<.001**	**0.235**	**<.001**
	Work Eng. – Vigor	Pearson's *r*	**0.226**	**<.001**	**0.319**	**<.001**	**0.234**	**<.001**
	Work Eng. – Dedication	Pearson's *r*	**0.210**	**<.001**	**0.310**	**<.001**	**0.228**	**<.001**
	Work Eng. – Absorption	Pearson's *r*	**0.213**	**<.001**	**0.244**	**<.001**	**0.201**	**<.001**
	Emp. – Competence	Pearson's *r*	**0.195**	**<.001**	**0.198**	**<.001**	**0.191**	**<.001**

Category	Variable	Bivariate Test	IRU		CRU		PRU	
			test value	p-value	test value	p-value	test value	p-value
	Emp. – Meaning	Pearson's *r*	**0.199**	**<.001**	**0.247**	**<.001**	**0.212**	**<.001**
	Emp. – Self Determination	Pearson's *r*	**0.163**	**<.001**	**0.289**	**<.001**	**0.249**	**<.001**
	Emp. – Impact	Pearson's *r*	**0.191**	**<.001**	**0.276**	**<.001**	**0.258**	**<.001**
	Physical Health Status	Pearson's *r*	**0.118**	**.002**	**0.143**	**<.001**	0.030	.418
	Mental Health Status	Pearson's *r*	**0.183**	**<.001**	**0.187**	**<.001**	**0.141**	**<.001**
	Burnout – Exhaustion	Pearson's *r*	**-0.191**	**<.001**	**-0.197**	**<.001**	**-0.160**	**<.001**
	Burnout – Cynicism	Pearson's *r*	**-0.185**	**<.001**	**-0.194**	**<.001**	**-0.141**	**<.001**
	Burnout – Efficacy	Pearson's *r*	**0.201**	**<.001**	**0.289**	**<.001**	**0.244**	**<.001**
Contextual Variables	Adequate Orientation	Pearson's *r*	**0.178**	**<.001**	**0.217**	**<.001**	**0.178**	**<.001**
	Dementia Related Responsive Behaviours *	Spearman's *rho*	0.001	.978	-0.053	.158	-0.050	.175
	ACT: Leadership	Pearson's *r*	**0.195**	**<.001**	**0.238**	**<.001**	**0.184**	**<.001**
	ACT: Culture	Pearson's *r*	**0.246**	**<.001**	**0.327**	**<.001**	**0.248**	**<.001**
	ACT: Evaluation	Pearson's *r*	**0.242**	**<.001**	**0.324**	**<.001**	**0.282**	**<.001**
	ACT: Formal Interactions *	Spearman's *rho*	**0.146**	**<.001**	**0.235**	**<.001**	**0.246**	**<.001**
	ACT: Informal Interactions *	Spearman's *rho*	**0.193**	**<.001**	**0.223**	**<.001**	**0.195**	**<.001**
	ACT: Social Capital	Pearson's *r*	**0.273**	**<.001**	**0.252**	**<.001**	**0.196**	**<.001**
	ACT: S & E Resources *	Spearman's *rho*	**0.311**	**<.001**	**0.376**	**<.001**	**0.335**	**<.001**
	ACT: Organizational Slack-Staff	Pearson's *r*	**0.101**	**<.001**	**0.266**	**<.001**	**0.150**	**<.001**
	ACT: Organizational Slack-Space	Pearson's *r*	**0.177**	**<.001**	**0.236**	**<.001**	**0.165**	**<.001**
	ACT: Organizational Slack-Time	Pearson's *r*	**0.250**	**<.001**	**0.268**	**<.001**	**0.181**	**<.001**
	Province	ANOVA	0.195	.823	0.136	.873	0.080	.923
	Health Region	ANOVA	0.680	.606	7.462	**<.001**	1.530	.192
	Owner Operator Model	ANOVA	0.253	.776	0.856	.425	0.897	.408
	Beds in Facility	Pearson's r	0.051	.164	0.031	.400	0.009	.801
	Facility Size	ANOVA	0.645	.525	1.280	.279	0.157	.855

Legend: * on variable name means that it is a count (non-parametric); Work Eng = Work Engagement, Emp = Empowerment, ACT= Alberta Context Tool, OCB= Organizational citizenship behaviour, S & E = structural and electronic, IRU = instrumental research use, CRU= conceptual research use, PRU= persuasive research use

Ethics Statement

Data were securely stored on the University of Alberta Health Research Data Repository server, with only results being exported, in accordance to the TREC Data Policy. The TREC data policy has been developed in accordance to University of Alberta Research Ethics Board regulations, as well as the Tri-Council Policy Statement 2 and Canadian Institutes of Health Research Best Practices for Protecting Privacy in Health Research [36]. I received training on how to access and use the data securely and remotely. My supervisor (Janet E. Squires, who is a TREC investigator) also had access to the data.

Ethical approval to assess data for the secondary data analysis was obtained through the University of Ottawa Research Ethics Board (H09-17-01; see **Appendix A**). Informed consent from participants was not required as per article 5.5B of the Tri-Council Policy Statement 2 - "researchers shall seek [research ethics board] review, but are not required to seek participant consent, for research that relies exclusively on the secondary use of non-identifiable information" [37]. This study had consent from the TREC principal investigator, Carole Estabrooks (see **Appendix B**).

Table 3-7: Significant Bivariate Tests

Category	Variable	Conceptual	Instrumental	Persuasive
Individual	Sex	X		
	Age (Ten Years)	X		
	Education (Highest Level)	X		
	Education, Courses, or Workshops in Research	X		X
	Presented Research Results		X	
	Hours Worked			X
	Years Worked as Nurse	X		
	Job Satisfaction	X	X	X
	Adequate Orientation	X	X	X
	Problem Solving	X	X	X
	Attitude Towards Research	X	X	X
	Belief Suspension – Willingness	X	X	X
	Belief Suspension – Implement	X	X	X
	Organizational Citizenship Behaviour	X	X	X
	Work Engagement – Vigor	X	X	X
	Work Engagement – Dedication	X	X	X
	Work Engagement – Absorption	X	X	X
	Empowerment – Competence	X	X	X
	Empowerment – Meaning	X	X	X
	Empowerment – Self Determination	X	X	X
	Empowerment – Impact	X	X	X
	Physical Health Status	X	X	
	Mental Health Status	X	X	X
	Burnout – Exhaustion	X	X	X
	Burnout – Cynicism	X	X	X
	Burnout – Efficacy	X	X	X
Contextual	Alberta Context Tool: Leadership	X	X	X
	Alberta Context Tool: Culture	X	X	X
	Alberta Context Tool: Evaluation	X	X	X
	Alberta Context Tool: Social Capital	X	X	X
	Alberta Context Tool: Organizational Slack-Staff	X	X	X
	Alberta Context Tool: Organizational Slack-Time	X	X	X
	Alberta Context Tool: Organizational Slack-Space	X	X	X
	Alberta Context Tool: Formal Interactions *	X	X	X
	Alberta Context Tool: Informal Interactions *	X	X	X
	Alberta Context Tool: Structural and Electronic Resources *	X	X	X
	Health Region	X		
	N Significant	35	30	30

Legend: * on variable name means that it is a count (non-parametric)

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Chapter Four

Predictors of Nurses' Research Use Canadian Long-Term Care Homes

This chapter is a version of the manuscript formatted for submission to the Journal of American Medical Directors Association.

Title: Predictors of nurses' research use in Canadian long-term care homes

Running title: Nurses' research use in long-term care homes

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The following is a listing of which authors were involved in each stage of this publication: study concept and design: MDV, CE, JS; acquisition of data: MDV, JS; analysis and interpretation of data: MDV, DS, JB, CE, JS; drafting of the manuscript: MDV; critical revision of the manuscript for important intellectual content: MDV, DS, JB, CE, JS; and final approval of the manuscript: MDV, DS, JB, CE, JS.

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Abstract

Objectives: We examined the influence of individual characteristics and organizational context features on nurses' self-reported use of research evidence in residential long-term care (LTC).

Design: A cross-sectional analysis of survey data collected in the Translating Research in Elder Care program.

Framework: The PARiHS framework.

Setting and Participants: 756 nurses (registered nurses and licensed practical nurses) from 89 residential LTC facilities in Western Canada.

Measures: Generalized Estimating Equation modeling was used to identify which individual characteristics and organizational context features significantly predict ($p<.05$) three kinds of self-reported use of research evidence by nurses: instrumental (the direct application of research findings to practice), conceptual (using research findings to change thinking), and persuasive (using research findings to make a point or convince others).

Results: There were no significant differences in mean research use scores by nursing role. Predictors of instrumental research use at the individual level were: past presentation of research, problem solving ability, and attitude towards research; and at the organizational level were: availability of structural and electronic resources, engaging in formal interactions, and better perceptions of organizational slack-staff. Predictors of conceptual research use at the individual level were attitude towards research, self determination (empowerment), and job efficacy (burnout); and at the organizational level were: structural and electronic resources. Predictors of persuasive research use at the individual level were: attitude towards research, belief suspension, organizational citizenship behaviour, self determination (empowerment), and job efficacy

(burnout); and at the organizational context level were: availability of structural and electronic resources, evaluation, and better perceptions of organizational slack-time.

Conclusions: Conceptual research use and persuasive research use by nurses in LTC were most strongly influenced by individual characteristics, while instrumental research use was predicted equally by individual and organizational variables. A more positive attitude towards research (individual-level) and better access to structural and electronic resources (organizational-level) were the only variables that predicted all three kinds of research use.

Keywords: research use, nurses, long-term care, context, Alberta Context Tool, TREC

Predictors of Nurses' Research use in Canadian Long-Term Care Homes

Introduction

Staff who provide direct nursing and personal care to residents in long-term care (LTC) homes include care aides and nurses (i.e. registered nurses (RNs) and licensed practical nurses (LPNs)) [1]. Nurses working in LTC often have leadership roles, in which they help achieve high standards of care through goal setting, mentoring and supervision of care aides, and use of best health care practices for residents [2]. Use of research evidence in practice leads to improved patient outcomes in LTC including: decreased depressive symptoms and antidepressant use [3], reduced falls and recurrent falls [4], and reduced urinary tract infections [5].

Research use refers to the use of research evidence in any aspect of one's work [6]. It is a multidimensional construct consisting of three kinds of research use: instrumental, conceptual and persuasive [6, 7]. Instrumental research use, otherwise known as direct research use, involves the direct application of research evidence in practice, meaning that practice is guided by guidelines, protocols, routines, care plans, or procedures based on research [6-9]. An example is the use of clinical guidelines for pressure sore management. Conceptual research use, also known as indirect research use, involves the indirect application of research, wherein one thinks about research-based knowledge and uses it to inform their clinical decision making [6-9]. An example is the application of knowledge of behaviours characteristic of Alzheimer's disease to plan care for residents exhibiting difficult behaviours. Persuasive research use, also known as symbolic research use, involves using research findings to win an argument or make a case to someone, regardless of whether there has been a thorough assessment of the research [6-9]. An example is using documented pain assessments and pain guidelines to advocate for appropriate analgesic/sedative medications.

Efforts to improve nurses' use of research evidence are more likely to be successful when they are planned with attention to the identified determinants of research use [7]. However, little is known about determinants of research use in LTC. In a scoping review of implementation research in LTC, Bostrom and colleagues found less than 1% of implementation studies related to the care of older adults [10]. To our knowledge, there are only three studies on the determinants to self-reported research use by nurses in LTC; one study from Sweden, which was reported in two articles [11, 12], and two unpublished dissertations [13, 14]. The only variable that was consistently significant in all three studies was a positive attitude towards research, which was positively related to nurses' research use. There are no published studies assessing kinds of self-reported research use by nurses in LTC in North America or investigating a wide range of individual and organizational context features concurrently in multivariate analysis. Therefore, the purpose of this study was to identify individual characteristics and organizational context features that predict nurses' self-reported use of research evidence in residential LTC. A secondary analysis of data from the Translating Research in Elder Care (TREC) program was undertaken.

Translating Research in Elder Care (TREC) Program

TREC is a multi-level (province, health region, facility, care units within facilities, staff and residents) and longitudinal research program. TREC aims to understand the effect of organizational context on research use and the subsequent effect on resident health outcomes and staff quality of work life outcomes in Canadian LTC homes [1, 15]. To date, TREC has occurred in two phases – TREC 1.0 (2009 – 2014), and TREC 2.0 (2014 – ongoing). Data from TREC 2.0 were used for this analysis.

In TREC 2.0, data were collected from care providers and facility managers across a stratified random sample of 91 LTC homes in three Canadian provinces: Alberta, Manitoba, and British Columbia. LTC homes were stratified by: 1) healthcare region (within province), 2) owner-operator model (public, private, voluntary) and 3) size (small: 1 to 79 beds, medium: 80 - 120, large: >120 beds). Eligible care providers completed the TREC survey – a suite of instruments that measure organizational context, research use, individual variables believed to impact research use, and staff outcomes believed to be sensitive to both organizational context and research use. Surveys were completed either online (nurses, allied health providers, practice specialists, care managers) or through computer assisted personal interviews (healthcare aides) [1, 15-21].

Theoretical Framework

An extension of the Promoting Action on Research Implementation in Health Services (PARiHS) framework was used to guide the TREC program [16]. According to PARiHS, successful implementation results from the interaction of three core elements: 1) context, 2) evidence, and 3) facilitation – each of which exist on a low-high continuum [22, 23]. Context, operationalized as the work environment, is composed of three dimensions (culture, leadership and evaluation); evidence is defined as knowledge derived from a variety of sources including research; and facilitation is defined as the process of enabling implementation [24].

Methods

Design.

A cross-sectional secondary analysis was performed on data collected between September 2014 and May 2015 in the TREC program.

Sample.

For this analysis, the sample comprised all nurses (RNs and LPNs, N=756) from 89 TREC facilities (two facilities were omitted due to there being no nurse survey data collected in those facilities). Eligibility criteria for nurses included working at the residential LTC in their current role for at least three months and working a minimum of six shifts per month.

Sample size calculation.

The minimum sample size needed was calculated utilizing the 50 + 8k rule, where 8 is the number of independent variables (categorical variables count as more than one variable, based on the number of categories) [25]. For this analysis, the minimum sample size, if all independent variables (n=63) were significant, was n=554. Therefore, the sample size was adequate to run all analyses.

Data collection and measures.

Nurses self-completed the TREC survey online. Facility level data were obtained both through standardized TREC unit and facility report forms, and short-structured interviews with facility administrators and managers. All TREC nurse, unit, and facility survey variables used in the analysis along with their definitions, measurement, and reliability are listed in **Table 1**.

Dependent variables.

The dependent variables for this study were self-reported instrumental research use (IRU), conceptual research use (CRU), and persuasive research use (PRU). Instrumental research use involves the direct application of research evidence in practice [6-9]. Conceptual research use involves the indirect application of research, wherein uses it to inform their clinical decision making [6-9]. Persuasive research use, also known as symbolic research use, involves using research findings to win an argument or make a case to someone, regardless of whether there has

been a thorough assessment of the research [6-9]. IRU and PRU were measured by a single item, presented after a definition of the research kind, which asked nurses to indicate the amount of time (in five categories: less than 10% of the time, about 25% of the time, about 50% of the time, about 75% of the time, almost 100% of the time) during their last typical shift that they used that kind of research. CRU was measured using the 5 item Conceptual Research Utilization Scale [26]. The CRU scale had a Cronbach's alpha of 0.965 in this study and used the same five categories of time as the single item questions for IRU and PRU.

Independent variables.

Independent variables were chosen based on their availability in the TREC survey, along with consideration for theoretical (PARiHS framework) and/or empirical support (individual and contextual determinants shown to have a relationship with nurses' use of research instrumentally, conceptually or persuasively.) Demographic variables were also included to provide characteristics of the sample.

Individual-level variables.

Individual variables included were: demographics (sex, age, highest education level, specialized courses, current education enrolment, shift worked, employment status, average hours worked in a two-week period, and years worked as a nurse); research activities (a series of five dichotomous questions about research activities, e.g. presenting research results from the literature); job satisfaction measured using the three-item Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale [27]; problem solving ability measured using an abbreviated version (ten items) of Heppner's Problem Solving Inventory [28]; attitude towards research measured using an adapted version (six items) of Lacey's Attitude to Research scale [29]; two dimensions of belief suspension (willingness – three items and implement – three

items) measured using Estabrooks' Research Utilization Survey [28]; organizational citizenship behaviour measured using an adapted version (four items) of Choi's 2007 Organizational Citizenship Behaviour – Organization scale [27, 30]; three dimensions of work engagement (vigor, dedication, absorption) measured with the Utrecht Work Engagement Scale (nine items) [31]; four dimensions of empowerment (competence, meaning, self-determination and impact) measured using Spreitzer's Psychological Empowerment Scale (12 items) [32]; physical health status and mental health status measured using the SF-8 Health Survey (eight items) [33], and three dimensions of burnout (exhaustion, cynicism, efficacy) measured using the Maslach Burnout Inventory-Short Form (nine items) [34]. All scales that were adapted or modified were used and validated in previous studies [1, 6, 20, 21, 27, 28].

Context-level variables.

Context outcomes were primarily from the Alberta Context Tool (ACT) [35]. The ACT is comprised of 53 items tapping ten concepts: leadership, culture, evaluation, social capital, formal interactions, informal interactions, structural and electronic resources, and organizational slack (comprising three concepts: staff, space, and time). The ACT has acceptable reliability and validity for use in residential LTC (with care aides and nurses) and with nurses in a variety of clinical settings [36]. Other contextual variables included: adequate orientation and dementia related responsive behaviours (both measured with the TREC nurse survey) and facility-level variables (province, health region, owner operator model, number of beds in facility, and facility size) measured on the TREC unit and facility profile forms.

Data analysis and modeling approach.

First, descriptive statistics were used to determine the levels of the three self-reported kinds of research use (CRU, IRU, and PRU) within the sample of nurses, as well as to create a

demographic profile of the sample. ***Second***, bivariate analysis of all independent variables was conducted, with each of the three kinds of research use to assist in selection of variables for modeling. ***Third***, Generalized Estimating Equations (GEE) models were constructed separately for each kind of research use, with all bivariate variables that were significant at $p<.05$ being entered into the models. GEE models were run with list-wise deletion and a set significance level of $p<.05$. GEE was selected as the modeling approach because TREC data has a natural hierarchal structure [1], meaning that nurses are nested within facilities, within regions, within provinces; therefore, nurse responses on the TREC survey may be correlated [7]. GEE modeling accounts for such clustering of data. All analyses were completed in SPSS v24 for Windows.

Results

Demographic characteristics.

The TREC survey was completed by 756 nurses (**Table 2**), with an overall response rate of 33.1%. The response rate was calculated by dividing the number of eligible surveys by the number of eligible staff. The majority of nurses were female (n=660, 87.3%), over 40 years of age (n=486, 64.3%), and worked day or evening shifts (n=652, 86.2%). The average number of hours worked in two weeks was 61.71 (SD=19.53) and the average length of time worked as a nurse was 8.75 years (SD= 9.36).

Bivariate analysis.

There were no significant differences for any the dependent variables (IRU, PRU, CRU) by province or by role (RN or LPN, see **Supplemental File**); therefore, a single analysis combining all nurses was undertaken. Mean scores for all study variables can be found in **Table 3**. In the bivariate analysis, a total of 35 variables were statistically significant at $p<.05$ for CRU, and 30 variables were significant for each of IRU and PRU. The three kinds of research use

(IRU, CRU and PRU) had 28 significant variables in common (see **Table 4**.) All significant variables from bivariate analysis were entered into their respective GEE models.

Multivariate analysis.

Overview.

From the GEE analysis, only two variables predicted all three kinds of research use: a positive attitude towards research (individual-level) and availability of structural and electronic resources (organizational context-level). In addition to the variables shared by all three kinds of research use, all variables that predicted CRU also predicted PRU. However, PRU also had further predictors, discussed below. The GEE analyses for IRU, CRU, and PRU are summarized in **Table 5.**

Instrumental research use.

At the individual level, three variables were statistically significant predictors of IRU: having presented research themselves previously (β = 0.604), problem solving ability (β = 0.344), and a positive attitude towards research (β = 0.290). At the organizational context level, significant predictors of IRU were availability of structural and electronic resources (β = 0.146), engaging in formal interactions (β = -0.117), and better perceptions of organizational slack-staff (β = -0.167).

Conceptual research use.

Significant predictors of CRU at the individual level included a positive attitude towards research (β = 0.476), self determination (empowerment) (β = 0.168), and job efficacy (burnout) (β = 0.141). At the organizational context level, only one predictor was significant – availability of structural and electronic resources (β = 0.117).

Persuasive research use.

Significant predictors of PRU at the individual level were positive attitude towards research (β = 0.336), belief suspension (implement) (β = 0.176), organizational citizenship behaviour (β = 0.215), self determination (empowerment) (β = 0.242), and job efficacy (burnout) (β = 0.140). At the organizational context level, significant predictors were availability of structural and electronic resources (β = 0.132), evaluation (feedback mechanisms) (β = 0.205) and better perceptions of organizational slack-time (β = -0.232).

Discussion

Nurse research use in Canadian long-term care homes.

In this study, there was no difference in mean research use scores between RNs and LPNs, despite differences in this population of RNs and LPNs in demographic, health related and work-related outcomes [37]. This study extends what is already known about nurse research use in LTC as, to our knowledge, it is the first published study to statistically compare RN and LPN research use levels. Conner [14], in an unpublished dissertation, reported mean research use scores for RNs and LPNs (working LTC in Eastern Canada) separately but did not compare them.

It is unclear how these findings of similar research use scores should be interpreted in view of the shifting staffing mix in LTC to more LPNs. Between 2007 and 2016, the proportion of LPNs in LTC in Canada increased from 50.3% to 56.3%, while the proportion of RNs decreased from 49.7% to 43.7% [38]. RNs and LPNs study from the same body of knowledge, but RNs study for a longer period of time and in a university setting, which is thought to allow for a greater foundational knowledge in clinical practice, decision making, and research use [39]. The educational preparation, knowledge and skills of RNs should allow them to care for more

complex and unstable patients as compared to LPNs [2]. Additionally, increasing RN staffing ratios in LTC homes reduces the probability of hospitalizations and mortality, and improves resident outcomes (e.g. fewer: falls, pressure ulcers, urinary tract infections, instances of catheter use, and instances of restraint use) [40-47]. Despite differences in their roles and responsibilities, education and skill set, and improved resident outcomes from increasing levels of RN staffing, statistically significant differences in research use scores were not found between RNs and LPNs.

Literature comparing research use between registered nurses and licensed practical nurses is limited, and to our knowledge only one study has previously examined research use by licensed practical nurses [13]. It is therefore uncertain if registered nurses and licensed practical nurses differ on research use scores in other countries or in other settings (e.g. acute care), and whether interventions to increase nurses' research use would be effective in both groups. Further study of licensed practical nurses' research use in a variety of clinical settings, with a comparison to registered nurses' research use is needed to determine if RNs and LPNs would respond to interventions to the same extent. Studies examining LPN research use, and potentially comparing it to RN research use within the same unit or facility, need to be conducted to determine if the lack of difference in research use scores of RNs and LPNs is a feature unique to the LTC setting.

One possible explanation for the lack of difference in mean research use scores between RNs and LPNs in long-term care is the undervaluing of long-term care in the nursing undergraduate education. In a survey of Canadian nursing and social work programs, Hirst and colleagues found that "79% of faculties reported that the gerontological content was primarily integrated within their generic baccalaureate programs" [48]. The lack of emphasis of

gerontology in the registered nursing program may affect attitudes towards long-term care in general and research use in long-term care settings.

Another possible explanation for the lack of difference in mean research use scores between RNs and LPNs is that the licensed practical nursing curriculum has evolved to include nursing research courses [49]. Additionally, in a longitudinal study of recently graduated RNs in Sweden, there were low overall reported extents of research use in nurses one and three years post-graduation, which Forsman and colleagues [50] argue raises the question of whether perspectives on nursing research included in nursing education are translated by graduates into clinical practice.

Resources facilitate the use of research.

At the organizational context level, access to structural and electronic resources was a predictor of all three kinds of research use. Structural and electronic resources, as defined in the Alberta Context Tool, are "the structural and electronic elements of an organization (unit) that facilitate the ability to assess and use knowledge" [35] and were measured as a count of ten specific resources. This resource scale was previously studied in relation to nurses' research use in acute pediatric settings, but with mixed results [7, 14]. However, other studies have found a significant relationship between overall research use and access to research findings [11] and multifaceted research related resources [51].

LTC managers and administrators should ensure that nurses have adequate access to structural and electronic resources. One strategy to improve availability of structural and electronic resources is to create desktop shortcuts to online databases and libraries [52]. This is intended to provide access to tools at the point of care and decrease the complexity of finding information [52]. Expanding on this strategy, the Midland and Canterbury District Health Boards

in New Zealand [53] created a web-based, evidence-based resource for nurses and midwives that included a centralized policy and procedures manual. The centralized, evidence-based policy and procedure manual was well received by nurses and was thought to decrease costs overall as compared to each individual facility or health board maintaining their own evidence-based policy and procedure manual [53]. Additionally, it allows for care practices to be aligned across districts and facilities. In order for the strategy to be fully implemented, access to a computer with the internet as well as time to search the policy and procedure manual are required [53].

Another strategy to improve availability of structural and electronic resources is to join a resource sharing network [54]. Networking provides access to resources and allows for interaction and collaboration between nurses [54]. An example of a resource sharing network is the Registered Nurses Association of Ontario's Best Practice Champions Network [55]. This network provides numerous tools and strategies to champion the implementation of nursing best practice guidelines including: e-bulletins, newsletters, social networking, and regular knowledge sharing teleconferences and webinars [55]. Another advantage of joining resource sharing networks is increasing the visibility of resources that are available, for example an e-orientation to LTC which aims to: "provide nurses, educators and leaders in long-term care with access to select, credible resources and the best available evidence to enhance orientation programs and processes [53]."

Other potential strategies include: implementation of a virtual journal club [56], providing mobile information technologies or applications [57], providing workshops by health science librarians reviewing credible web-based resources and strategies to retrieve and evaluate health-related research [58, 59], ensuring that workplace reference materials are current and user friendly [59], creating a single portal access with a good search engine [60] and ensuring policies

and procedures are evidence-based [59, 61]. Selection and tailoring of interventions will need to consider the context of the facility as well as input from the end-users (e.g. nurses) [62]. Ongoing monitoring and evaluation of interventions will also be needed to evaluate their success and iterate on possible improvements [62].

Important to establish positive attitudes.

In this study, a positive attitude towards research had a positive, significant relationship with all three kinds of research use (IRU, CRU, PRU) by nurses in LTC. This is consistent with other studies whose authors report that a positive attitude towards research was significantly related to overall research use in LTC [11] and acute care [63-65], and to conceptual research use in LTC [14]. Squires and colleagues, authors of a systematic review of individual determinants of nurse research use [66], found that attitude towards research had a consistent, significant positive relationship with IRU, overall research use, and general research use. Taken together, there is empirical support that attitude towards research use consistently predicts nurses' use of research regardless of the kind of research use and setting.

To our knowledge, despite the evidence supporting a link between nurses' attitude towards research and their research use, there are few studies examining predictors of nurses' attitudes towards research use and even fewer studies examining interventions to improve nurses' attitudes towards research. This lack of intervention studies within nursing may be due to the fact that attitudes are hard to change, but this does not discount the importance of changing nurses' attitudes towards research. Support exists for relationships between nurses' attitudes towards research and: critical thinking [65], participation in research activities [67, 68], organizational and peer support of research [67], previous involvement in research projects [67], post-basic education [67, 68], being a beginner practitioner [67], and position (i.e. staff nurse,

charge nurse, manager – [68]). Successful initiatives to improve nurses' attitudes towards research and evidence-based practice have included: the creation of a mentor training program and formalized structure [69], the implementation of an Evidence-Based Practice (EBP) program consisting of five implementation strategies [52], and the involvement of nurses in an accelerated EBP development program [70].

Spiva and colleagues [69] conducted a quasi-experimental study with two interventions – a mentor training program and the creation of a formalized structure ("adding EBP as a job description requirement; assigning EBP as an annual competency and as part of the nurse performance appraisal; and enhancing the clinical advancement program to incorporate the EBP model, tools, and mentoring" [69]) to enculturate evidence-based practice. Both interventions resulted in positive, significant improvements in nurses' knowledge, attitude, and skill level towards evidence-based practice. Yackel and colleagues [52] implemented an EBP program at two Army outpatient health facilities, which consisted of five interventions: 1) involving leadership in developing an EBP strategic plan, 2) providing staff nurses with an EBP workshop, 3) conducting an EBP mentorship/champion program, 4) revising performance standards, and 5) creating desktop shortcuts to a virtual library. The program resulted in a statistically significant improvement in nurses' beliefs about the value of EBP and their ability to implement it [52]. Varnell and colleagues [70] implemented a program wherein nurses attended a two hour a week session on EBP for eight weeks, which resulted in statistically significant improvements in nurses' attitudes towards EBP.

Additionally, initiatives to improve nurses' attitudes towards research have resulted in improved research knowledge and application, but without a statistically significant improvement in attitude towards research as attitudes were already at the higher end of a

negative to positive continuum in the studies. These studies have included: the involvement of nursing teams in a research training program [70], and the involvement of nurses in a mentoring program to implement EBP models [71].

Strengths and Limitations

To our knowledge, this study is the first to examine research use by nurses in a large random sample of LTC homes across three Canadian provinces. A strength of this study was the use of multivariate analysis because it allows the researcher to test multiple variables and co-variates simultaneously. A second strength was the relatively large sample of nurses and the inclusion of a wide range of individual and contextual variables. There are three key limitations of this study. First, it is a secondary data analysis, and therefore not all previously identified variables related to nurse research utilization could be included (i.e. autonomy [72-74] and reading journals [75-79].) However, as the TREC program was designed to study the uptake of research evidence by care providers in LTC, a large number of variables previously related to research utilization were included in the TREC survey and were therefore able to be analyzed in this secondary data analysis. A second limitation is that results may not be generalizable to LTC nurses beyond Western Canada. The third limitation is the use of self-report data in the original study, which has the inherent limitations of recall bias, social desirability bias, and self-report bias [80, 81]. To limit these effects, survey completion was anonymous and recall on the research use variables was limited to the nurses' last typical shift.

Conclusion

There were no significant differences by role (registered nurse or licensed practical nurse) on mean research use scores for any of the three kinds of research use (instrumental, conceptual and persuasive research use). Both individual nurses' attitudes and availability of structural and

electronic resources within the organization played important roles in nurses' use of research evidence in long term care, as they were predictors of all three kinds of research use. Additional individual-level and context-level variables also predicted nurses' research use. Conceptual research use and persuasive research use were most strongly influenced by individual characteristics, while instrumental research use was predicted equally by individual and organizational variables.

Table 4-1: Descriptions, Measurements and Reliability of Independent and Dependent Variables

Category	Variable	Definition	Measurement	α
Dependent Variables	Instrumental Research Use **(1 item)**	Using observable research-based practices when caring for residents. By this we mean that practice may be guided by guidelines, protocols, routines, care plans, or procedures based on research.	Single item, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day.	N/A
	Conceptual Research Use **(5 items)**	Thinking about research-based knowledge and using it to inform your clinical decision making.	Conceptual Research Utilization Scale [26]. Five items, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day. An overall score is derived by taking the mean of the 5 items.	0.965
	Persuasive Research Use **(1 item)**	Using research findings to *win* an argument or *make a case* to someone, regardless of whether you have made a thorough assessment of the research.	Single item, asked to indicate the percentage of the time (in 5 categories) that research was used in this way during the last typical work day.	N/A
Individual Variables	Sex	An individual's sex.	Asked for sex: male or female.	N/A
	Age	An individual's age.	Asked to indicate age category.	N/A
	Highest Education	Highest level of education obtained (recoded from individual education responses)	Asked if completed: diploma/certificate, bachelor's certificate, master's degree and/or PhD (yes/ no).	N/A
	Specialized Courses	Specialized courses completed in addition to previously listed post-secondary education.	Asked to answer: yes/no.	N/A
	Current Enrolment Status	Current enrolment in an educational program.	Asked to answer: yes/no.	N/A
	Shift Worked	Shift worked most of the time.	Asked to indicate if they work primarily day, evening or night shifts.	N/A
	Employment Status	Employment status on that unit.	Full time, part time or casual.	N/A
	Hours Worked	In the last typical two-week period, how many hours that were worked.	Numerical response (number of hours).	N/A
	Years Worked as Nurse	Total number of years worked as a nurse.	Asked for number of years and months worked as a nurse.	N/A

Category	Variable	Definition	Measurement	α
	Research Activities *(note: analyzed as 5 separate variables)*	Involvement in a series of five research related activities.	Asked to answer: yes/no for all five activities 1. Research as part of a post-graduate study 2. Data collector for someone else's research project 3. Journal club 4. Education/courses/workshops in research e.g. statistics 5. Presenting research results from the literature (defined by respondents, informal or formal)	N/A
	Job Satisfaction	An individual's perception of whether they are "satisfied" in their job.	Michigan Organizational Assessment Questionnaire, Job Satisfaction Subscale [27]. Three items, all scored on a five-point Likert agreement scale (ranging from 1) strongly disagree to 5) strongly agree).	0.859
	Problem Solving	The cognitive, affective and behavioural processes and the particular set of skills employed in order to find solutions for the challenges of everyday life.	Abbreviated Heppner's Problem Solving Inventory [28]. 10 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 10 items.	0.708
	Attitude Towards Research	An individual's perception of their attitude toward research knowledge expressed along a continuum of negative to positive.	Adapted from Lacey's Attitudes to Research scale [29]. 6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 6 items.	0.806
	Belief Suspension – Willingness	The degree to which an individual is able to suspend previously held beliefs in order to implement a research-based change. It taps personal beliefs of the healthcare worker (i.e. those beliefs that originate in the family of origin (the home), in school/training, or within the work context.	Adapted from Estabrook's Research Utilization Survey [28]. A total of 6 items with 3 items per subscale scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 3 items in each subscale.	0.813
	Belief Suspension – Implement			0.830
	Organizational Citizenship Behaviour	Reflects constructive efforts by individuals to identify and implement changes with respect to work methods, policies and procedures to improve situation and performance.	Measured using a version of Choi's 2007 Organizational Citizenship Behaviour – Organization scale [27, 30]. 4 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 4 items.	0.780
	Work Eng. – Vigor	Commitment to one's job. Nine statements, related to how one feels at work, form three subscales: dedication, vigor and absorption.	UWES-9 (Utrecht Work Engagement Scale) [30]. Nine items on 6-point Likert frequency scales (ranging from never to daily) rating how often they have experienced feelings related to their job.	0.876
	Work Eng. – Dedication			0.828
	Work Eng. – Absorption			0.755

Category	Variable	Definition	Measurement	α
	Emp. – Competence	Feelings about work life.	Spreitzer's Psychological Empowerment scale [32]. 12 items with 3 items/subscale; all scored on a 5-point Likert agreement scale (ranging from 1) strongly disagree to 5) strongly agree).	0.870
	Emp. – Meaning			0.914
	Emp. – Self Determination			0.895
	Emp. – Impact			0.821
	Physical Health Status	An individual's perception of their health status over past 4 weeks.	SF-8™ health survey [33]. 8 items scored on 5- or 6-point Likert scales. Scoring was done using a proprietary algorithm (granted with permission to use the scale) to produce a summary mental and physical health score (0% to 100%).	N/A
	Mental Health Status			N/A
	Burnout – Exhaustion	Burnout is a debilitating psychological condition brought about by unrelieved work stress.	The Maslach Burnout Inventory General Survey (short form) [34]. 3 items/subscale; all scored on a 7-point Likert frequency scale (never to daily). A mean was calculated for each subscale.	0.800
	Burnout – Cynicism			0.707
	Burnout – Efficacy			0.621
Context Variables	Adequate Orientation	An individual's perception of whether they had enough orientation to do their job safely and effectively.	A single item scored on a 5-point Likert agreement scale (strongly disagree to strongly agree).	N/A
	Dementia Related Responsive Behaviours	Aggressive behaviours towards staff by residents.	Sum of six items: threat of assault, emotional abuse, physical abuse, verbal sexual harassments, sexual assault, and forced sexual intercourse. Each item was scored as yes or no based on if the respondent had experienced the behaviour during their last five shifts.	N/A
	ACT: Leadership	The actions of formal leaders in an organization (unit) to influence change and excellence in practice, items generally reflect emotionally intelligent leadership.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score is derived by taking the mean of the 6 items.	0.879
	ACT: Culture	The way that "we do things" in our organizations and work units, items generally reflect a supportive work culture.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.857
	ACT: Evaluation	The process of using data to assess group/team performance and to achieve outcomes in organizations or units.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.914
	ACT: Social Capital	The stock of active connections among people. These connections are of 3 types: bonding, bridging, and linking.	6 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 6 items.	0.849

Category	Variable	Definition	Measurement	α
	ACT: Formal Interactions	Formal exchanges that occur between individuals working within an organization (unit) through scheduled activities that can promote the transfer of knowledge.	4 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 4 item scores to "0" (no interaction) and "1" (interaction). An overall score was derived by taking a count of the 4 recoded items.	0.689
	ACT: Informal Interactions	Informal exchanges that occur between individuals working within an organization (unit) that can promote the transfer of knowledge.	9 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 9 item scores to "0" (no interaction) and "1" (interaction). An overall score was derived by taking a count of the 9 recoded items.	0.786
	ACT: Structural and Electronic Resources	The structural and electronic elements of an organization (unit) that facilitate the ability to assess and use knowledge.	10 items scored on a 5-point Likert frequency scale (never to almost always). Recoded each of the 10 item scores to 0 (no resource) or 1 (resource). An overall score was derived by taking a count of the 10 items.	0.801
	ACT: Organizational Slack-Staff	The cushion of actual or potential resources which allows an organization (unit) to adapt successfully to internal pressures for adjustments or to external pressures for changes.	3 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 3 items.	0.936
	ACT Organizational Slack-Time		4 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall score was derived by taking the mean of the 4 items.	0.814
	ACT Organizational Slack-Space		2 items scored on a 5-point Likert agreement scale (strongly disagree to strongly agree). An overall was derived by taking the mean of the 2 items.	0.834
	Province	Province in which the nursing home is located.	Alberta, Manitoba, or British Columbia.	N/A
	Health Region	Health region within the province in which the nursing home is located.	Alberta: Region 1 and 2. BC: Region 1 and 2.	N/A
	Owner Operator Model	Ownership and operation model of the facility.	Public: publicly funded, operated and managed by the province (or regional equivalent). Private: owned and managed by a corporate for-profit corporation or chain. Voluntary: publicly funded, operated and managed by a not-for-profit organization other than government (e.g. faith based, municipal, board of directors).	N/A
	Beds in Facility	Total number of beds for residents in facility.	Sum of long-term care beds and non-long-term care beds.	N/A
	Facility Size	Size of facility based on three bed number categories.	Small (<80 beds), medium (80-120 beds), large (>120 beds).	N/A

Note. Work Eng = Work Engagement, Emp = Empowerment, ACT= Alberta Context Tool, α= Cronbach's alpha

Table 4-2: Demographic Characteristics Among Nurses (N=756)

Variables		RN *n= 308*	LPN *n= 448*	Total *n= 756*
Owner Operator Model [n, (%)]	Public not-for-profit	65 (21.1)	77 (17.2)	142 (18.8)
	Private for-profit	111 (36.0)	205 (45.8)	316 (41.8)
	Voluntary not-for-profit	132 (42.9)	166 (37.0)	298 (39.4)
Facility Size [n, (%)]	Small (≤79 beds)	43 (14.0)	55 (12.3)	98 (12.9)
	Medium (80-120 beds)	99 (32.1)	148 (33.0)	247 (32.7)
	Large (>120 beds)	166 (53.9)	245 (54.7)	411 (54.4)
Sex [n, (%)]	Male	30 (9.7)	52 (11.6)	82 (10.8)
	Female	272 (88.3)	388 (86.6)	660 (87.3)
	Missing	*6 (2.0)*	*8 (1.8)*	*14 (1.9)*
Age [n, (%)]	<20 years	1 (0.3)	2 (0.4)	3 (0.4)
	20-29 years	26 (8.5)	85 (19)	111 (14.7)
	30-39 years	53 (17.2)	103 (23)	156 (20.6)
	40-49 years	99 (32.1)	133 (29.7)	232 (30.7)
	50-59 years	74 (24.0)	95 (21.2)	169 (22.4)
	>60 years	55 (17.9)	30 (6.7)	85 (11.2)
Highest Education [n, (%)]	Diploma	128 (41.6)	363 (81.0)	491 (64.9)
	Bachelors	169 (54.9)	75 (16.8)	244 (32.3)
	Graduate	10 (3.2)	8 (1.8)	18 (2.4)
	Missing	*1 (0.3)*	*2 (0.4)*	*3 (0.4)*
Specialized Courses [n, (%)]	Yes	78 (25.3)	114 (25.5)	192 (25.4)
	No	204 (66.2)	315 (70.3)	519 (68.6)
	Missing	*26 (8.5)*	*19 (4.2)*	45 (6.0)
Current Enrolment Status [n, (%)]	Yes	14 (4.5)	45 (10)	59 (7.8)
	No	292 (94.8)	400 (89.3)	692 (91.5)
	Missing	*2 (0.7)*	*3 (0.7)*	*5 (0.7)*
Shift Worked [n, (%)]	Day Shift	144 (46.8)	230 (51.3)	374 (49.5)
	Evening Shift	107 (34.7)	171 (38.2)	278 (36.8)
	Night Shift	55 (17.9)	39 (8.7)	94 (12.4)
	Missing	*2 (0.6)*	*8 (1.8)*	*10 (1.3)*
Employment Status [n, (%)]	Full Time	121 (39.3)	228 (50.9)	349 (46.2)
	Part Time	166 (53.9)	177 (39.5)	343 (45.4)
	Casual	21 (6.81)	42 (9.4)	63 (8.3)
	Missing	*0 (0.0)*	*1 (0.2)*	*1 (0.1)*
Hours Worked - 2 Weeks [Mean, (SD)]		59.60 (17.84)	63.10 (20.47)	61.71 (19.53)
Years Worked as Nurse [Mean, (SD)]		11.54 (11.39)	6.91 (7.16)	8.75 (9.36)

Table 4-3: Average Scores for Study Variables

Category	Variable	N	Mean (SD)
Dependent	Instrumental Research Use (1-5)	754	3.38 (1.31)
	Conceptual Research Use (1-5)	734	3.18 (1.25)
	Persuasive Research Use (1-5)	745	3.06 (1.44)
Individual Variables	Hours Worked	702	61.71 (19.53)
	Years Worked as Nurse	700	8.75 (9.36)
	Job Satisfaction (1-5)	730	4.14 (0.69)
	Problem Solving (1-5)	718	3.85 (0.38)
	Attitude Towards Research (1-5)	732	3.17 (0.24)
	Belief Suspension – Willingness (1-5)	737	3.95 (0.66)
	Belief Suspension – Implement (1-5)	737	3.45 (0.86)
	Organizational Citizenship Behaviour	725	3.64 (0.60)
	Work Engagement – Vigor (0-6)	730	5.07 (1.15)
	Work Engagement – Dedication (0-6)	724	5.30 (1.01)
	Work Engagement – Absorption (0-6)	723	5.68 (0.65)
	Empowerment – Competence (1-5)	732	4.40 (0.55)
	Empowerment – Meaning (1-5)	728	4.53 (0.54)
	Empowerment – Self Determination (1-5)	727	3.99 (0.76)
	Empowerment – Impact (1-5)	721	3.76 (0.73)
	Physical Health Status (0-100%)	712	50.60 (7.74)
	Mental Health Status (0-100%)	712	50.68 (9.15)
	Burnout – Exhaustion (0-6)	724	2.02 (1.44)
	Burnout – Cynicism (0-6)	711	1.83 (1.44)
	Burnout – Efficacy (0-6)	719	4.69 (1.05)
Contextual Variables	Adequate Orientation (1-5)	735	3.90 (0.88)
	Dementia Related Responsive Behaviours (0-6)	726	2.63 (1.65)
	Alberta Context Tool: Leadership (1-5)	742	3.78 (0.83)
	Alberta Context Tool: Culture (1-5)	745	3.89 (0.66)
	Alberta Context Tool: Evaluation (1-5)	747	3.56 (0.79)
	Alberta Context Tool: Formal Interactions (0-4)	730	1.43 (1.19)
	Alberta Context Tool: Informal Interactions (0-10)	717	4.21 (2.02)
	Alberta Context Tool: Social Capital (1-5)	731	3.97 (0.55)
	Alberta Context Tool: Structural & Electronic Resources (0-11)	715	4.43 (2.48)
	Alberta Context Tool: Organizational Slack-Staff (1-5)	733	2.74 (1.12)
	Alberta Context Tool: Organizational Slack-Space (1-5)	729	3.71 (1.15)
	Alberta Context Tool: Organizational Slack-Time (1-5)	729	2.92 (0.70)
	Beds in Facility	756	151.36 (80.70)

Table 4-4: Bivariate Analysis (N=756)

Category	Variable	Bivariate Test	IRU		CRU		PRU	
			test value	p-value	test value	p-value	test value	p-value
Individual Variables	Sex	t-test	1.661	.097	**2.122**	**.034**	1.852	.064
	Age (10 years)	ANOVA	1.622	.152	**3.170**	**.008**	1.324	.252
	Role (RN vs. LPN)	t-test	1.405	.160	1.684	.093	1.633	.103
	Education (Highest Level)	ANOVA	0.793	.453	**6.118**	**.002**	1.359	.258
	Specialized Courses	t-test	0.641	.522	-1.357	.157	.174	.862
	Current Enrolment Status	t-test	-0.707	.480	-0.026	.979	-.093	.926
	Shift Worked	ANOVA	0.785	.457	2.469	.085	.406	.667
	Employment Status	ANOVA	2.890	.056	1.608	.201	2.639	.072
	Hours Worked	Pearson's *r*	-0.013	.724	0.074	.054	**.078**	**.041**
	Years Worked as Nurse	Pearson's *r*	0.055	.149	**-0.121**	**.002**	-.043	.260
	Research as Part of a Post-Graduate Study	t-test	0.917	.359	1.223	.222	.241	.810
	Data Collection for Someone Else	t-test	0.679	.497	0.290	.772	1.307	.192
	Participation in a Journal Club	t-test	0.071	.943	0.268	.789	1.187	.236
	Education, Courses, or Workshops in Research	t-test	0.850	.396	**2.319**	**.021**	**2.197**	**.028**
	Presented Research Results	t-test	**2.743**	**.012**	0.302	.763	0.397	.691
	Job Satisfaction	Pearson's *r*	**0.222**	**<.001**	**0.285**	**<.001**	**0.228**	**<.001**
	Problem Solving	Pearson's *r*	**0.266**	**<.001**	**0.149**	**<.001**	**0.182**	**<.001**
	Attitude Towards Research	Pearson's *r*	**0.292**	**<.001**	**0.365**	**<.001**	**0.281**	**<.001**
	Belief Suspension – Willingness	Pearson's *r*	**0.136**	**<.001**	**0.161**	**<.001**	**0.089**	**.016**
	Belief Suspension – Implement	Pearson's *r*	**0.198**	**<.001**	**0.238**	**<.001**	**0.178**	**<.001**
	OCB	Pearson's *r*	**0.170**	**<.001**	**0.267**	**<.001**	**0.235**	**<.001**
	Work Eng. – Vigor	Pearson's *r*	**0.226**	**<.001**	**0.319**	**<.001**	**0.234**	**<.001**
	Work Eng. – Dedication	Pearson's *r*	**0.210**	**<.001**	**0.310**	**<.001**	**0.228**	**<.001**
	Work Eng. – Absorption	Pearson's *r*	**0.213**	**<.001**	**0.244**	**<.001**	**0.201**	**<.001**
	Emp. – Competence	Pearson's *r*	**0.195**	**<.001**	**0.198**	**<.001**	**0.191**	**<.001**

Category	Variable	Bivariate Test	IRU		CRU		PRU	
			test value	p-value	test value	p-value	test value	p-value
	Emp. – Meaning	Pearson's *r*	**0.199**	**<.001**	**0.247**	**<.001**	**0.212**	**<.001**
	Emp. – Self Determination	Pearson's *r*	**0.163**	**<.001**	**0.289**	**<.001**	**0.249**	**<.001**
	Emp. – Impact	Pearson's *r*	**0.191**	**<.001**	**0.276**	**<.001**	**0.258**	**<.001**
	Physical Health Status	Pearson's *r*	**0.118**	**.002**	**0.143**	**<.001**	0.030	.418
	Mental Health Status	Pearson's *r*	**0.183**	**<.001**	**0.187**	**<.001**	**0.141**	**<.001**
	Burnout – Exhaustion	Pearson's *r*	**-0.191**	**<.001**	**-0.197**	**<.001**	**-0.160**	**<.001**
	Burnout – Cynicism	Pearson's *r*	**-0.185**	**<.001**	**-0.194**	**<.001**	**-0.141**	**<.001**
	Burnout – Efficacy	Pearson's *r*	**0.201**	**<.001**	**0.289**	**<.001**	**0.244**	**<.001**
Contextual Variables	Adequate Orientation	Pearson's *r*	**0.178**	**<.001**	**0.217**	**<.001**	**0.178**	**<.001**
	Dementia Related Responsive Behaviours *	Spearman's *rho*	0.001	.978	-0.053	.158	-0.050	.175
	ACT: Leadership	Pearson's *r*	**0.195**	**<.001**	**0.238**	**<.001**	**0.184**	**<.001**
	ACT: Culture	Pearson's *r*	**0.246**	**<.001**	**0.327**	**<.001**	**0.248**	**<.001**
	ACT: Evaluation	Pearson's *r*	**0.242**	**<.001**	**0.324**	**<.001**	**0.282**	**<.001**
	ACT: Formal Interactions *	Spearman's *rho*	**0.146**	**<.001**	**0.235**	**<.001**	**0.246**	**<.001**
	ACT: Informal Interactions *	Spearman's *rho*	**0.193**	**<.001**	**0.223**	**<.001**	**0.195**	**<.001**
	ACT: Social Capital	Pearson's *r*	**0.273**	**<.001**	**0.252**	**<.001**	**0.196**	**<.001**
	ACT: S & E Resources *	Spearman's *rho*	**0.311**	**<.001**	**0.376**	**<.001**	**0.335**	**<.001**
	ACT: Organizational Slack-Staff	Pearson's *r*	**0.101**	**<.001**	**0.266**	**<.001**	**0.150**	**<.001**
	ACT: Organizational Slack-Space	Pearson's *r*	**0.177**	**<.001**	**0.236**	**<.001**	**0.165**	**<.001**
	ACT: Organizational Slack-Time	Pearson's *r*	**0.250**	**<.001**	**0.268**	**<.001**	**0.181**	**<.001**
	Province	ANOVA	0.195	.823	0.136	.873	0.080	.923
	Health Region	ANOVA	0.680	.606	7.462	**<.001**	1.530	.192
	Owner Operator Model	ANOVA	0.253	.776	0.856	.425	0.897	.408
	Beds in Facility	Pearson's r	0.051	.164	0.031	.400	0.009	.801
	Facility Size	ANOVA	0.645	.525	1.280	.279	0.157	.855

Legend: * on variable name means that it is a count (non-parametric); Work Eng = Work Engagement, Emp = Empowerment, ACT= Alberta Context Tool, OCB= Organizational citizenship behaviour, S & E = structural and electronic, IRU = instrumental research use, CRU= conceptual research use, PRU= persuasive research use

Table 4-5: Generalized Estimating Equation Modeling Results for Instrumental Research Use, Conceptual Research Use and Persuasive Research Use

Level	Variables	Instrumental		Conceptual		Persuasive	
		β, SE	Sig.	β, SE	Sig.	β, SE	Sig.
Individual Variables	Sex[1] – Male			0.029 (0.142)	.838		
	Age[2] – 20-29 years			0.275 (0.203)	.176		
	Age – 30-39 years			0.380 (0.198)	.055		
	Age – 40-49 years			0.249 (0.187)	.184		
	Age – 50-59 years			0.242 (0.179)	.178		
	Highest Level of Education[3] – Diploma/Certificate			0.226 (0.215)	.294		
	Highest Level of Education – Bachelor			0.183 (0.219)	.404		
	Hours Worked in Two Weeks					0.004 (0.003)	.164
	Time Worked as a Nurse			-0.009 (0.006)	.130		
	Presenting Research Results[4] – Yes	**0.604 (0.270)**	**.025**				
	Education/Courses/Workshops in Research[5] – Yes			-.073 (.100)	.467	0.058 (0.123)	.636
	Job Satisfaction	0.005 (0.110)	.965	-0.025 (0.106)	.816	0.005 (0.124)	.965
	Problem Solving	**0.344 (0.148)**	**.020**	-0.087 (0.136)	.526	0.087 (0.178)	.623
	Attitude Towards Research	**0.290 (0.102)**	**.005**	**0.476 (0.112)**	**<.001**	**0.336 (0.132)**	**.011**
	Belief Suspension – Willingness	-0.073 (0.107)	.494	0.034 (0.089)	.703	-0.079 (0.102)	.440
	Belief Suspension – Implement	0.142 (0.084)	.089	0.138 (0.072)	.058	**0.176 (0.078)**	**.023**
	Organizational Citizenship Behaviour	0.062 (0.093)	.502	0.147 (0.087)	.090	**0.215 (0.104)**	**.038**
	Work Engagement – Vigor	0.004 (0.076)	.957	0.052 (0.070)	.462	-0.002 (0.083)	.982
	Work Engagement – Dedication	0.002 (0.085)	.984	0.004 (0.076)	.957	-0.001 (0.093)	.993
	Work Engagement – Absorption	0.070 (0.094)	.454	-0.013 (0.085)	.878	0.048 (0.120)	.688
	Empowerment – Competence	0.149 (0.118)	.206	0.121 (0.111)	.277	0.048 (0.129)	.709
	Empowerment – Meaning	-0.045 (0.128)	.726	-0.056 (0.117)	.633	-0.130 (0.136)	.304
	Empowerment – Self Determination	-0.026 (0.080)	.748	**0.168 (0.086)**	**.049**	**0.242 (0.097)**	**.013**
	Empowerment – Impact	-0.130 (0.088)	.138	-0.082 (0.080)	.308	-0.034 (0.101)	.735
	Physical Health Status	0.003 (0.007)	.621	0.005 (0.006)	.420		
	Mental Health Status	0.005 (0.006)	.420	-0.006 (0.005)	.239	-0.007 (0.007)	.319
	Burnout – Exhaustion	0.009 (0.051)	.865	0.054 (0.046)	.237	-0.034 (0.052)	.512
	Burnout – Cynicism	-0.048 (0.049)	.327	-0.080 (0.043)	.066	-0.018 (0.054)	.733
	Burnout – Efficacy	0.033 (0.053)	.532	**0.141 (0.051)**	**.006**	**0.140 (0.061)**	**.022**
Organizational Context Variables	Adequate Orientation	0.044 (0.062)	.481	0.012 (0.060)	.847	0.036 (0.070)	.607
	ACT – Leadership	0.082 (0.069)	.239	0.064 (0.063)	.310	0.014 (0.080)	.857
	ACT – Culture	0.022 (0.105)	.830	0.016 (0.099)	.876	-0.013 (0.116)	.910
	ACT – Evaluation	0.117 (0.079)	.138	0.131 (0.077)	.088	**0.205 (0.092)**	**.026**
	ACT – Formal Interactions	**-0.117 (0.050)**	**.020**	0.006 (0.046)	.895	0.070 (0.059)	.236
	ACT – Informal Interactions	0.007 (0.030)	.818	0.003 (0.026)	.901	-0.019 (0.034)	.580
	ACT – Social Capital	0.142 (0.107)	.182	-0.106 (0.103)	.304	-0.123 (0.132)	.352
	ACT – Structural & Electronic Resources	**0.146 (0.024)**	**<.001**	**0.117 (0.023)**	**<.001**	**0.132 (0.027)**	**<.001**
	ACT – Organizational Slack: Staff	**-0.167 (0.053)**	**.002**	0.061 (0.051)	.236	-0.004 (0.061)	.950
	ACT – Organizational Slack: Space	0.035 (0.045)	.439	0.049 (0.044)	.269	0.006 (0.053)	.911
	ACT – Organizational Slack: Time	0.111 (0.087)	.202	-0.060 (0.085)	.480	**-0.232 (0.103)**	**.024**
	Health Region[6] – Alberta North			-0.042 (0.135)	.757		
	Health Region – Alberta South			0.059 (0.144)	.683		
	Health Region – Fraser Health			-0.019 (0.129)	.886		
	Health Region – Interior Health			-0.230 (0.172)	.180		
Quasi Likelihood under Independence Model Criterion (QIC)		820.344		643.090		960.131	

[1] Reference group is female.
[2] Reference group is 60-69 years.
[3] Reference group is graduate studies.
[4] Reference group is No.
[5] Reference group is No.
[6] Reference group is Manitoba.

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Supplemental File: Comparison of Independent Variables by Role (Registered Nurse and Licensed Practical Nurse) and Province (Alberta, Manitoba, British Columbia)

Table S1.1: Comparison of Independent Variables by Role and Province

Variables [Mean, (SD)]	Nursing Role				Province				
	RN *n= 308*	**LPN** *n= 448*	**Total** *n= 756*	**p-value (t-test)**	**Alberta** *n= 272*	**Manitoba** *n= 161*	**B.C.** *n= 323*	**Total** *n= 756*	**p-value (ANOVA)**
Instrumental Research Use (1-5)	3.46 (1.28)	3.33 (1.32)	3.38 (1.31)	.160	3.38 (1.32)	3.33 (1.31)	3.41 (1.30)	3.38 (1.31)	.823
Conceptual Research Use (1-5)	3.27 (1.27)	3.12 (1.24)	3.18 (1.25)	.093	3.19 (1.25)	3.22 (1.28)	3.16 (1.23)	3.18 (1.25)	.873
Persuasive Research Use (1-5)	3.17 (1.42)	2.99 (1.46)	3.06 (1.44)	.103	3.07 (1.43)	3.03 (1.43)	3.08 (1.47)	3.06 (1.44)	.923

Legend: RN = registered nurse; LPN = licensed practical nurse; B.C. = British Columbia

Chapter Five

Integrated Discussion

Integrated Discussion

The purpose of this chapter is to provide an integrated discussion of the findings from the two studies included in this thesis. In this chapter, I summarize the findings of the literature review (Chapter 2) and the cross-sectional secondary data analysis (Chapter 4). Based on the findings, there are three main points of discussion: 1) how regulated nurses and unregulated care aides compare on predictors of best practice use, 2) how my secondary analysis compares to the literature review, and 3) implications for the PARiHS framework. Finally, I discuss implications for nursing practice, leadership, education and research.

Summary of Thesis Findings

Literature review.

I conducted a literature review to identify variables associated with nurses' general research use and kinds of research use (instrumental, conceptual, persuasive, and/or overall). I searched nine electronic databases and performed hand searching of: 1) articles by authors known to be experts in the research use field, and 2) two key implementation science journals. I conducted an initial scoping search limited to the long-term care setting but expanded my search to all settings as there were few published studies in the long-term care setting.

Results of the literature review revealed 52 studies (reported in 55 articles) relevant to my thesis. I grouped these studies into two broad categories: 1) those examining research use generally (41 studies reported in 44 articles) and 2) those examining the different kinds of research use (11 studies reported in 11 articles). For studies that measured nurses' research use generally, six individual-level variables were found to have a significant, positive relationships with nurses' research use: attitude towards research, autonomy, attendance at conferences or in-services, job satisfaction, being in a leadership or advanced-practice role versus a staff role, and

working in critical care versus other specialities. Seven individual-level variables had a non-significant relationship with nurses' general research use: participation in a research study, completion of research classes, age, gender, full or part time status, completion of a bachelor's degree versus a diploma, and years employed as a registered nurse. One context-level variable had a positive significant relationship with nurses' general research use: support from colleagues, administrators and other health care professionals; and a second context-level variable, size of the organization, was not significantly related to research use.

For studies that measured the kinds of nurses' research use: the individual-level variable age was non-significant for nurses' conceptual research use; and had mixed findings for instrumental, persuasive and overall research use. Attitude towards research was found to have a positive significant relationship with instrumental and overall research use, but was not significantly related to conceptual research use, and had mixed findings with persuasive research use. Belief suspension had a positive significant relationship to overall research use, but had mixed findings with the remaining kinds of research use. Finally, trust was non-significant with overall research use and had mixed findings with the remaining kinds of research use.

Secondary data analysis.

The aim of this study was to determine the predictors of nurses' kinds of research use (instrumental, conceptual and persuasive) in Western Canadian long-term care settings. I conducted a secondary data analysis of data provided by 756 long-term care nurses using data from TREC 2.0 (September 2014 – May 2015). There were no significant differences between registered nurses (308 nurses) and licensed practical nurses (448 nurses) for any of the dependent variables (instrumental, conceptual, and persuasive research use), therefore nurses were analyzed as one group. Bivariate analysis was completed first, with all variables that were significant in

bivariate analysis (for instrumental research use n=35, and persuasive and conceptual research use, n=30) entered into three separate Generalized Estimating Equations models. I summarize the statistically significant results of the three models next.

One individual-level variable (attitude towards research) and one contextual-level variable (availability of structural and electronic resources) were significant predictors of all three kinds of research use. Two individual-level variables (presenting research results and problem solving) were significant predictors for instrumental research use only, and two individual-level variables (belief suspension – implement and organizational citizenship behaviour) were significant predictors for persuasive research use only. A final two individual-level variables were predictive of both conceptual and persuasive research use: self determination (empowerment) and efficacy (burnout). Additionally, two context variables were predictive of instrumental research use only (formal interactions and organizational slack – staff); and two context variables were predictive of persuasive research only (evaluation and organizational slack time).

Integrated Discussion

The integration of findings from my literature review and my secondary analysis of TREC nurse data presented in this thesis leads to three main points for discussion: 1) how regulated nurses and unregulated care aides compare on predictors of research use, 2) how my secondary analysis compares to the literature review, and 3) implications for the PARiHS framework and my conceptual model.

Regulated versus unregulated care providers in long-term care.

In long-term care settings in Canada, approximately 80% of personal care services (resident interactions) are provided by unregulated care aides (also known as personal support

workers, nursing assistants, and health care aides), while regulated nurses (consisting of registered nurses and licensed practical nurses) provide the remaining 20% of direct personal care [1]. Nurses in long-term care also provide mentorship and support to unregulated health care providers, communicate with families, and develop care plans for residents founded in research-based practices [2]. It is currently unknown if predictors of nurses' research use are the same as predictors of care aides' best practice use. Next, I present a comparison of my thesis results to a study of predictors of instrumental and conceptual best practice use by care aides in western Canadian long-term care homes [1].

Estabrooks and colleagues [1] conducted a study of the individual and organizational context features that predicted use of best practices by care aides in Western Canadian long-term care homes using the TREC 1.0 data (July 2009 – June 2010). Their sample included 1262 care aides in 25 long-term care homes in the 3 Canadian prairie provinces [1]. The dependent variables, instrumental use of best practices and conceptual use of best practices, were operationalized with the same measures as in the current thesis study but with the term research use substituted for the term best-practice use.

When comparing Estabrooks's care aide study [1] with my findings for nurses, mean research use scores, for both instrumental and conceptual research use, were higher in care aides compared to nurses (**Table 5-1**). Mean best practice use scores in care aides may be higher than mean research use scores in nurses due to the renaming of the variable to something more concrete (i.e. best practice use rather than research use.) Additionally, the care aides were given different examples of best practice (research) use, which may have resonated more than the examples provided to the nurses. Care aides also completed the TREC survey in person with a research assistant, using computer assisted personal interviewing, where as nurses completed the

TREC survey online. Social desirability bias (the tendency of some respondents to answer a question in a way they consider to be more socially acceptable than their unbiased response [3]) may have factored into the higher scores found in care aides. Further exploratory research should be conducted to determine why care aides best practice use scores were considerably higher than nurses' research use scores.

Table 5-1: Comparison of Mean Research Use Scores between Care Aides and Nurses

Variables [Mean, (SD)]	**Care Aides** ***n= 1262***	**Nurses** ***n= 756***
Instrumental Research Use (1-5)	4.322 (0.796)	3.38 (1.31)
Conceptual Research Use (1-5)	3.871 (0.833)	3.18 (1.25)
Persuasive Research Use (1-5)	Not assessed	3.06 (1.44)

Instrumental use of best practices (by care aides) was predicted by both individual (sex, age, shift worked, job efficacy, and belief suspension) and contextual (social capital, organizational slack (staffing and time), number of informal interactions, unit type, ownership model and working in Saskatchewan) variables [1]. Significant predictors of conceptual use of best practices were: at the individual level – English as a first language, job efficacy, belief suspension, intent to use research, adequate knowledge, number of information sources used; and at the contextual level – evaluation (feedback mechanisms), structural resources, organizational slack (time) and working in Saskatchewan [1].

A summary of all predictors of care aides' best practice use and nurses' use of research is presented next and full details are available in **Table 5-2**, located at the end of this chapter. A discussion of the similarities and differences between predictors of nurses' research use and care aides use of best practices will follow. Only three variables were significant for both nurses and care aides: 1) ***availability of structural and electronic resources*** was a significant predictor for

care aides' conceptual use of best practices and nurses' instrumental and conceptual use of research; 2) ***organizational slack-staff*** was a predictor of care aides' instrumental best practice use and nurses' instrumental research use; and 3) ***burnout – efficacy***, was a predictor of care aides' instrumental and conceptual use of best practices and nurses' conceptual use of research.

It may be more cost effective to design interventions that would improve both nurses' research use and care aides' best practice use simultaneously, therefore these variables may be especially important to target when designing interventions. It is important to keep in mind the differences in educational preparation and preferred learning styles when designing interventions, as well as other predictors of research use. For example, one strategy to increase access to structural and electronic resources is the provision of workshops by a health sciences librarian who would review credible web-based resources and strategies to retrieve and evaluate health-related research [4, 5]. A formal educational session may be beneficial for nurses (as formal interactions is a predictor of instrumental research use, but for care aides, more one-on-one informal sessions may be more beneficial as informal interactions were significant for instrumental best practice use and not formal interactions. An example potential strategy that could be beneficial for both groups is ensuring that workplace reference materials are current and user friendly [6].

The majority of the variables that were significant for care aides, but not for nurses were demographic and not highly modifiable (age, sex, English as a first language). However, two potentially modifiable factors were predictive of care aides research use and not nurses research use – working day shifts and social capital (as defined in the Alberta Context Tool as the stock of active connections among people, including how one feels they are treated by people in positions in authority). Therefore, it may be important to target interventions to care aides that work on

evening or night shifts, but it is not as important to target interventions for nurses based on the shift worked. A potential reason that social capital was significant for care aides, and not for nurses, is that care aides work in teams more frequently, and nurses may be seen as the leader in these teams.

How my secondary-analysis compares to the literature review.

The findings from my secondary analysis add to the body of knowledge of predictors of nurse research use, as described in my literature review, both in long-term care and across all settings.

Long term care.

In my literature review, the authors of two studies assessed the kinds of nurse research use [7, 8], and the authors of one study (in two articles) assessed nurses' research use generally [9, 10]. In my thesis study, I assessed kinds of nurses' research use. The results from my literature review and study, taken together, provide empirical support for the importance of positive attitudes towards research in long-term care, as it was significant in all of the studies conducted in long-term care. There is also support that beliefs and perceptions about research use and one's ability to use research clinically are important for nurses' research use. Future research should examine the relationship between burnout, problem solving, and organizational citizenship behaviour and nurses' research use to confirm findings of my study. Additionally, results from my thesis provide empirical support for a relationship between nurses' research use and access to structural and electronic resources. No other context-level variables were consistently reported between studies. Future research investigating the significance of organizational slack – time and staff, formal interactions, and evaluation with nurses' research use should be undertaken to confirm my findings outside of the western Canadian setting.

All settings.

My study added to the limited number of studies that accessed nurses' kinds of research use, as opposed to research use generally. In this section I discuss how adding my secondary analysis study to the literature review changes the votes from my literature review.

Individual-level variables.

With the addition of results of my study, age was assessed in enough studies to consider instrumental and conceptual research use as non-significant variables. Age was not assessed in enough studies to draw conclusions for persuasive and overall research use. Additionally, sex (or gender as defined by individual study authors) was reported in enough studies to draw conclusions for instrumental research use (non-significant) and conceptual research use (non-significant) but was not assessed in enough studies to draw conclusions for persuasive and overall research use. In my secondary analysis study, only 11% of the participants were male, which is consistent with the studies in my literature review. The small proportion of men included in the sample of nurses may account for some of the lack of difference between genders with regards to research use levels.

Number of years worked as a nurse was assessed in enough studies to draw the conclusion that is non-significant for instrumental research use, but was not assessed in enough studies to draw conclusions for conceptual, persuasive and overall research use. Attitude towards research was found to have a positive significant relationship with instrumental and overall research use, a non-significant relationship conceptual research use, and had mixed findings for persuasive research use. Belief suspension and trust were not assessed in my study, and therefore results from the literature review were unchanged with the addition of my study (belief suspension had a positive significant relationship with overall research use and was not assessed

in enough studies to draw conclusions for instrumental, conceptual and persuasive research use; and trust had a non-significant relationship with overall research use and was not assessed in enough studies to determine relationships with instrumental, conceptual and persuasive research use).

Context-level variables.

With the addition of my study, no contextual variables were assessed in enough studies conducted in long-term care (four or more) to draw conclusions. Future research assessing the relationship between organizational context and nurses' research use would help clarify the body of knowledge of contextual predictors of nurses' research use.

Comparison of nurses' research use in long-term care settings and all settings.

The body of literature about nurses' research use within the long-term care setting is much smaller than the body of literature about nurses' research use in all settings. Due to the small number of studies conducted in the long-term care setting, I was not able to the apply vote counting rules that I used with the literature in all settings. Attitudes towards research and availability of structural and electronic resources were significant both in long-term care and other settings.

Quality of the included literature.

The vast majority (N=50, 96%) of the 52 included studies (reported in 55 articles) in the literature review are of low, fair, or medium quality. Reasons for lower quality ratings, as determined by Squires and colleagues in their systematic review which contained 43 of 52 included studies in the literature review (in 45 articles) were: "mainly to sample representativeness, treatment of missing data, and appropriateness of the statistical test(s) used [11]." Reasons for lower quality for the eleven articles that were found in my literature review,

but were not included in the individual determinants systematic review (two articles were second reports of studies included in the individual determinants systematic review – one from the contextual determinants review [12], and one from my database searching [9]) include outcomes only being measured at one timeframe, and exposures being measured prior to outcomes.

Eleven studies in the literature review, and my study, had authors who reported on the kinds of research use by nurses. Of these 12 studies, eight (including my study) employed multivariate statistics [7, 8, 13-17] which allows for statistical control of confounding variables and true assessment of predictors rather than factors that are only associated with research use. Four studies [18-21]used only bivariate statistics to determine relationships between research use and independent variables. Of the 41 studies (in 44 articles) whose authors measured nurse research use generally, 25 [22-44] used bivariate statistics and 16 [9, 45-59] used a combination of bivariate and multivariate statistics. Future studies should use the more robust multivariate statistics to determine predictors of nurse research use in order to improve the quality of the research findings. Additionally, the quality of the literature could be improved by having longitudinal studies and ensuring sample representativeness.

Future steps.

To continue to advance the field of nurse research use, future studies should employ multivariate statistics with large samples of nurses from a variety of settings. Studies testing interventions to increase nurse research use, based on the predictors of nurse research use, should be designed and implemented. Additionally, moving forward, it is important to determine the impact of the different kinds of research use on resident outcomes. Determining if increases in one kind of research use impacts resident outcomes more than another kind may allow for targeted intervention studies. The TREC database may potentially be used to determine trends in

practice sensitive resident outcomes (using the Resident Assessment Instrument – Minimum Data Set 2.0 (RAI-MDS 2.0) resident data, which was also collected in TREC) with increasing levels of nurse research use, but a larger sample would be needed for more robust statistical analyses.

To allow for more consistent comparison across studies, clarification and consistency in use of nursing research terms is needed. Research use is a term that has been used in nursing since the 1970s, but more recently the term evidence-based nursing practice has been used interchangeably with research use, despite not having the same meaning, leading to confusion [60, 61]. Evidence-based nursing practice is a broader term, encompassing the integration of best research evidence, clinical expertise, and patient values, in providing resident or patient care [62-64]. A possible future systematic review could compare predictors of nurse research use and predictors of evidence-based nursing practice to determine if the predictors are similar or different, and if researchers had used the correct term in their study.

Suggestions for the PARiHS framework.

The PARiHS framework was used in this study to help conceptualize nurses' research use, as well as inform the selection of included variables. A reflection on the fit of the PARiHS framework with this thesis follows.

The PARiHS framework.

The PARiHS framework posits that successful implementation of research findings is a result of the interrelationship between evidence, context, and facilitation [65]. In my study, the PARiHS framework was used to help guide the selection of individual and contextual variables. Facilitation was not actively considered in my models as my study was not an intervention study. Additionally, characteristics of evidence were not considered in the study as they were not

measured in the primary data source and therefore could not be entered into the secondary data analysis. A strength of using the PARiHS framework for my thesis study is that the PARiHS framework is not rigidly prescriptive, meaning that it could be used to guide my thinking around research use without limiting the selection of variables to be included. In my final statistical models, both contextual and individual determinants were predictive of nurses' research use. A limitation of the PARiHS framework is that it does not consider the influence of individual characteristics of the innovation adopter.

Suggestions.

Based on my findings, both individual and contextual variables are important to nurses' research use. Therefore, the PARiHS model is limited in that it does not discuss the individual as being important to the implementation of research evidence. Recently, one of the authors of the PARiHS framework revisited the framework, expanding it to be the i-PARiHS framework [66]. The authors expanded the framework to include individual health professionals and the system and policy levels of implementation. The revised framework considered successful implementation to be an interaction between characteristics of the innovation (e.g. research evidence), context (both inner and outer) and the recipient (defined as the people who are affected by and influence implementation at both the individual and collective team level) as mediated by facilitation [66].

The i-PARiHS accounts for individual factors but is not as intuitive or clear as the original PARiHS framework. My suggestion is that with simplification and clarification, as well as a new diagram, the i-PARiHS model could be a meaningful model to guide conceptualization of nurse research use.

Implications for Nursing

This thesis' findings provide specific implications for nursing practice, leadership, education, and research. These implications will be discussed as they relate to the nursing role in Canada [67].

Implications for nursing practice.

The College of Nurses of Ontario's professional standards of continuing competence, knowledge application, and leadership have direct relationships with nurse research use [67]. Nurses are governed by a self-regulated body, and therefore have a responsibility to uphold to the standards of their profession. Therefore, using research evidence in practice is an expectation of nurses.

A nurse can demonstrate the professional standard of continuing competence through encouraging the evaluation of practice through research and communicating best-practice findings to others [67]. The knowledge application professional standard can be demonstrated through the integration of research findings into professional practice [67]. The leadership professional standard can be demonstrated by role-modeling professional values, beliefs and attributes (including the importance of research use), and promoting nursing research [67].

A finding of this thesis is that positive attitudes towards research are significantly related to all kinds of research use by nurses. Additionally, in my literature review, there is some empirical support that presence of research champions [13, 15, 16], expectation of oneself to use research [57], and support from colleagues, administrators and other key professionals [20, 50, 56] are related to nurses' research use. Therefore, by considering research use an essential component of one's professional role, a more positive attitude towards research may be fostered.

Implications for leadership.

Nurses in long-term care are often active in middle-management leadership roles, in which they have the opportunity to use or influence use of research findings to improve resident care [68]. Indicators of the professional practice standard of leadership [67] include: 1) role modeling professional values and beliefs (including the importance of research use clinically), 2) providing direction to and sharing knowledge with novices, students and unregulated care providers, 3) providing leadership through formal and informal roles, 4) providing feedback and support to staff on an individual and organizational level, 5) enabling others to develop expertise and confidence in their abilities, 6) communicating research findings to nurses and other team members, and 7) educating staff about the research process. Although leadership specifically was not related to nurses' research use in my secondary analysis study, other individual and contextual variables that were related to research use could be targeted by nursing leadership to increase research use.

Empowerment (self-determination) was a significant predictor of nurses' conceptual and persuasive research use in my secondary analysis study. Through enabling nurses to develop expertise and confidence in their research abilities, nursing leaders may improve empowerment, and subsequently research use. Evaluation was a significant predictor of persuasive research use. Nurses in leadership positions could incorporate research use into job descriptions and performance evaluations, which encourages nursing research as a normal part of the job. Additionally, leaders could recognize nurses with positive attitudes towards research and host research spotlights. Formal interactions was a significant predictor of instrumental research use. Nurses in leadership positions, and staff nurses with leadership roles, can educate staff about the research process, how to find and implement research, and how to use resources that exist within

the organization. Availability of structural and electronic resources was a predictor of all three kinds of research use, and therefore an important variable for nursing leadership to target with interventions. Up to date evidence is needed at the point of decision making [69]. Nurses in leadership positions could advocate for computerized decision-making supports, updated and evidence-based policies and procedures, and availability of research resources including research briefs, library, and database access. Through innovative leadership, a organizational context that encourages evidence-based research use could be fostered [69].

Implications for education.

In order to leverage positive attitudes towards research (which are predictive of all three kinds of nurses' research use in long-term care and nurses' research use generally in all settings) nursing curriculums need to be adjusted to foster improved attitudes towards research. Many students entering pre-licensure programs have limited knowledge of research, and some will have had varying experiences with research which may have fostered disinterest [70]. Innovative approaches based on the needs of students, as well as feedback from students could be employed. These include using: experiential learning with reflection [70], participation in feedback and evaluation on other student research projects internationally [71], social media facilitated journal clubs [72], and integrating research education into all semesters of the nursing program [73].

Additionally, continuing education sessions are important, as formal interactions were a significant predictor of nurses' instrumental research use. Education sessions have been successful in improving nurses' attitudes towards research [74-76]. Depending on the age of the nurse, research use may not have been emphasized or taught in pre-licensure programs, as curriculums have changed over time. Foreign trained, internationally educated nurses, may not have had the exposure to research methods and research use training. Continuing education

sessions should be provided during orientation and ongoing updates to introduce (or reintroduce) nurses to the resources available at their institution and to establish a work culture that encourages and supports research use.

Implications for research.

There is a need for more robust, multivariate analyses that consider a wide variety of individual and contextual variables (related to nurse research use) across multiple settings (e.g. acute care, long-term care, primary care) [11]. As researchers, nurses can generate and disseminate knowledge related to implementation of best-practice research findings either through the conduction of research studies themselves or through: facilitating the involvement of others in the research process, communicating research findings with decision-makers, and/or securing resources to explore nursing research [67]. Context varies between nursing units and facilities [69, 77, 78], and although there may be shared predictors of research use across units, facilities and settings, it is also important to consider tailoring interventions to the specific context. Studies assessing interventions to improve nurse research use are needed, and there is consensus in the literature that studies targeting individual behaviours should: identify barriers, select intervention components, use theory, and engage end-users [79]. Interventions designed at the organization or system level may also be effective, although there is no consensus on the essential components for these kinds of interventions [79].

Further research should focus on the design, implementation and evaluation of interventions to increase nurses' use of research in pilot studies, and later scale up successful interventions. Future studies should also examine whether improvements in predictors of nurse research use in this study will lead to improved research use in long-term care. Additionally, studies should examine whether improvements in one or more kinds of research use ultimately

lead to improved resident health conditions, in order to determine which kind or kinds of research use are most important to target. Finally, studies outside of long-term care are also needed to determine if research use differs between RNs and LPNs in different settings.

Conclusion

In my thesis, I reviewed the literature on predictors of nurses' research use and modeled predictors of nurses' self-reported instrumental, conceptual, and persuasive research use in Canadian long-term care homes. The literature review revealed no studies that compared between registered nurses and licensed practical nurses research use. In the secondary data analysis, there were no significant differences by role (registered nurse or licensed practical nurse) on mean research use scores for any of the three kinds of research use, which has important implications related to the shifting nurse staffing mix in long-term care. Both individual nurses' attitudes and availability of structural and electronic were predictors of all three kinds of research use. This is consistent with the findings of the literature review, adding that attitudes towards research and availability of structural and electronic resources are important predictors of nurses' research use regardless of setting or kind of research use.

Table 5-2: Comparison of Predictors of Care Aides Best Practice Use and Nurses' Research Use

	Care Aides				Regulated Nurses (RNs and LPNs)			
	Conceptual (β, SE)	**p value**	**Instrumental (β, SE)**	**p value**	**Conceptual (β, SE)**	**p value**	**Instrumental (β, SE)**	**p value**
Intercept / Constant	-0.808 (0.383	.049	2.408 (0.447)	<.0001	-2.320 (0.855)	.007	-2.416 (0.832)	.004
Sex[1] – Male	-0.137 (0.069)	.063	**-0.217 (0.081)**	**.015**	0.029 (0.142)	.838		
Age[2] – 20-29 years	-0.003 (0.009)[10]	.769	**-0.042 (0.011)**	**<.001**	0.275 (0.203)	.176		
Age – 30-39 years					0.380 (0.198)	.055		
Age – 40-49 years					0.249 (0.187)	.184		
Age – 50-59 years					0.242 (0.179)	.178		
Highest Level of Education[3] – Diploma/Certificate					0.226 (0.215)	.294		
Highest Level of Education – Bachelor					0.183 (0.219)	.404		
Education – No High School	-0.030 (0.074)	.684	-0.133 (0.086)	.131				
Education – High School, No Certificate[4]	0.010 (0.056)	.865	0.021 (0.065)	.750				
English as First Language[5]	**-0.185 (0.045)**	**.001**	-0.014 (0.053)	.800				
Presenting Research Results[6] – Yes							**0.604 (0.270)**	**.025**
Education/ Courses/ Workshops in Research[7] – Yes					-0.073 (0.100)	.467		
Shift Worked[8] – Day	0.004 (0.064)	.957	**-0.157 (0.075)**	**.042**				
Shift Worked – Evenings	0.007 (0.064)	.912	-0.147 (0.075)	.056				
Time Worked on a Unit	-0.006 (0.004)	.131	0.005 (0.005)	.291				
Health Region[9] – Alberta North					-0.042 (0.135)	.757		
Health Region – Alberta South					0.059 (0.144)	.683		
Health Region – Fraser Health					-0.019 (0.129)	.886		
Health Region – Interior Health					-0.230 (0.172)	.180		
Time Worked as a Nurse					-0.042 (0.135)	.757		
Job Satisfaction	0.029 (0.029)	.310	0.006 (0.033)	.854	-0.009 (0.006)	.130	0.005 (0.110)	.965
Adequate Orientation	0.015 (0.028)	.595	0.031 (0.032)	.342	0.012 (0.060)	.847	0.044 (0.062)	.481
Problem Solving					-0.087 (0.136)	.526	**0.344 (0.148)**	**.020**
Intent to Use Research	**0.091 (0.030)**	**.003**	-0.051 (0.035)	.144				
Information Sources	**0.128 (0.021)**	**<.001**	0.009 (0.025)	.730				
Adequate Knowledge	**-0.064 (0.030)**	**.031**	-0.003 (0.035)	.926				
Attitude Towards Research	0.040 (0.043)	.355	0.055 (0.051)	.280	**0.476 (0.112)**	**<.001**	**0.290 (0.102)**	**.005**
Belief Suspension – Willingness					0.034 (0.089)	.703	-0.073 (0.107)	.494
Belief Suspension – Implement	**0.156 (0.024)**	**<.001**	**0.062 (0.028)**	**.029**	0.138 (0.072)	.058	0.142 (0.084)	.089
Organizational Citizenship Behaviour					0.147 (0.087)	.090	0.062 (0.093)	.502
Work Engagement – Vigor					0.052 (0.070)	.462	0.004 (0.076)	.957
Work Engagement – Dedication					0.004 (0.076)	.957	0.002 (0.085)	.984
Work Engagement – Absorption					-0.013 (0.085)	.878	0.070 (0.094)	.454
Empowerment – Competence					0.121 (0.111)	.277	0.149 (0.118)	.206
Empowerment – Meaning					-0.056 (0.117)	.633	-0.045 (0.128)	.726
Empowerment – Self Determination					**0.168 (0.086)**	**.049**	-0.026 (0.080)	.748

	Care Aides				Regulated Nurses (RNs and LPNs)			
	Conceptual (β, SE)	**p value**	**Instrumental (β, SE)**	**p value**	**Conceptual (β, SE)**	**p value**	**Instrumental (β, SE)**	**p value**
Empowerment – Impact					-0.082 (0.080)	.308	-0.130 (0.088)	.138
Physical Health Status	0.001 (0.003)	.828	0.001 (0.003)	.811	0.005 (0.006)	.420	0.003 (0.007)	.621
Mental Health Status	0.002 (0.003)	.410	-0.003 (0.003)	.392	-0.006 (0.005)	.239	0.005 (0.006)	.420
Burnout – Exhaustion	0.027 (0.016)	.086	0.011 (0.019)	.544	0.054 (0.046)	.237	0.009 (0.051)	.865
Burnout – Cynicism	-0.002 (0.015)	.879	-0.010 (0.018)	.589	-0.080 (0.043)	.066	-0.048 (0.049)	.327
Burnout – Efficacy	**0.069 (0.023)**	**.003**	**0.067 (0.027)**	**.013**	**0.141 (0.051)**	**.006**	0.033 (0.053)	.532
ACT – Leadership	0.072 (0.037)	.051	0.030 (0.043)	.478	0.064 (0.063)	.310	0.082 (0.069)	.239
ACT – Culture	0.062 (0.050)	.212	-0.065 (0.058)	.260	0.016 (0.099)	.876	0.022 (0.105)	.830
ACT – Evaluation	**0.206 (0.035)**	**<.001**	0.046 (0.041)	.263	0.131 (0.077)	.088	0.117 (0.079)	.138
ACT – Formal Interactions	0.031 (0.030)	.307	0.051 (0.035)	.140	0.006 (0.046)	.895	**-0.117 (0.050)**	**.020**
ACT – Informal Interactions	0.025 (0.015)	.092	**0.049 (0.017)**	**.005**	0.003 (0.026)	.901	0.007 (0.030)	.818
ACT – Social Capital	0.048 (0.048)	.317	**0.234 (0.055)**	**<.001**	-0.106 (0.103)	.304	0.142 (0.107)	**.182**
ACT – Structural & Electronic Resources	**0.057 (0.017)**	**.001**	0.035 (0.019)	.070	**0.117 (0.023)**	**<.001**	**0.146 (0.024)**	**<.001**
ACT – Organizational Slack: Staff	-0.007 (0.022)	.734	**-0.071 (0.025)**	**.005**	0.061 (0.051)	.236	**-0.167 (0.053)**	**.002**
ACT – Organizational Slack: Space	0.002 (0.017)	.913	-0.012 (0.019)	.554	0.049 (0.044)	.269	0.035 (0.045)	.439
ACT – Organizational Slack: Time	**0.109 (0.030)**	**<.001**	**0.135 (0.035)**	**<.001**	-0.060 (0.085)	.480	0.111 (0.087)	.202
Unit Type[11]	0.081 (0.044)	.086	**0.132 (0.053)**	**.025**				
Support for Innovation	-0.021 (0.028)	.451	-0.018 (0.032)	.567				
In-services, Resident Care	-0.002 (0.012)	.881	0.017 (0.014)	.240				
Beds in Facility	0.000 (0.000)	.392	0.000 (0.000)	.455				
Clinical Educator[12]	0.001 (0.062)	.993	0.044 (0.075)	.568				
Operation Model[13] – Public	-0.027 (0.053)	.611	-0.046 (0.064)	.480				
Operation Model[13] – Private for Profit	-0.003 (0.052)	.959	**-0.137 (0.063)**	**.043**				
Province[14] – Alberta	0.042 (0.061)	.505	0.129 (0.074)	.098				
Province - Saskatchewan	**-0.280 (0.084)**	**.004**	**-0.221 (0.102)**	**.043**				

Greyed out areas represent variables that were not included in the respective GEE models

[1] Reference group is female.
[2] Reference group is 60-69 years.
[3] Reference group is graduate studies.
[4] Reference group is health care aide certificate.
[5] Reference group is English as additional language.
[6] Reference group is No.
[7] Reference group is No.
[8] Reference group is Nights.
[9] Reference group is Manitoba
[10] Age for HCA study was a continuous variable
[11] Reference group is general long-term care
[12] Reference group is No.
[13] Reference group is voluntary.
[14] Reference group is Manitoba.

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Appendices

Appendix A: Ethics Approval

File Number: H09-17-01 Date (mm/dd/yyyy): 09/21/2017

Université d'Ottawa University of Ottawa
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

Certificate of Ethics Approval

Health Sciences and Science REB

Principal Investigator / Supervisor / Co-investigator(s) / Student(s)

First Name	Last Name	Affiliation	Role
Janet	Squires	Health Sciences / Nursing	Supervisor
Melissa	Demery Varin	Health Sciences / Nursing	Student researcher

File Number: H09-17-01

Type of Project: Master's Thesis

Title: Predictors of Nurse Research Utilization in Canadian Residential Long-Term Care Facilities

Approval Date (mm/dd/yyyy)	Expiry Date (mm/dd/yyyy)
09/21/2017	09/20/2018

Special Conditions / Comments:
N/A

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http://www.recherche.uottawa.ca/deontologie/ http://www.research.uottawa.ca/ethics/index.html

File Number: H09-17-01 **Date (mm/dd/yyyy)**: 09/21/2017

Université d'Ottawa University of Ottawa
Bureau d'éthique et d'intégrité de la recherche Office of Research Ethics and Integrity

This is to confirm that the University of Ottawa Research Ethics Board identified above, which operates in accordance with the Tri-Council Policy Statement and other applicable laws and regulations in Ontario, has examined and approved the application for ethical approval for the above named research project as of the Ethics Approval Date indicated for the period above and subject to the conditions listed the section above entitled "Special Conditions / Comments".

During the course of the study the protocol may not be modified without prior written approval from the REB except when necessary to remove participants from immediate endangerment or when the modification(s) pertain to only administrative or logistical components of the study (e.g. change of telephone number). Investigators must also promptly alert the REB of any changes which increase the risk to participant(s), any changes which considerably affect the conduct of the project, all unanticipated and harmful events that occur, and new information that may negatively affect the conduct of the project and safety of the participant(s). Modifications to the project, information/consent documentation, and/or recruitment documentation, should be submitted to this office for approval using the "Modification to research project" form available at: http://research.uottawa.ca/ethics/submissions-and-reviews.

Please submit an annual status report to the Protocol Officer 4 weeks before the above-referenced expiry date to either close the file or request a renewal of ethics approval. This document can be found at: http://research.uottawa.ca/ethics/submissions-and-reviews.

If you have any questions, please do not hesitate to contact the Ethics Office at extension 5387 or by e-mail at: ethics@uOttawa.ca.

[redacted]

Germain Zongo
Protocol Officer for Ethics in Research
For Daniel Lagarec, Chair of the Sciences and Health Sciences REB

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Appendix B: Permission from TREC Primary Investigator

August 22, 2017

Daniel Lagarec, Chair of the Health Sciences and Science REB
Office of Research Ethics and Integrity
Tabaret Hall
550 Cumberland Street
Room 154
Ottawa, ON K1N 6N5

Dear Dr. Lagarec,

I am writing as the Principal Investigator of the TREC (Translating Research in Elder Care) program to authorize permission for Melissa Demery Varin to use TREC data for secondary analyses as part of her thesis.

Melissa will work on her Master's thesis *Predictors of Nurse Research Utilization in Canadian Residential Long-Term Care Facilities* under the supervision of Dr. Janet Squires.

Yours truly,

[redacted]

Carole A. Estabrooks, CM, PhD, RN, FCAHS, FAAN
Professor & Canada Research Chair (Tier 1)
Faculty of Nursing, University of Alberta