University of Alberta

A Pilot Test of the Alberta Context Tool in Neonatal and Pediatric Acute Care Nurses

by

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Abstract

The Alberta Context Tool (ACT) is a self-administered survey instrument designed to operationalize the key components of the PARiHS framework. The *CIHR Team in Children's Pain* conducted a pilot study of the ACT in a population of pediatric health care professionals. Using data collected from the nursing subsample, I conducted two separate research projects. First, I conducted a process evaluation of the pilot and explored the feasibility of using a sequential mixed-mode survey for data collection. I determined that web-surveys are a feasible option for data collection in this population and can be used to reduce participant burden while achieving high response rates. Second, I examined the factor structure of the work context scale of the ACT. The context scale formed a three component solution (leadership, evaluation, and culture) that paralleled the components of context proposed in the PARiHS framework.

Dedication

I dedicate this thesis to my mother ***Karen MacNaughton*** and the love of my life ***Stephen Fee***.

Mom – your strength, wisdom and unconditional love have made me the woman I am today. You have always believed in me and encouraged me to be the best that I can be. Words cannot express gratitude I have for all that you have given to me. Thank-you.

Steve – I believe that everything in life happens for a reason and this journey brought me you. You have been *my rock* through this whole experience. You have taught me not take life, and myself, so seriously - something that cannot be taught in a book or a course. I cannot wait to spend the rest of my life with you. I love you.

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CHAPTER 1: Introduction

A Pilot Test of the Alberta Context Tool with Neonatal and Pediatric Acute Care Nurses

This thesis is the product of my master of nursing program in which I focused on aspects of a pilot test of a newly developed survey instrument, designed to assess the influence of organizational context and other factors on research utilization, in a population of acute care neonatal and pediatric nurses. Using a paper-based thesis format, I have divided what follows into four chapters. This chapter provides the background to the research study and summarizes information about the research methods and sets the stage for what follows. Chapters two and three are complementary papers presenting two different components of the pilot study in manuscript format. The final chapter summarizes the findings from this research project and discusses the contributions it makes and directions for future research.

Background

In recent years, North American health care systems have come under a great deal of scrutiny. The release of reports such as *To Err is Human: Building a Safer Health System* (Institute of Medicine, 1999), *Crossing the Quality Chasm: A New Health System for the 21st Century* (Committee on Quality Health Care in America, 2001) and the Canadian Adverse Events Study (Baker et al., 2004) have focused attention on important questions about the safety and quality of care being provided in hospitals. In the United States, it has been estimated that 30-40% of patients do not receive recommended care and 20-30% of patients actually receive care that is potentially harmful (Schuster, McGlynn, & Brook, 1998). A Canadian study conducted by Baker et al. suggests that approximately 70,000 preventable adverse events occur each year in Canadian hospitals. Studies such as these are bringing increased focus to the area of patient safety and raise questions about how we as health care professionals can ensure our patients are receiving the best possible care.

There is evidence to suggest that pediatric patients (i.e., patients from birth to 16 years of age) are at an increased risk for medical errors (Miller & Zhan, 2004; Stratton, Blegen, Pepper, & Vaughn, 2004). In a retrospective study, which reviewed the charts of 5.7 million pediatric patients, Miller and Zhan found the youngest patients, birth to one year of age, were at the highest risk for injury due to medical care. Risk factors that place the pediatric population at increased risk include their developmental level, reliance on adults, and unique diagnoses (Forrest, Shipman, Dougherty, & Miller, 2003; Miller & Zhan). Nurses play an important role in mitigating the effects of these risk factors and ensuring the safety of this vulnerable population.

As the largest group of health care providers, nurses provide most of the day-to-day care hospitalized patients receive (Canadian Institute for Health Information, 2005; 2006), and the care they provide has been shown to impact patient outcomes (Aiken, Clarke, & Sloane, 2002; Estabrooks, Midodzi, Cummings, Ricker, & Giovannetti, 2005). One approach which may improve the quality and safety of the care provided to patients is to increase the use of research findings in the everyday practices of health care providers. At first glimpse, it appears as though this should be a relatively straightforward process, but when viewed in light of the complex reality of acute care hospital settings, coupled with the vast amount of research being published daily, the task actually becomes quite daunting.

Research Utilization and Context

Encompassed within the broader field of knowledge translation, research utilization, can be considered as a way to increase the use of current research findings in the provision of patient care (Estabrooks, Wallin, & Milner, 2003; Graham et al., 2006). Numerous barriers to this process, both individual and organizational, have been identified (Funk, Champagne, Wiese, & Tornquist, 1991; Funk, Champagne, Tornquist, & Wiese, 1995). Organizational barriers cited include, but are not limited to, insufficient authority to change practice; insufficient time to read

and implement research findings; inadequate facilities to permit implementation; and physicians, administration or other staff not supporting implementation (Funk, Tornquist, & Champagne, 1995). A study on barriers to research utilization for pediatric nurses found that elements of the environment were more often cited as barriers than characteristics of the individual (McCleary & Brown, 2003). Organizational barriers to research use are well documented in the nursing literature; however, the means to overcome them are less clear.

One of the challenges in overcoming organizational barriers to research use is the variation seen between settings. Elements of the work environment (i.e., *context*) differ not only from hospital to hospital but also from unit to unit, and thus, it is not surprising that the same strategy has different effects in different settings (Oxman, Thomson, Davis, & Haynes, 1995). For example, increasing *access* to research findings on one unit will not be successful in improving research use if the nurses state that a lack of *time* is their most significant barrier.

Recently, scholars in the field of knowledge translation have begun to acknowledge that the context within which individuals are situated plays a key role in research uptake and use (Dopson, FitzGerald, Ferlie, Gabbay, & Locock, 2002; Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005; Improved Clinical Effectiveness through Behavioural Research Group [ICEBeRG], 2006; Meijers et al., 2006; Stetler, 2003; Wallin, Ewald, Wikbald, Scott-Findlay, & Arnetz, 2006). Studies investigating elements of unit context, such as culture, suggest that there is variability between units (Coeling & Simms, 1993a; 1993b; Coeling & Wilcox, 1990); this variability may account for differences in research use behaviours (Pepler et al., 2005; 2006). However, little is known about *how* and *why* context varies between nursing units.

Context in Neonatal and Pediatric Nursing Units

Simple differences between pediatric and adult patient populations, such as children's dependence on adults, create different demands on nurses and influence how the nursing care

on neonatal and pediatric units is structured. These differences may contribute to variances in context, or work environment, between pediatric and adult settings. A review of the literature surrounding work environments revealed no studies specifically comparing or contrasting the context of neonatal or pediatric acute care nursing environments with similar adult nursing environments. Instead, what emerged from this literature review were some of the experiences reported by pediatric nurses such as working with patients at various stages of growth and development, working from a philosophy of family-centred care and the emotional demands of caring for infants and children.

Due to the structure of many pediatric units, nurses need to be able to care for children from birth through to adolescence. Thus, pediatric nurses need to have an awareness of normal growth and development patterns and the ability to use this knowledge to tailor nursing care to meet the developmental needs of their patients (Dunbar, 1995).

Most pediatric units strive to provide care from a 'family-centred care' perspective (Hutchfield, 1999). Although it is often a hidden aspect of their work, pediatric nurses spend a significant amount of time caring for parents and siblings of their patients (Callery, 1997; Sarajärvi, Haapamäki, & Paavilainen, 2006). Caring for patients' families adds to demands for nurses' time and can increase the emotional burden placed on nurses (Bruce et al., 2002).

In a grounded theory study examining how nursing students learn to care for children, Coetzee (2004) noted that pediatrics is often described as the most stressful rotation in the curriculum and that "emotional investment" is often a defining trait. There are several aspects of pediatric settings which may be emotionally demanding for nurses. In a study looking at factors contributing to stress in pediatric nursing, Watson and Feld (1996) report a lack of time to provide emotional support to patients and performing painful procedures as two of the largest contributing stressors for these nurses. Finally, caring for children inevitably challenges

nurses to deal with complex ethical questions (Jennings, 1990). Death in infants and children tend to seem untimely and, in addition to raising difficult ethical questions, can be a contributing factor to stress and burnout in nurses working in these areas (Watson & Feld).

Although these elements of work environment are not necessarily exclusive to neonatal and pediatric nursing units they draw attention to how the needs of a particular patient population can change the nature and structure of nursing work and thereby influence unit context. With the increased attention being given to context as an important element in the research utilization process, the demand for an instrument with which to assess it is becoming increasingly important. The ability to assess context would improve our capacity to design interventions that are sensitive to unit needs and target relevant barriers. Although McCleary & Brown (2003) have identified some of the barriers to research utilization in pediatric settings, we still do not know enough about the context of pediatric nursing units to know how best to overcome them. A need exists for an instrument which can assess contextual factors in pediatric units and examine how these elements impact research use.

CIHR Team in Children's Pain

Recognizing the lack of understanding about how context affects knowledge translation interventions, the Canadian Institutes of Health Research (CIHR) Team in Children's Pain is conducting a five year, multi-site study which will, in part, examine context as a mediator of a knowledge translation intervention aimed at decreasing acute pain in hospitalized children. The participants for this study will be from general pediatric units (including but not limited to medicine, surgery, cardiology & oncology); pediatric intensive care units (PICU) and neonatal intensive care units (NICU). This study is divided into three separate but related projects: *Project 1* focuses on establishing a database of painful experiences in hospitalized children across Canada. This database will provide a baseline for assessment of outcomes in Projects 2

and 3. Projects 2 and 3 are focused on delineating the context of pediatric acute care units and assessing its influence on knowledge translation and pain outcomes. *Project 2*, led by a team in Edmonton (Estabrooks, Scott-Findlay, & Cummings), will use a suite of survey instruments, including the newly developed Alberta Context Tool (Estabrooks et al., 2007), to assess the influence of organizational context on knowledge translation. *Project 3* will be a cohort comparative study with repeated measures and will compare a knowledge translation intervention (Evidence-based Practice in Change) with usual practice. The integration of these three projects will allow the team to develop an in-depth understanding of the relationships between context, research utilization and acute pain in hospitalized children.

Purpose

This master of nursing research project is a component of the CIHR Team in Children's Pain pilot study for Project 2 entitled Context and Research Use in the Care of Children. The purpose of this pilot study was to test the newly developed Alberta Context Tool (ACT) in a population of pediatric health care professionals (nurses, physicians, managers, educators and allied health care groups). My thesis research focused on pilot testing the ACT in a sample of acute care pediatric nurses. This included refining the survey for the intended audience, participating actively in the data collection phase, assessing the feasibility of using a web-based survey in this population, and finally, providing a preliminary assessment of the psychometrics and factor structure of the work context scale of the survey instrument.

Research Objectives

This research project can be subdivided into two separate but related objectives. They are presented in manuscript format in chapters two and three, and each is formatted for submission to a different research journal.

Objective #1: Conduct a process evaluation to examine various aspects of using web-surveys for data collection in a sample of pediatric acute care registered nurses.

- This manuscript is being prepared for submission to *Applied Nursing Research*.

Objective #2: Examine the psychometric properties and factor structure of the Alberta Context Tool scale which assesses the core components of work context (culture, leadership and evaluation) as defined by the PARiHS framework.

- This manuscript is being prepared for submission to *Nursing Research*.

Theoretical Framework and Development of the Survey Instrument

The PARiHS Framework

The Promoting Action on Research Implementation in Health Services (PARiHS) framework explores and develops the effect of context on the research utilization process. In the PARiHS framework, Kitson and colleagues, view research utilization as a function of the dynamic relationship between the quality of the evidence, the availability of effective facilitation and the receptivity of the context (Kitson, Harvey, & McCormack, 1998).

The first core element of the PARiHS framework is *evidence* which is broadly defined to include findings from research, professional experience and patient preference (Rycroft-Malone et al., 2002). For the implementation process to be successful, the research needs to be rigorous, there needs to be a high level of consensus among clinicians and finally, it needs to account for individual patient preference (Kitson et al., 1998). This broad conceptualization of evidence acknowledges that findings from research studies alone are not sufficient to address the questions that arise in clinical practice. The second element, *facilitation*, involves the ability of one person to make something easier for others (Kitson et al.). The purpose of facilitation can range from assisting with the completion of a specific task to a more holistic process of evaluating practices and developing a culture which values and supports the use of evidence in

practice (Harvey et al., 2002). The final core element of the PARiHS framework is *context* which is defined as the environment in which health services are provided and where the implementation of evidence occurs (McCormack et al., 2002). It is meant to encompass "the forces at work that give the physical environment a character and a feel" (Kitson et al., p. 152). Within this framework, context is further subdivided into three elements: culture, which encompasses the values and beliefs of individuals on a unit; leadership, which represents the overall power structure; and evaluation which is related to the presence of audit and feedback systems (McCormack et al.).

As a work in progress, the PARiHS framework provides a flexible structure from which we can begin to assess and build upon the components of context as they relate to the research utilization process. The conceptualization of context presented in the PARiHS framework provided a starting point for the development of the Alberta Context Tool which was originally designed to assess the impact of context on research utilization in adult acute care settings.

The Alberta Context Tool

The Alberta Context Tool (ACT), developed by Estabrooks et al. (2007), was designed to both operationalize the construct of context in the PARiHS framework and to assess the influence of organizational factors on knowledge translation in various health care professional groups. The ACT is composed of seven sections: (1) work context (i.e., culture, leadership and evaluation) and other context related concepts; (2) using research; (3) facilitation of research use; (4) information transfer mechanisms; (5) resources (structural: paper & electronic, social, human, time and space); (6) relationship with work; and finally, (7) demographics. There were several instruments used in addition to the ACT for the purpose of this pilot: the Maslach Burnout Inventory-General Scale Short Form (Maslach, Jackson, & Leiter, 1996), a subset of the Environmental Complexity Scale (O'Brien-Pallas et al., 2001; O'Brien-Pallas et al., 2002; O'Brien-

Pallas, Irvine, Peereboom, & Murray, 1997) and the SF-8 Health Survey (Ware, Kosinski, Dewey, & Gandek, 2001). Also a small set of process evaluation questions were added to gather information about the time required to complete the survey; where and when the surveys were completed; how many sittings were required to complete the survey; and finally, for the print survey, why respondents did not use the web.

The ACT is designed to collect data on potentially modifiable elements that are thought to be important determinants of research utilization in health care settings; of particular interest to this study is the survey section related to work context. The team of researchers that developed the work context scale used the key components of context as outlined in the PARiHS framework as a starting point. These three work context 'subscales' are culture (five items), leadership (six items) and evaluation (called 'feedback processes' in the ACT, six items). Because the PARiHS framework is a work in progress, the research team used an extensive literature review coupled with their expertise in the content areas to operationalize these three concepts and construct the items with which to measure them.

To date, the ACT has only been pilot tested in adult acute care units in four Alberta teaching hospitals. Based on studies assessing culture in nursing units (Coeling, & Simms, 1993a; 1993b; Coeling & Wilcox, 1990) and among nursing specialties (Mallidou, 2004) we have good reason to believe that elements of culture, and by extension context, vary between nursing units. If this is true, the ACT requires extensive testing in a variety of different health care settings to establish its validity and reliability prior to widespread use.

Pilot Testing of the ACT

Pilot testing of the ACT was first done in small focus groups to help ensure and enhance face validity. Following the focus groups, minor revisions were made and the instrument was then piloted in four adult acute care hospital settings with nurses, physicians, managers,

educators and allied health care professionals (pharmacists, occupational therapists and physiotherapists). Although the results have not yet been published, psychometric testing and factor analysis conducted following this initial pilot resulted in item reduction of some scales and reorganizing of others. It was the newly modified ACT that was used in this pilot study.

Design

This study employed a cross-sectional survey design. I first conducted a process evaluation of the pilot to assess the feasibility of using a web survey format for data collection in pediatric nurses. Next, I examined the psychometric properties and factor structure of the work context scale of the ACT.

Methods

Sample & Setting

This study was conducted in two tertiary hospitals in the same western Canadian city. In order to represent the types of units that will be used in the larger CIHR Team in Children's Pain study, three units were selected: a neonatal intensive care unit (NICU), a pediatric intensive care unit (PICU) and a pediatric non-ICU unit. We surveyed all Registered Nurses (RN), Graduate Nurses (GN) and Licensed Practical Nurses (LPN) employed in the provision of direct patient care in one or more of the three units on a full-time, part-time or casual basis. Managers, Educators, Clinical Nurse Specialists and Nurse Practitioners were excluded as their roles differ substantially from bedside care providers and this may influence their perception of the variables being explored. The three aforementioned units provided a population of 407 nurses.

Recruitment

Since the main study would use the web as its sole method of data collection, we initially chose to conduct the pilot study using only the web in order to determine how best to maximize response rates to this survey mode. However, due to programming limitations we

were unable to include the Environmental Complexity Scale (ECS) in the web-based survey. Thus, we elected to use a sequential web/print survey mode for the pilot. This involved initially offering participants the web option only and then later, at the time of the second reminder, providing non-respondents with a print option. This allowed us to assess the feasibility of web-based data collection while still enabling us to gather some data from the ECS.

To date, web surveys have not been extensively used in populations of acute care nurses, and in studies where they have been used response rates, more often than not, have been poor (18-44%) (Bjornsdottir & Thorhallsdottir, 2003; Feudtner et al., 2007; Villanueva, Thompson, Macpherson, Meunier, & Hilton, 2006). One study, conducted by Lee, Lin, & Lin (2007) reported a response rate of 74.2% over a short two-week data collection period. Unfortunately, Lee et al. provide no details about the recruitment strategies used to achieve this response rate. In addition to these four studies that employed *only* a web survey format, we located three mixed-mode (print/web) studies conducted in populations of acute care nurses. The response rates to the web survey mode in these studies were a discouraging 2% (Estabrooks et al., 2007), 4% (Warren, 2004) and 9% (Lusk, Delclos, Burau, Drawhorn, & Aday, 2007). Thus, in order to obtain an adequate response rate to the web-based survey, the CIHR Team in Children's Pain - Project 2 research team conducted an intense recruitment campaign which began four months prior to the onset of data collection. Face-to-face communication was used as much as possible in hopes this would help bolster response rates (Mond, Rodgers, Hay, Owen, & Beumont, 2004).

Initially we made contact with the Patient Care Managers and Unit Managers of the selected units to introduce the study and obtain information about each of the units. Specifically we sought information about the number of computers, internet connections and the availability of an externally accessible work e-mail system. All of the units had computers with

internet access that staff was permitted to use to complete the survey. A work e-mail system was present in all three units; however, one system was not accessible via the internet and could not be used by us to distribute information pertaining to the study. Thus, we elected to distribute all study information in print form using hand-delivery whenever possible and work mail slots for those individuals we were unable to make face-to-face contact with.

Introduction of the study to the staff nurses was done through a combination of formal and informal means. We attended staff and team meetings and 'Lunch and Learn' sessions to introduce the study to groups of individuals. In addition, we regularly toured the units to speak informally with as many nurses as possible. For nurses that we were unable to meet with, a copy of the recruitment letter was placed in their mail slot. Information provided to the staff included a brief summary of the study and emphasized how to access and complete the survey using the internet.

Data Collection

Data collection took place from July to September, 2007. Initially, individualized survey packages were hand distributed to as many nurses as possible. Packages consisted of an information letter, a business card containing a password and information on how to access the survey online, a continuing education certificate (signed by the Senior Operating Officer and the Project 2 Principal Investigator) and a $5 booklet of gift certificates. For nurses we were unable to contact, a copy of the survey package was placed in their mail-slots. Two weeks following the initiation of data collection we distributed reminder postcards to all nurses who had not started or completed their online survey. A second reminder notice, which included a print copy of the survey, was distributed at four weeks into data collection, and data collection ended two weeks following the delivery of this second notice.

Throughout the data collection period, we continued our presence on the units. This allowed us to provide assistance to staff related to the operation of the web survey and also enabled us to gather important feedback about the survey format. We provided the units with weekly response rate reports and displayed this information on posters in each unit's staff lounge. Unexpectedly, this created a friendly rivalry between the units, especially on the two units that were within the same institution, and seemed to enhance interest and excitement about the study among the nursing staff. In total, up to the time data collection ended, we had conducted 105 visits to the three study units over a seven month period for a total of 45.5 contact hours.

The Web Survey & the Population Research Laboratory

The University of Alberta Population Research Laboratory (PRL) (http://www.uofaweb.ualberta.ca/prl/) created and managed the website that hosted the survey. In addition, the PRL assisted with the creation of information sheets, business cards and reminder notices and they provided each participant with a unique password that ensured them anonymity from the research team.

With the exception of one question, pertaining to primary nursing role, participants were not forced to answer any survey questions. As participants navigated through the survey pages, answer selections were automatically saved. The survey design allowed participants to return as many times as required to complete the survey. The first time participants logged into the survey they were able to navigate back-and-forth between pages to change responses or answer questions left blank. However, due to a programming limitation, if they needed to return to the survey (i.e., in second or subsequent log-ins), participants were automatically directed to the page furthest along in the survey that contained a completed response and they could not

access any pages prior to that point. In a review of the final dataset, this limitation did not appear to affect the completeness of the responses.

Data Analysis

Objective #1: Feasibility of web surveys. Data analysis for this objective was primarily descriptive. Using demographic data I created a profile of respondents on the three units. I calculated response rates for the overall survey and for each individual unit and determine the proportion of responses that were web-based and print-based. Finally, using data collected in the process evaluation questions I determined the average length of time to complete the survey, the average number of sittings required, where most surveys were completed (work vs. home), and reasons why the print option was selected over the web format.

Objective #2: Factor analysis of the work context scales. Exploratory factor analysis (EFA) was employed to examine the psychometric properties and factor structure of the work context scale which is composed of three subscales: leadership (6 items), culture (5 items) and feedback processes (6 items). A commonly applied approach to EFA in the health sciences is to begin with principal components analysis (PCA) followed by varimax rotation. Once the factor structure was determined, we examined the internal consistency of the factors using Cronbach's alpha coefficient (Burns & Grove, 2005; Pett, Lackey, & Sullivan, 2003). All data analysis was carried out using SPSS 15.0® for Windows™ software.

Summary

Pilot testing the ACT in neonatal and pediatric settings is a necessary first step in the research process for the CIHR Team in Children's Pain. This pilot will provide the team with information about how the survey performed with nurses in the three units, response rates in this population, success of a web-based survey format and successes or failures of the selected recruitment strategies.

There is a need for a robust, psychometrically sound instrument to measure work context in health care settings. By analyzing the work context section of the ACT I was able to provide information on the psychometric properties and factor structure of this scale to the researchers who developed the survey. I was also able to provide them with some recommendations on how to improve these scales for future use with neonatal and pediatric nurses.

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CHAPTER 2: The feasibility of web-based surveys as a data collection tool: A process evaluation

Background

The use of computer technology as a tool for research is increasing in popularity. Web surveys have been shown to have several advantages over traditional data collection means such as telephone and print surveys. Some of the benefits of using web surveys include more complete data (Bachmann, Elfrink, & Vazzana, 1996; Truell, Bartlett, & Alexander, 2002), reduced cost (Akl, Maroun, Klocke, Montori, & Schunemann, 2005; Bachmann et al.) and a faster rate of return (Akl et al.; Bachmann et al.; Truell et al.). Although nurse researchers have used computer technology quite extensively to conduct research with various populations (Bond, 2006; Kittleson, 2003; Lakeman, 1997; Picherack, 2000; Thomas, Stamler, Lafreniere, & Dumala, 2000; Yeaworth, 2001), little information exists on how to successfully engage nurses as participants in studies that use a web survey format.

To date, web surveys have not been used extensively in populations of acute care nurses, and studies that have used them have employed a variety of different recruitment strategies such as the internet, association membership and place of employment. Internet-based research studies use tools such as listserves to recruit participants (AbuAlrub, 2004; Hayajneh, 2000; Mrayyan, 2002; Tang, 2005). Rather than reporting response rates, authors of these studies tend to report the number of 'usable questionnaires' received. In the four studies cited, the authors sent out between 1900-6000 invitations to participate in their online surveys. The number of usable questionnaires returned ranged from 254 to 432 suggesting that this means of recruitment may not be the most effective way of engaging acute care nurses in web survey research. Nursing association memberships have also been used to distribute invitations to participate in web surveys, but these studies have also had low response rates: 18%

(Bjornsdottir & Thorhallsdottir, 2003) and 19% (Villanueva, Thompson, Macpherson, Meunier, & Hilton, 2006). Finally, web surveys have been used in studies conducted within a single institution. Feudtner and colleagues (2007) conducted a cross-sectional survey of nurses at the Children's Hospital of Philadelphia, and reported a response rate of 44%, and Lee, Lin, & Lin (2007) achieved a response rate of 74% in a hospital-based study conducted in Taiwan. Overall, web surveys have not been extensively used in populations of acute care nurses and in the few studies we located, response rates, with one exception (Lee et al.), have been relatively poor.

Experts in survey design have suggested that employing a mixed-mode strategy may help to enhance survey response rates (Dillman & Smyth, 2007; Schaefer & Dillman, 1998). One example of this is to use paper copies of a survey as an adjunct to the web-based version. These mixed-mode approaches can offer participants a choice between the two survey modes, web and print, either simultaneously or sequentially. The order in which they are presented may have a strong impact on the response rates for each mode. In a study with several arms, Quigley, Riemer, Cruzen, & Rosen (2000) found that when participants were offered both web and print surveys simultaneously, at the onset of the study, only 23% of respondents chose the web option. However, when participants were initially given the web survey and then only non-respondents were offered a print option, the web response rate was 73%. Similar findings were reported by Beebe and colleagues in a study which compared a sequential web then print survey distribution pattern to the converse (print then web) in a sample of physicians (Beebe, Locke III, Barnes, Davern, & Anderson, 2007). Beebe et al. found that when participants were offered the web mode first 75% of respondents chose web; whereas when the print mode was offered first only 14% responded using the web.

We located two studies that used a mixed-mode survey format with nurses (Lusk, Delclos, Burau, Drawhorn, & Aday, 2007; Warren, 2005). Warren's study of registered nurses

initially offered respondents a print option only; a web option was later offered in both the second and third mailings. This sequential print/web approach generated an overall response rate of 31%; 86% of respondents chose the print mode and only 14% chose web. In a study that evaluated determinants of participation in web-based surveys amongst health care professionals, Lusk et al. chose to offer both the print and web survey formats to participants simultaneously. The overall response rate for Lusk's study was 66%, and an overwhelming 91% of the health professionals chose to respond by mail. Of the nursing sub-sample, less than 9% of respondents chose to complete the survey via the internet.

Previous experience with mixed-mode survey designs by one of the authors echoes the above literature (Estabrooks et al., 2007). In Estabrooks et al.'s initial pilot of their Alberta Context Tool, five groups of health professionals working in adult acute care settings were surveyed and the nursing and allied health care professional groups were offered a choice between web and print survey modes. The overall response rates for these two groups were 43% and 52% respectively. However, only 8% of the allied professionals and only 2% of the nurse respondents chose to use the web survey. In the manager, educator and physician groups, response rates ranged from 38-39% using the web survey alone.

The study reported here is a component of a study being conducted by the Canadian Institutes of Health Research (CIHR) Team in Children's Pain. This five year, multi-site study is comprised of three separate but related projects which together aim to decrease the incidence of acute pain in hospitalized children by narrowing the gap between research and practice. One of these projects, entitled Delineating the Context of Evidence Use, focuses on assessing the context of pediatric acute care units and determining its influence on knowledge translation. Presented here is a piece of the pilot study which was conducted prior to the launch of the larger project in 32 pediatric units, in eight hospitals, across Canada.

Pilot studies are useful as they allow for small scale assessment of the project and provide information on the proposed study environment, the data collection process and allow for assessment of data collection instruments (Lancaster, Dodd, & Williamson, 2004; Nyatanga, 2005). Given the magnitude of the larger research study, part of this pilot test sought to determine if web surveys were feasible to use in pediatric acute care settings. Thus, we elected to conduct a pilot test of the proposed suite of survey instruments beginning with only a web survey option and using a print option as a 'back-up' if adequate response rates were not achieved by web. Our target response rate was 50% (n = 180) which would provide us with the minimum number of cases needed to conduct psychometric testing of the survey instrument. As the process unfolded, we chose to include a print survey option not because of insufficient response rates but because we wanted to collect some data on one of our instruments (the Environmental Complexity Scale) which, due to program limitations, could not be included in the web survey format. In order to enable us to assess the feasibility of web surveys, the print option was not offered until the second, and final, reminder was distributed. In addition, we conducted a concurrent process evaluation in which we tracked recruitment strategies, formal and informal feedback from participants and response rates to each survey mode. The purpose of this paper is to report on our experience with the sequential mixed-mode format and the results of the process evaluation.

Methods

Design

This study employed a cross-sectional survey design with a concurrent process evaluation to examine the feasibility of using web surveys in a population of acute care neonatal and pediatric nurses. The purpose of conducting a process evaluation was to understand if using strategies such as maximizing face-to-face communication with participants, sending reminder

notices, and providing continuous support would encourage nurses to use a web-based survey. In addition, we sought feedback about where nurses completed the survey, the number of sittings and length of time it took, and why participants that selected the print mode chose not to use the web. Ethical approval for this study was received from the appropriate university health research ethics board.

Setting and Sample

A combination of neonatal and pediatric in-patient units from two tertiary care hospitals, in the same Canadian city was selected for this study. A Pediatric Intensive Care Unit (PICU), a Neonatal Intensive Care Unit (NICU) and a general pediatric (non-ICU) unit were purposely selected to provide adequate representation of the diversity of settings in which acute care pediatric nurses practice. We surveyed all nurses (i.e., Graduate Nurses, Registered Nurses and Licensed Practical Nurses) on the three units whose primary role was the provision of direct patient care. Using this inclusion criterion the initial population available from which to sample, based on the staff lists provided by the Human Resource departments, was 407.

Recruitment

Initial contact was made with the study units four months prior to the beginning of data collection. During this four month period we had 36 separate meetings on the three units to introduce the pilot study to as many individuals as possible. We began by meeting with the managers for each of the units to explain the study and the web survey data collection system. Through these meetings we gathered information about computer, internet and e-mail access on the units and sought input into how best to engage nurses in the study. Based on the feedback received, we used a combination of face-to-face interactions and print documents to raise awareness and interest about the study. In addition, we provided staff with small tokens of appreciation for giving both personal and work time to learn about our study.

Face-to-face interactions. Whenever possible, one of the authors (LC) and the Study Nurse working on the project went onto the units to provide information to the nurses about the study. We attended staff and various team meetings, conducted 'Lunch & Learn' education sessions, and spent time on the units informally speaking with the nurses. The emphasis in these exchanges was how to access, navigate and complete the survey using the internet.

Print and electronic documents. Throughout recruitment, print and electronic documents were used as an adjunct to face-to-face meetings. Given the nature of acute care nursing, such as shift work, self-scheduling, and unpredictable workloads, we were unable to personally meet with every staff member. Print and electronic documents contained information pertaining to commonly asked questions about the study and the web survey format. We sent electronic copies to the unit managers to distribute through staff e-mail (when available) and print copies were given to staff during meetings, placed in mailboxes (when e-mail was unavailable), and posted on communication boards and in staff lounges. For one of the study units, we provided a summary of the study for publication in the staff newsletter. Finally, we created a poster which reported unit response rates and posted one on each unit to provide feedback to the participants about their response rates.

Tokens of appreciation. Anytime staff made time to attend a meeting or speak with us at the bedside regarding the study we left them with a small token of our appreciation. For larger, more formal meetings we brought pizza, cookies, or coffee and donuts for attendees, and for informal one-on-one 'bedside' meetings we provided small packages of jelly beans or chocolates. This was our way of acknowledging how busy the nursing staff were and allowed us to demonstrate our appreciation for the time they invested in learning about our study.

Survey Design

The suite of survey instruments selected for use by the CIHR Team in Children's Pain is intended to assess the influence of organizational factors (i.e., context) on knowledge translation. These include the Alberta Context Tool (Estabrooks et al., 2007), the Maslach Burnout Inventory-General Survey (Maslach, Jackson, & Leiter, 1996), the SF-8 Health Survey (Ware, Kosinski, Dewey, & Gandek, 2001) and a sub-set of the Environmental Complexity Scale (included in the print survey mode only) (O'Brien-Pallas et al., 2001; O'Brien-Pallas et al., 2002; O'Brien-Pallas, Irvine, Peereboom, & Murray, 1997). In addition, to collect data for the process evaluation component of the pilot study, a short section of questions which sought information about where, when and in how many sittings the survey was completed, ease of use of the web survey, and why the participant did not select the web survey (print version only) were included (see Table 1). This suite of instruments used a combination of multiple choice, yes/no, Likert scale and open-ended answer formats.

The construction and administration of the website that hosted the web survey was contracted to a third party: the University of Alberta Population Research Laboratory (PRL) (http://www.uofaweb. ualberta.ca/prl/). Each participant was assigned a unique password granting them access to the survey questionnaire; to maintain anonymity, only the PRL had access to the key matching participants with their passwords. With the exception of one question pertaining to primary nursing role, participants were not forced to answer any questions and could move throughout the survey and complete questions in any order. Answer selections were automatically saved as participants navigated between pages and participants could return to the survey as many times as needed to complete it.

Survey Administration & Data Collection

Data were collected from July to September 2007. Personalized survey packages were created for each participant and contained an information sheet; continuing education certificate signed by the Senior Operating Officer and the Principal Investigator; a $5 package of gift certificates; and a business card with a Uniform Resource Locator (URL), unique password and instructions for how to access the survey online. The business card was designed to encourage nurses to carry the survey information with them so they could access it throughout the day as time permitted. Whenever possible, survey packages were hand-delivered to participants by members of the research team. Two weeks following the initiation of data collection, reminder postcards were placed in the work mailboxes of those nurses who had not started or completed their survey. A final reminder letter and a print copy of the survey were filed in staff mailboxes for all nurses who had not started or completed the web survey at four weeks past the initiation of data collection.

Throughout data collection, the units were kept up-to-date on their response rates. In addition to collecting survey data, we tracked time spent on the units, solicited feedback from the staff regarding the use of the web survey (likes, dislikes, and suggestions for improvement) and sought information specifically from nurses who had not completed the survey to help us understand if the web format was a deterrent to participation. These components of the process evaluation were intended to augment our understanding of why web surveys were or were not feasible in this population.

Data Analysis

Analysis of the data from the process evaluation was primarily descriptive. We examined the demographic characteristics of respondents from each unit by separating the web and print respondent groups and compared them using chi-square and independent sample t-

tests. This was done to determine if there were demographic differences between participants that selected each of the response modes. Response rates to the survey were calculated for each unit and the sample as a whole; we also calculated the percentage of web versus print responses. Finally, information collected from the process evaluation questions embedded in the survey and through informal discussions with nurses on the various units enhanced our understanding of the acceptability of web surveys to these nurses.

Results

Sample

The initial population for the three units, as provided by the hospital Human Resource (HR) departments was 407; however, due to maternity leaves (n = 27), short and long-term disabilities (n = 13) and staff turnover (n = 36), we excluded 76 nurses. An additional 31 participants who worked in the units but were not on the original list provided by the HR departments were added to the study list at their request. This left us with a final denominator of 362. The largest of the three units was the NICU with 193 nurses, then the PICU with 106 and finally the non-ICU unit with 63 nurses. A summary of demographic characteristics for participants is provided in Table 2.

We further examined the demographic variables using chi-square and independent sample t-tests to see if differences existed between those individuals who responded by web and those that responded by print. No statistically significant differences were found on the selected demographic variables between the web and print sub-samples. Although not statistically significant $\chi^2(2, N = 245) = 5.8$, $p \leq .06$, the web and print samples differed most in respect to their employment status. Upon closer examination, full-time staff made up a greater proportion of web respondents (50%) than print respondents (36%), whereas casual staff made

up a larger percentage of print respondents (21%) than they did for the web (9%). Part-time staff composed a similar portion of both response modes (44% print and 40% web).

Access to computers and the internet varied greatly between the three units. The NICU nurses had the most access with one computer, with internet access, available at every bedside. The other two units had 8 to 10 computers each scattered throughout patient care areas, the nursing lounge and at the nursing desk. Not all of the computers in the non-ICU unit had internet access thereby further limiting the number of computers available to use to complete the web survey.

Response Rates

Response rates divided by unit and by survey mode are presented in Figure 1. In total, 253 surveys were returned to us through the two survey modes: 213 by web and 40 by print. Of the 213 surveys submitted by the web format, four were returned with the majority of the questions unanswered. These four surveys were removed from the final sample resulting in a total of 209 usable web surveys. This provided an overall response rate of 69% (N = 249).

During the first 11 days of data collection, from the time the initial survey packages were delivered up to the distribution of the first reminder, a 45% response rate was achieved. Two weeks later, at the time the second reminder was delivered, the response rate had increased to 55%. At this point, a second reminder notice was distributed and nurses who had not yet responded were given a choice to either complete the survey by the web or to use the print survey that was provided with their second reminder. In the final two weeks of data collection an increase of 14% was seen in the overall response rate; the majority of these responses were completed using the print format (40/54). Overall, the majority of completed surveys (209/249) used the web format; only 16% of respondents used the print format.

Survey Completion Profile

The inclusion of several process evaluation questions (Table 1) provided some insight into survey completion times, where and when participants completed the surveys and reasons why some participants selected the print format over the web survey option. The average survey completion time, for all respondents, was 24 minutes. When broken down by survey mode, the average time for the web format was significantly shorter (22 minutes) than the average of 33 minutes required to complete the print format ($p \leq .01$).

The number of sittings required to complete the survey also varied between the web and print survey formats. More web respondents (73%) than print respondents (40%) were able to complete the survey in a single sitting. The majority of participants chose to complete the survey while at work (84%). Interestingly, more web respondents completed the survey on work time while more print respondents chose to use their break time. Web respondents were almost three times more likely than print respondents to complete the survey at home. See Table 3 for more details.

Finally, respondents that completed the print version of the survey were asked why they did not use the web survey format. The top three reasons given for selecting the print format were (1) liked the flexibility of paper (able to carry it around and complete it in free time) (18%); (2) no internet access at home (15%); and (3) felt it would be more time consuming to complete the survey using the web (8%).

Discussion

Historically, health professionals have tended to have low response rates to surveys. Mixed-mode survey designs can be a useful strategy to increase response rates while helping to contain research costs (Dillman, 2007). Web surveys are generally accepted as a less expensive mode of data collection (Akl et al., 2005; Bachmann et al., 1996) and also provide additional

benefits such as expedited rate of return, more complete data and reduced error due to the elimination of manual data entry (Akl et al.; Bachmann et al.; Truell et al., 2002). However, previous authors who have employed mixed-mode survey designs in populations of nurses found that when provided with a choice between print and web survey modes, nurses overwhelmingly selected the print option (Estabrooks et al., 2007; Lusk et al., 2007; Warren, 2005). In this study we initially provided participants with a web survey option only, and following one reminder notice the overall response rate was 55% (n = 199). The remaining 163 non-respondents were then sent a second reminder which included a print copy of the survey; these participants were allowed to choose between the print and web formats. Following this, our overall response rate rose to 70% (N = 253). Of the 54 new responses received, 26% (n = 14) were submitted on the web and 74% (n = 40) were print. Thus, using a sequential web/print mixed mode survey design allowed us to maximize the benefits of the web mode of data collection while using the print mode to augment our response rate.

One of the top three reasons nurses selected the paper survey mode over the web format was the perception that the web format would be more time consuming. In reality, for our study, the web format actually took less time to complete and generally required fewer sittings than the print format. At least part of the difference in time can be attributed to the inclusion of the Environmental Complexity Scale (ECS) in the print format of the survey. In a pre-test of the ECS, conducted with a small group of NICU and PICU nurses, we found that completion times ranged from 5 to 10 minutes with the average completion time being about 6 minutes. Given that the web and print survey modes were not identical (inclusion of the ECS in the print survey and slight variations in the process evaluation questions for the two formats), we cannot say with certainty that the web survey format is less time consuming than the print. However, using the pre-test completion times for the ECS as a guide to estimate the additional

time burden for this scale, it is likely that the web survey format is at least not more time consuming than the print.

Despite the fact that 84% of the participants completed the survey while at work, the highest individual unit response rate was not seen in the unit with the greatest number of computers. The NICU had 65 computers with internet access, one at every bedside, and their overall response rate was 65%. The non-ICU unit achieved an 89% response rate and only had eight computers in the unit with internet access. However, upon closer examination, the NICU had 112 participants submit surveys via the web out of a total of 128 participants (88%). The percentage of respondents in the PICU and non-ICU unit that used the web format was 78% and 84% respectively. Thus, greater access to computers/internet may actually help to improve the percentage of responses submitted by the web but will not necessarily improve the overall response rate.

Due to the amount of face-to-face contact that we had with participants we continuously received feedback about the data collection process as a whole. Although the information we received was informal it still may have value for researchers planning on using web or mixed-mode surveys. For the most part, participants found the web survey easy to use. The most commonly mentioned frustration with the web survey was technical difficulties (e.g., login not recognized by the server, unable to access the website). This feedback was congruent with the web survey process evaluation question that asked about ease of use; only one participant responded that the web survey was not easy to use. Ensuring the server which hosts the web survey is reliable and that all information provided to participants is accurate prior to commencing data collection is essential in minimizing these frustrations.

Several participants also expressed that the use of web surveys with a personal login made them feel as though their responses could be tracked. This perceived lack of anonymity is

concerning for researchers in that it may not only reduce response rates but also may lead to questions about ethical conduct. We had a neutral third party (the University of Alberta Population Research Laboratory (PRL)) manage the staff lists provided by the Human Resource departments and assign personal logins for all nurses. The PRL used the staff list to distribute the two reminders; however, no identifying information was contained in the final dataset that the PRL created for the research team. Although our information sheet explicitly stated that all information provided by participants will be kept strictly confidential, more detail regarding how participant anonymity would be maintained may have been needed.

Finally, an extensive amount of human resources went into meeting with nursing staff to inform them about the study, hand-delivering survey and reminder packages and in soliciting participant feedback on the survey modes. In addition, there were costs associated with providing modest tokens of appreciation to the nursing staff who took time to learn about the study and provide us with feedback on the print and web survey modes. This included such things as supplying coffee and donuts or pizza during formal information sessions such as staff meetings or 'Lunch and Learn' sessions. Often nursing staff were too busy to attend these formal information sessions so we conducted numerous informal 'bedside' sessions with one or two nurses at a time. For these nurses we prepared small individually wrapped packages of chocolates and jellybeans as a gesture of thanks for taking time to listen and assist us with the study. Finally, a five dollar booklet of gift certificates for a local coffee shop was provided to all nursing staff with their initial survey package as a token of appreciation for considering participation in the study. A summary of these costs is provided in Table 4. The costs associated with maximizing face-to-face communication with the staff and in providing tokens of appreciation were not insignificant; however, they may have contributed to the response rates we achieved. Participants often expressed gratitude for the tokens of appreciation and on

several different occasions we were told that the gift certificates accompanying the survey packages created a 'sense of responsibility' to participate in the study. Further research is needed to sort out which components of this process, if any, help improve survey response rates.

Conclusion

To our knowledge, a sequential, web-print, mixed-mode survey format has not previously been explored in populations of acute care nurses. We initially offered participants a web survey option only and followed with a print option, as a part of our second reminder, several weeks later. In contrast to other studies that have simultaneously provided web and print survey options (Estabrooks et al., 2007; Lusk et al., 2007) or have offered participants a print option initially later followed with a web option (Warren, 2005), we were able to attain a much higher percentage of responses that were submitted using the web format (84%). In order to maximize the potential of the web survey mode we invested significant time and resources into ensuring nurses were aware of the study, knew how to access and use the website that hosted the survey and in extending tokens of appreciation for their time and support. In general, nurses reported the web survey was easy to use, needed fewer sittings to complete and did not require any additional time when compared with the print survey mode. Thus, web surveys appear to be a promising data collection tool in populations of acute care neonatal and pediatric nurses.

Table 2-1. ***Process Evaluation Questions***

Asked in **web** survey format only:
(1) Did you find the web-based survey format easy to use? If 'no', what did you dislike about it?
(2) Would you answer a similar web-based survey in the future?
Asked in **print** survey format only:
(1) Did you attempt to complete the survey on the web/internet first?
(2) Why did you choose not to complete the survey using the web-based format?
Asked in **both** web and print survey formats:
(1) How long did it take you to complete this survey?
(2) Where did you complete this survey (select the location where you completed the majority of the survey)?
(3) In how many sittings did you complete this survey?

Table 2-2. ***Staff Demographics by Unit and Survey Completion Format.***

	PICU		NICU		Non-ICU		Total	
	(*n* = 68)		(*n* = 125)		(*n* = 56)		(*N* = 249)	
	Web	Print	Web	Print	Web	Print	Web	Print
	(n=53)	(n=15)	(n=109)	(n=16)	(n=47)	(n=9)	(n=209)	(n=40)
Primary Nursing Role*:								
(a) GN & RN	53	15	109	16	41	7	203	38
(b) LPN	0	0	0	0	6	1	6	1
Gender*:								
(a) Female	50	13	108	16	42	9	200	38
(b) Male	2	1	0	0	5	0	7	1
Employment Status*:								
(a) Full-time	32	9	48	3	24	2	104	14
(b) Part-time	16	4	48	9	20	4	84	17
(c) Casual	3	1	12	4	3	3	18	8
Highest Level of Completed Education*:								
(a) Diploma/Certificate	18	5	37	8	15	3	70	16
(b) Bachelors	33	9	67	8	29	6	129	23
Years of Practice:								
Mean	11.2	10.6	11.1	15.1	6.2	3.6	10.0	10.7
Standard Deviation	(9.5)	(7.4)	(9.9)	(12.4)	(7.6)	(6.0)	(9.5)	(10.2)

Note: RN = Registered Nurse; GN = Graduate Nurse; LPN = Licensed Practical Nurse

* Indicates total does not equal the total number of respondents due to missing responses.

Table 2-3. *Survey Completion Profile*

	Where respondents completed survey			Number of Sittings required to complete survey			
	Work – work time	Work – break time	Home	1	2	3	> 3
Web (n = 209)	144 (69%)	30 (14%)	30 (14%)	153 (73%)	42 (20%)	4 (2%)	6 (3%)
Print (n = 40)	23 (58%)	12 (30%)	2 (5%)	16 (40%)	16 (40%)	6 (15%)	2 (5%)

Note. Totals may not equal 100% due to missing responses.

Table 2-4. ***Budget for Mixed-mode (web/print) Survey***

Item	Cost
Incentives*	$2,615
Personnel‡	$5,440
Printing costs (e.g., posters, survey packages, print surveys)	$1,175
Fees paid to Contractor†	$15,375
Total cost estimate§	$24,605

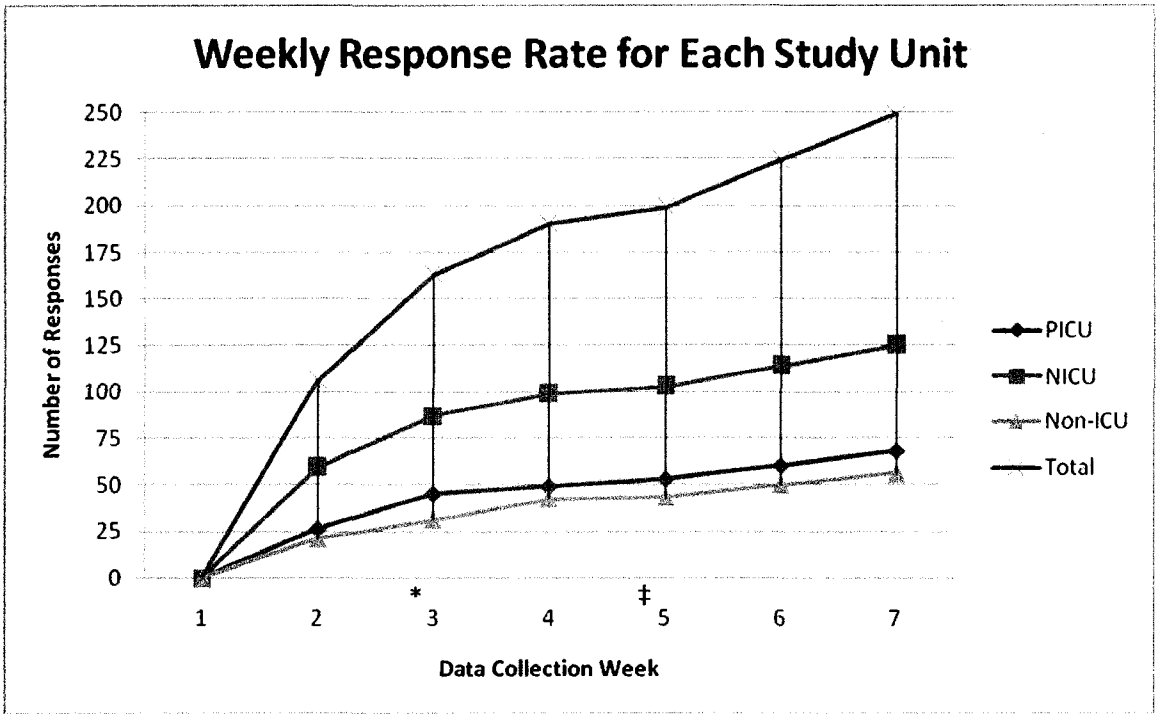
* Coffee gift certificates provided with initial survey package; refreshments; small tokens of appreciation (candy, doughnuts).

‡ Personnel cost is an estimate based on approximately 120 hours of study nurse time and 40 hours of in-kind graduate student time spent in direct unit/nurse contact. The study also employed a project coordinator (0.5FTE); the project coordinator and study nurse (0.4FTE) were not devoted exclusively to this pilot, that is, they were also engaged in other CIHR Team in Children's Pain projects.

† Includes: Programming of five surveys (approximately 17 print pages per survey) to web based format, generation of passwords; printing of cards with URL and passwords, reminders; tracking of respondents, weekly reports of response rates; preparation and initial cleaning of data file.

§ Does not include travel, parking costs to sites (approx. $216).

Figure 2-1. ***Weekly response rates***



* = first reminder notice sent to all non-respondents

‡ = second reminder notice (with print survey option) sent to all non-respondents

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CHAPTER 3: Piloting the Alberta Context Tool in a Population of Neonatal and Pediatric Nurses

Background

In recent years, knowledge translation scholars have begun to consider the importance of work context in the research utilization process (Dopson, FitzGerald, Ferlie, Gabbay, & Locock, 2002; Eccles, Grimshaw, Walker, Johnston, & Pitts, 2005; Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004; Improved Clinical Effectiveness through Behavioural Research Group [ICEBeRG], 2006). Encompassed within the broader field of knowledge translation, research utilization, is the process of increasing the use of current research findings in the provision of patient care (Estabrooks, Wallin, & Milner, 2003; Graham et al., 2006). Despite the increased attention being paid to the role of context in the research utilization process little is understood about *how* context influences research use behaviors. In nursing, various terminology has been used to describe context such as nursing practice environment, clinical practice environment and environment of practice; however, these terms are seldom defined (Sleutel, 2000).

One framework that defines context begins to explore its role in the research utilization process is the Promoting Action on Research Implementation in Health Services (PARiHS) framework. Developed by Kitson and colleagues, the PARiHS framework presents research utilization as a function of the dynamic relationship between the quality of the evidence, the availability of effective facilitation and the receptivity of the context (Kitson, Harvey, & McCormack, 1998). Context is defined as the environment in which health services are provided and, from a research utilization perspective, where the implementation of evidence occurs (McCormack et al., 2002). The framework's authors describe three elements of context: *culture*, which encompasses the values and beliefs of individuals on a unit; *leadership*, which represents the overall power structure; and *evaluation* which is related to the presence of audit and feedback systems (McCormack et al.).

The Alberta Context Tool

The Alberta Context Tool (ACT), developed by Estabrooks et al. (2007), is a survey instrument designed to operationalize the key concepts in the PARiHS framework, with a particular focus on context and its dimensions. The ACT is composed of several sections each containing a unique set of items intended to operationalize either core (i.e., PARiHS identified) concepts of context or additional concepts that may comprise expanded conceptualizations of context (e.g., organizational processes and resources, information sharing activities, social capital, relationship with work). Of particular interest to this paper are the three *core PARiHS elements of context* – leadership, evaluation and culture.

The PARiHS framework provided the foundation for the development of the context scale. The research team used an extensive literature review coupled with their expertise in the content areas to operationalize each of the three components of context and construct items with which to measure them. An overview of the literature used to develop the three context subscales is provided below.

Leadership

The authors of the PARiHS framework suggest that leadership comes from formal management roles and they assert that strong leadership is transformational (McCormack et al., 2002). Transformational leaders assume an interactive, supportive and flexible approach to working with others. This leadership style is more focused on relationships; inspiring and motivating team members; and developing others to take on leadership responsibilities (Bass, Avolio, Jung, & Berson, 2003). A distinguishing characteristic of transformational leadership is emotional intelligence. Salovey & Mayer (1990) defined emotional intelligence as the ability to recognize and monitor emotions, both personal and those of others around you, and use this awareness to guide personal thoughts and actions. In their 2002 book, Primal leadership –

Realizing the power of emotional intelligence, Goleman, Boyatzis, & McKee discuss four categories of leadership competencies present in emotionally intelligent leaders: self-awareness, self-management, social awareness and relationship management. The competencies of emotional intelligence are not considered innate; instead, they are thought to be skills that can be learnt and developed (Freshman & Rubino, 2002). This lends us the ability to view leadership style as a measurable and modifiable element of work context. No tool was available in the literature to assess emotionally intelligent leadership; thus, the research team developed a 10-item subscale intended to capture the four competencies of emotionally intelligent leaders.

Culture

In the PARiHS framework, culture is characterized as encompassing the values, beliefs and assumptions held by a group (McCormack et al., 2002). Strong cultures are described as those which value individuals within the group, find consistency between individual expectations and group processes, have a shared vision and are able to identify the prevailing values and beliefs. A broad body of literature exists describing various different perspectives of culture (Hatch, 1993; Hofstede, Neuijen, Ohayv, & Sanders, 1990; Martin, 2002; Smircich, 1983), and each perspective lends itself to a different approach to examining and understanding it. For example, Smircich suggests that two broad categories of culture exist: culture as something an organization *has* and culture as something an organization *is*. The first perspective is a fairly objective approach to culture and suggests it is something that can be measured (i.e., through surveys) and even manipulated to a certain end. The second outlook on culture suggests that it cannot be disentangled from the organization or context within which it exists (Scott-Findlay & Golden-Biddle, 2005).

Culture has been found to vary between nursing units (Coeling, & Simms, 1993a; 1993b; Coeling & Wilcox, 1990). These differences can be attributed to such things as membership, imprints left by early leaders in the formative years of the unit, current leadership and the nature of work being done on the unit (Coeling & Simms, 1993a). In nursing, only a small number of empirical studies have been conducted on organizational culture. The predominant viewpoint used by the authors of these studies was to view culture as something that an organization *has* (Scott-Findlay & Estabrooks, 2006) suggesting that culture is a measureable and modifiable element of context. Using this perspective, the research team constructed eight items intended to capture elements of unit culture.

Evaluation

In the PARiHS framework, the final element of context, evaluation, is described as employing multiple methods of monitoring and feeding back information at the individual, team and system levels (McCormack et al., 2002). In the literature, audit, assessment of practice over a specified time period, and feedback, a means of relaying information back to clinicians, is an evaluation strategy frequently used to try and modify the behaviour of health care providers (Foy et al., 2005; Jamtvedt, Young, Kristoffersen, O'Brien, & Oxman, 2006). The exact mechanism by which audit and feedback alters behaviour is not fully understood. However, it is assumed that providing clinicians with information about their practice highlights discrepancies between what individuals perceive they are doing and what they are actually doing (van der Weijden & Grol, 2005).

Studies of behaviour change, using audit and feedback with physicians, have shown small to moderate effects (Foy et al., 2005; Grimshaw et al., 2004; Jamtvedt et al., 2006). Less evidence exists about the effectiveness of audit and feedback on nursing practice. One systematic review examining interventions used in nursing did not identify any studies using

audit and feedback (Thompson, Estabrooks, Scott-Findlay, Moore, & Wallin, 2007). An updated review of the nursing literature uncovered one cluster randomized control trial evaluating its effectiveness (Cheater et al., 2006). In this study, audit and feedback was shown to have a modest effect similar to that observed in medicine. To operationalize the construct of evaluation for the ACT, the research team developed seven items designed to capture the process of audit and feedback. This included data access, using the data, reviewing the data (formally and informally), constructing action plans, monitoring performance and benchmarking.

The research team that developed the ACT conducted the initial pilot study in four teaching hospitals in western Canada. Following this pilot, the work context scale underwent psychometric testing and item reduction resulting in a 17-item work context scale: leadership (6 items), evaluation (6 items), and culture (5 items) (Estabrooks et al., 2007). To date, the instrument has not undergone testing in any other settings.

The reliability of a measure is related to the population in which it is being used in (Streiner & Norman, 2003). Therefore, the ACT will require pilot testing in new populations prior to widespread use. This pilot study served, in part, to establish the reliability of the ACT in a neonatal and pediatric setting in anticipation of its use in a large program of research being conducted by the Canadian Institutes of Health Research (CIHR) Team in Children's Pain.

CIHR Team in Children's Pain

The CIHR Team in Children's Pain is a large national study being conduct in eight pediatric centers across Canada. The ACT will be used to assess context in the 32 participating study units. The broader purposes of this pilot study were to assess the recruitment process, data collection methods (web versus print survey format) and data collection instruments. A process evaluation was conducted to evaluate recruitment strategies and examine the feasibility of using a web-based version of the survey instruments. These results are reported elsewhere.

To enable a meaningful assessment of the context of pediatric units, and to facilitate comparisons between units, it was necessary to assess the performance of the ACT in neonatal and pediatric settings. In this paper we report on the factor structure and psychometric properties of the 17-item work context scale of the ACT in a sample of neonatal and pediatric acute care nurses.

Methods

Setting and Sample

This study was conducted on three units of two tertiary care hospitals in one large western Canadian city. The units selected were a pediatric intensive care unit (PICU) (n=106), a neonatal intensive care unit (NICU) (n=193) and a pediatric non-ICU unit (n=63). A total of 362 nurses worked on the three units at the time of this study. Inclusion criteria were employment as a Graduate Nurse, Registered Nurse, or Licensed Practical Nurse, involved in the direct provision of patient care, in a full-time, part-time, or casual position on one of the three study units.

Procedures

Ethical approval for this study was received from the appropriate University health research ethics board and administrative approval was granted from the Patient Care Directors and Senior Operating Officer responsible for the three units. Data collection took place throughout the summer of 2007. All nurses meeting the inclusion criteria were provided with a survey package inviting them to participate in the study. Packages included information on how to access the web survey, a user password, certificate of participation, and a five dollar package of gift certificates as a token of our appreciation. Two reminders were distributed at week two and four of data collection. The second, and final, reminder package included an option to complete a print copy of the survey rather than using the web.

Instrument

The instruments used in this pilot study included the complete ACT as well as the Maslach Burnout Inventory-General Survey (Maslach, Jackson, & Leiter, 1996), the SF-8 Health Survey (Ware, Kosinski, Dewey, & Gandek, 2001), and a subset of the Environmental Complexity Scale (included in the print survey mode only) (O'Brien-Pallas et al., 2001; O'Brien-Pallas et al., 2002; O'Brien-Pallas, Irvine, Peereboom, & Murray, 1997). A combination of multiple choice, yes/no, Likert scale and open-ended answer formats are included in this suite of instruments.

The ACT is a new measure and has not been used in a pediatric setting; therefore, prior to its administration, we tailored it to a pediatric health care provider audience. This consisted primarily of minor wording changes (e.g., changing *patient* to *patient and family*) and changing the examples provided in some questions to be more representative of a pediatric work environment (e.g., examples such as *"knowledge of delirium to assess and plan care for elderly patients exhibiting difficult behaviors"* were changed to *"using knowledge of developmental stages to plan care"*). This paper is focused specifically on the assessment of the psychometric properties and factor structure of a subset of items from the ACT intended to measure the core elements of context as defined by the PARiHS group (Kitson et al., 1998).

The context scale of the ACT used in this pilot was composed of 17 items hypothesized to capture the elements of leadership, culture and evaluation. For each item, respondents were asked to indicate their level of agreement with the given statement. Participants selected a response from a five point Likert scale ranging from *strongly disagree* to *strongly agree* with a neutral anchor of *neither agree nor disagree*. A sixth answer option of *unable to determine* was also offered.

Leadership. The leadership items of the ACT were specifically designed to capture the four domains of emotionally intelligent leadership as described by Goleman et al. (2002). The

initial leadership scale contained 10 items, but following data reduction, conducted with the initial pilot test of the instrument, it was reduced to six items. To answer the six questions, respondents were asked to focus on the leadership behaviour of the person they primarily report to. The stem for all six items was "*The leader in this clinical program*" which was followed by the six leadership questions - each describing a characteristic of emotionally intelligent leaders (e.g., *calmly handles stressful situations*).

Culture. The context scale of the ACT originally contained eight items intended to assess unit culture. Estabrooks et al. (2007) operationally defined culture as the way things are done within an organization or work unit. Following the initial pilot test of the ACT the research team reduced the eight culture items to five. These items are intended to assess "the way things are done" in organizations and on work units. An example of one of the culture items is "*I am a member of a supportive work group*". Once again, participants selected their level of agreement ranging from *strongly disagree* to *strongly agree*.

Evaluation. The final set of items contained in the work context scale of the ACT are related to evaluation which is defined as the process of analyzing and using data to assess performance and achieve desired outcomes. This is similar to what is discussed in the literature as audit and feedback. In the original ACT, evaluation was operationalized using seven items; this has since been reduced to six. The remaining six items ask participants to assess their team's performance in receiving quality improvement data; formally and informally discussing the data; formulating action plans and acting upon the information received; and finally, monitoring performance and comparing it with others (i.e., benchmarking). Examples of data that may be used are listed in the survey and include such things as infection rates, pain control and pressure sore frequency. These six items together with the items capturing leadership and culture makeup the 17-item work context scale of the ACT.

Data Analysis

The main analyses were conducted using the SPSS version 15.0. The homogeneity of correlation matrices was tested using the computer program EQUORM (Harley, 1986). Correlation matrices were run separately for the web and print subsamples. Using a Jennrich test for the equality of two correlation matrices we tested the homogeneity of the web and print matrices to determine if the two subsamples could be combine for the purpose of conducting exploratory factor analysis (EFA) (Jennrich, 1970). The 17 items of the work context scale were then assessed for normality and missing data and pairs of items were assessed for linearity. The suitability of the data for EFA was assessed by examining correlation coefficients, the Kaiser-Meyer-Oklin value and Bartlett's Test of Sphericity. EFA, using principal component analysis (PCA) and varimax rotation, was used to assess the underlying factor structure of the work context scale. Internal consistency of the context scale and its component subscales was assessed using Cronbach's alpha coefficient.

Results

Two hundred and forty-nine responses were received 209 using the web-based survey format and 40 using the print format. This provided a response rate of 69%. The Jennrich test for homogeneity of the correlation matrices for the web and print subsamples determined that the two matrices were significantly different ($p \leq .02$) and should not be combined for EFA. The small number of print surveys received ($n = 40$) relative to the number of items to be factor analyzed (17) does not provide a sufficient ratio of cases to items (2.3:1) to perform factor analysis (Pett, Lackey, & Sullivan, 2003); therefore, we proceeded with EFA on the web sample only.

The percentage of missing data was calculated for the web-based sample on each of the 17 items in the context scale and final sample for analysis was assessed to ensure an adequate case-to-item ratio for factor analysis. Although no "safe" ratio of subjects to variables has been

determined for instrument testing (Gorsuch, 1983), authors' suggestions range from 5 to 10 subjects per item (Streiner & Norman, 2003; DeVellis, 2003) up to 15 subjects per item (Pett et al., 2003). For the context scale, missing-value rates ranged from 0% to 10% with an average of 3.6%. Culture had the fewest number of missing items (M = 2.6) and evaluation the most (M = 12). Using listwise deletion, 162 valid cases remained for use in EFA providing a mid-range ratio of 10 cases per item.

The characteristics of the web sample used in the factor analysis are presented in Table 1. The majority of participants were female (96%), Graduate or Registered Nurses (97%) employed on one of the three study units on a full or part time basis (89%). Almost half of the sample (45%) has been nursing for five years or less. On average, participants have been employed on their current nursing unit for seven years.

For each of the 17 work context items mean, standard deviation, normality and linearity were assessed. Frequency distributions were examined using histograms and were found to be relatively symmetrical. The majority of items were negatively skewed. This did not preclude the use of factor analysis as the assumption that the variables are normally distributed is not a requirement (Tabachnick & Fidell, 2007). Finally, linearity was assessed using scatterplots, and no non-linear relationships were found. Items, means and standard deviations are reported in Table 2.

EFA permits preliminary exploration of the underlying factor structure and aides in instrument refinement and theory generation (Henson & Roberts, 2006). Prior to conducting EFA, we assessed the data for its suitability for factor analysis. Examination of the correlation matrix revealed the existence of many coefficients of .3 and above. Support for the factorability of the correlation matrix was provided by a Kaiser-Meyer-Olkin value of .86, which exceeds the

recommended minimum value of .6 (Pett et al., 2003) and the Bartlett's Test of Sphericity which was found to be statistically significant ($p \leq .001$).

PCA was used to identify the initial factor structure of the work context scale. One item (*C5. Clear on clients' wants & needs and work to provide it*) from the culture subscale, was ambiguous with loadings greater than .3 on two factors and only a .06 difference between the loadings. Upon further examination of the item it was found to be poorly worded as it was asking participants about more than one concept. We decided to remove this item from the analysis and re-run EFA on the remaining 16-item scale. PCA produced three components with eigenvalues greater than one. Component 1 had an eigenvalue of 5.24 and explained 32.74% of the variance. Component 2 had an eigenvalue of 2.99 and accounted for an additional 18.66% of the variance. Finally, with an eigenvalue of 1.41, Component 3 contributed 8.83% of the total explained variance which was 60.23%. Inspection of the Scree plot (Figure 1) shows a change in slope at the point of the fourth component supporting the retention of three components for further investigation.

Varimax rotation was performed to ease the interpretation of the three principal components. Rotation resulted in a simple factor structure with each item loading on only one component (see Table 3). This three component solution accounted for 60.23% of the total variance. All six leadership items loaded onto the first component which explained 24.94% of the variance. The six evaluation items and the four culture items also loaded unequivocally onto components two and three and explained 22.87% and 12.42% of the variance respectively. The entire context scale had a Cronbach's α of .86 and the leadership, evaluation and culture components had a Cronbach's α of .89, .86 and .64 respectfully.

Discussion

The current study used exploratory factor analysis to investigate the factor structure and psychometric properties of the work context scale of the Alberta Context Tool (ACT) in a population of acute care neonatal and pediatric nurses. The loadings for the items of the context scale created a simple structure solution in which each item loaded strongly on only one component (Pett et al., 2003). The three components produced were congruent with the original three subscales hypothesized by Estabrooks et al. (2007) when they developed the ACT. These three subscales are: leadership (6 items), evaluation (6 items) and culture (4 items).

The three subscales of the ACT were originally derived from the PARiHS framework which purposes that context is composed of three elements: leadership, evaluation and culture (Kitson et al., 1998). The factor structure of the work context scale resulting from this analysis is congruent with the composition of context as proposed by the authors of the PARiHS framework. Although this study does not provide definitive support for the framework it provides a starting point for testing, refining and further developing it.

The culture subscale had a lower Cronbach's α (0.65) than the other two subscales. This subscale was also reduced by one item during the analysis due to an ambiguous loading. Several of the items on this scale are worded such that they may be asking about more than one concept within the same question. For example, another culture item (C4) asks participants if they are both "encouraged and supported" by their organization. Although both encouragement and support could be elements of culture one or both of these concepts could also be construed as part of another concept such as leadership. The complex wording of this item and other items on this subscale may be contributing to the lower reliability. This subscale may require some revision prior to use in future studies to ensure it is only capturing elements of culture and that each item is only tapping one concept.

The current study is limited by sample size and by its inclusion of nurses from only one small geographic region. Although we had a case to item ratio of 10:1, authors have argued that it is ideal to have a minimum of 300 cases for EFA (Streiner & Norman, 2003; Tabachnick & Fidell, 2007). In addition, this study only utilized nurses from three units in one city which may not be representative of the larger population of neonatal and pediatric nurses. In future studies, researchers should consider testing the ACT in larger and more diverse populations in order to further assess the stability of the factor structure reported here and enhance generalizability.

In nursing, numerous phrases such as nursing practice environment, clinical practice environment and environment of practice have been used throughout the literature to describe elements of work context (Sleutel, 2000). Various instruments have been designed to measure these organizational elements and their impact on various patient, nurse and organizational outcomes. These include, but are not limited to the Nursing Work Index (NWI), the Work Environment Scale (WES), the Job Characteristics Inventory (JCI), the Ward Organization Features Scale (WOFS), the Work Quality Index (WQI), and the Assessment of Work Environments Scale (AWES) (Lake, 2007).The most widely used measure of nursing practice environments is the Revised Nursing Work Index (NWI-R) (Aiken & Patrician, 2000; Aiken, Sochaliski, & Lake, 1997) which contains a Practice Environment Scale (PES-NWI) that Lake has suggested is a composite measure of practice environments. The authors of the ACT tool argue that it measures context as it is conceptualized by the PARiHS group (Kitson, 1998; 2008). Future study is likely required to assess whether context and practice environment share common features or are unique concepts.

This study indicates that the work context scale of the ACT had acceptable reliability in this sample of neonatal and pediatric nurses. The development of the work context scale of the

ACT began by using the PARiHS framework as a template. The authors then conducted an extensive literature review to operationalize the subcomponents of leadership, evaluation and culture. This development process provides some preliminary face and content validity for the instrument. In future studies, researchers should consider employing different analyses, such as confirmatory factor analysis, to try and verify the factor structure of the work context scale and work towards establishing construct validity.

Table 3-1. ***Demographic Characteristics of the Web Sample (n = 162)***

Sample Characteristics	*n* (%)
Gender:	
Male	6 (3.7)
Female	155 (95.7)
Nursing Role:	
Licensed Practical Nurses	5 (3.1)
Graduate Nurses & Registered Nurses	157 (96.9)
Educational Background:	
Certificate or Diploma	70 (31.5)
Baccalaureate Degree	103 (63.6)
Employment Status:	
Full time	77 (47.5)
Part time	67 (41.4)
Casual	16 (9.9)
Years of Practice in Current Profession:	
0-5 years	73 (45.1)
6-10 years	31 (19.1)
11-15 years	14 (8.6)
16-20 years	13 (8.0)
21 years or more	30 (18.5)

Years of Practice on Current Nursing Unit:	
Less than 1 year	25 (15.4)
1-5 years	68 (42.0)
6-10 years	31 (19.1)
11-20 years	22 (13.6)
21 years or more	14 (8.6)

Note. Totals may not equal 100% due to missing responses.

Table 3-2. ***Work Context Scale: Instrument Items and Hypothesized Subscales***

Subscale	Variable Number	Mean (*M*)	Standard Deviation (*SD*)
Leadership	L1.	3.36	1.00
	L2.	3.51	0.96
	L3.	4.03	0.73
	L4.	3.69	0.98
	L5.	3.28	1.07
	L6.	3.38	0.97
Evaluation	E1.	3.60	1.00
	E2.	3.14	1.01
	E3.	2.95	0.98
	E4.	3.41	0.93
	E5.	3.30	0.98
	E6.	3.31	0.87
Culture	C1.	3.37	0.99
	C2.	3.58	0.98
	C3.	3.75	0.84
	C4.	3.36	1.03
	C5.	3.41	1.02

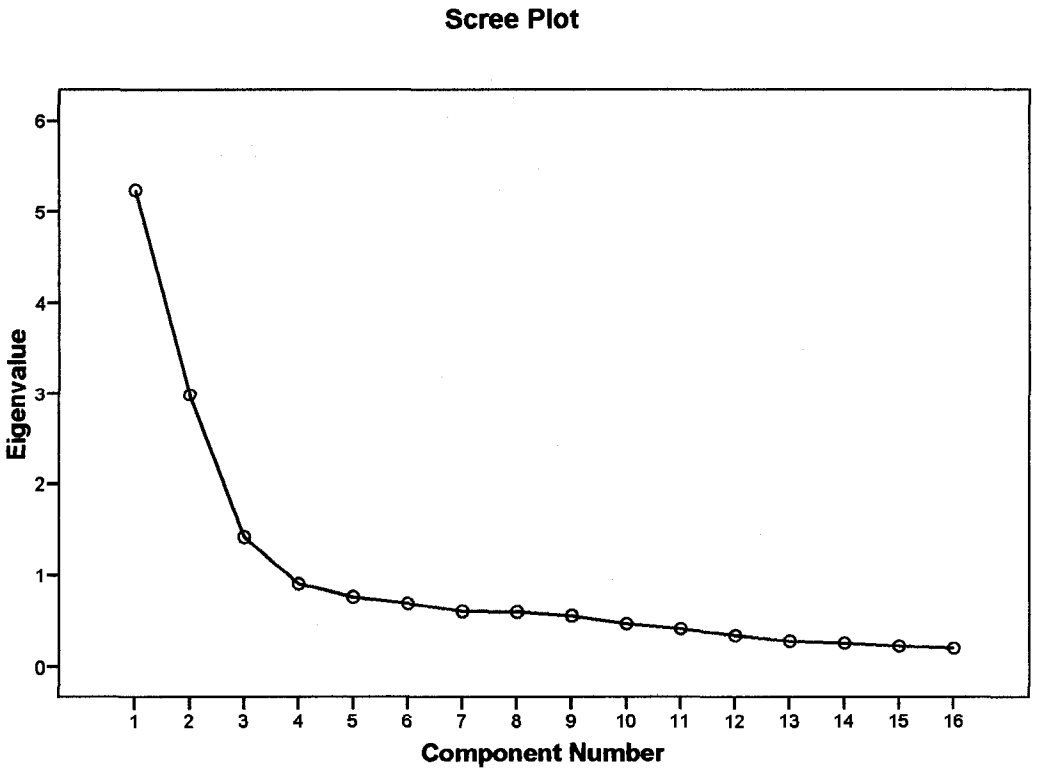
Note. n = 162: web sample only; listwise deletion used.

Table 3-3. ***Varimax Rotation Solution of the Work Environment Scale of the ACT***

Survey Item Number	Component 1: Leadership	Component 2: Evaluation	Component 3: Culture
L4.	**.89**	.02	.10
L5.	**.81**	.08	.13
L6.	**.81**	.21	.16
L1.	**.75**	.19	.18
L2.	**.74**	.10	.14
L3.	**.69**	-.00	.25
E4.	.13	**.88**	.00
E5.	.11	**.87**	.01
E6.	-.01	**.77**	.06
E3.	.04	**.71**	.14
E1.	.06	**.71**	.13
E2.	.27	**.62**	-.10
C3.	.07	.07	**.78**
C2.	.26	-.10	**.70**
C1.	.16	.08	**.68**
C4.	.31	.19	**.47**
Total Variance Explained by Each Factor	**24.94%**	**22.87%**	**12.42%**

Note. Loadings highlighted in bold indicate the factor on which the item was placed.

Figure 3-1. ***Scree Plot***



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CHAPTER 4: Overview of Results, Further Discussion and Conclusions

Overview of Results

Up to this point, I have presented two papers discussing different aspects of a pilot test of the Alberta Context Tool in a population of acute care neonatal and pediatric nurses. In what follows, I will briefly summarize the findings from these two components of my thesis research project. Next, I will discuss the contributions they make to the areas of research methods and nursing research and outline some of the limitations and directions for future research in each of the project areas. I conclude with discussing the relationship between the two components of my thesis research project and their relevance to the Canadian Institutes of Health Research (CIHR) Team in Children's Pain research study and to future work on the Alberta Context Tool.

Objective 1: Process Evaluation of Using Web-based Surveys

Conducting a process evaluation alongside our pilot study provided us with useful information regarding the acceptability of using a web-based survey for data collection and the suitability of the recruitment strategies employed. We used a sequential web/print mixed-mode survey design which elicited an overall response rate of 69% in a population of neonatal and pediatric acute care nurses. Eighty-four percent of respondents completed the survey using the web. The concurrent process evaluation enabled us to determine that the web survey option took no more time to complete than the print option, on average required fewer sittings to complete and, for most participants, was easy to use.

Our primary recruitment strategy was to invest significant time in face-to-face communication with the nurses on the three study units. We hoped this strategy would improve response rates, enhance comfort with and acceptance of the web survey and aid in gathering feedback on the web survey mode. In addition to frequent meetings with staff, we also extended tokens of appreciation to them. This took various forms including, but not limited to,

gift certificates for coffee included with each survey package, coffee and donuts for meetings and pizza for 'Lunch and Learn' sessions. Through discussions with nurses on the units we learned that the gift certificates included in the packages created a sense of responsibility to participate in the study for many of the respondents.

In addition to gathering information on participant recruitment and the acceptability of the data collection modes, pilot tests provide an opportunity to test the data collection instrument (Lancaster, Dodd, & Williamson, 2004). One of the data collection instruments employed in this study, the Alberta Context Tool (ACT), had never been used in a population of neonatal and pediatric acute care nurses. The second objective of this thesis project examined the factor structure of the work context scale of the ACT.

Objective 2: Factor Structure of the Context Scale of the Alberta Context Tool

The 17-item work context scale of the ACT was developed by Estabrooks et al. (2007) to assess the three core elements of work context (culture, leadership and evaluation) as presented by Kitson, Harvey, & McCormack (1998) in the Promoting Action on Research Implementation in Health Services (PARiHS) framework. Exploratory factor analysis, using principal component analysis and varimax rotation, resulted in a 16-item, three-component solution accounting for 60.23% of the variance. These three components were congruent with the three core elements of context suggested in the PARiHS framework. The first component (leadership) accounted for 24.94% of the total variance, 22.87% was explained by the second component (evaluation) and the final component (culture) contributed 12.42%. The Cronbach's α for the entire 16-item scale was .86 and for the three factors were .89, .85 and .65 respectively. Thus, although the work context scale of the ACT is a relatively new measure, it demonstrated good reliability in this sample of neonatal and pediatric acute care nurses.

Contributions, Limitations and Future Directions

Objective 1: Process Evaluation of Using Web-based Surveys

Web surveys are thought to have several advantages over traditional data collection means including decreased cost, expedited rate of return, more complete data and reduced error due to the elimination of manual data entry (Akl, Maroun, Klocke, Montori, & Schunemann, 2005; Bachmann, Elfrink, & Vazzana, 1996; Truell, Bartlett, & Alexander, 2002). Despite these advantages, web surveys have not been used extensively in populations of nurses, and when they have been used response rates tend to be poor (Feudtner, Santucci, Feinstein, Snyder, & Rourke, 2007; Lusk, Delclos, Burau, Drawhorn, & Aday, 2007; Warren, 2005). No studies employing a sequential web/print mixed mode survey in a population of acute care nurses could be found in the literature. However, one study that used this approach in a population of military personnel reported a response rate of 73% to the web format of the survey (Quigley, Riemer, Cruzen, & Rosen, 2000). By initially offering the web survey option alone, and deferring the more familiar paper option, we were able to elicit a response rate of 55% following one reminder notice. With the second reminder notice we included the option to complete the survey by print, and at the end of the data collection period, our overall response rate was 69% (N = 249). Of the 249 participants who completed the survey, 84% submitted their survey via the web.

Experts in survey design have suggested that employing a mixed-mode strategy may help to enhance survey response rates (Dillman & Smyth, 2007; Schaefer & Dillman, 1998). However, the order in which you present the two survey modes to participants may determine which option the majority of respondents select. Our results suggest that it might be best to initially offer the web survey only and follow with a print option later in the data collection

process. This may allow researchers to capitalize on the benefits of using a web survey while helping to maximize response rates.

We employed several different strategies to try and maximize participation in our study. The difficulty arising from using all of these strategies in the same study is that it becomes difficult, if not impossible, to determine what had the greatest effect on improving our response rates. For example, we made contact with the units and began to establish relationships with the staff prior to starting the study. In addition, we hand-delivered survey packages to each staff member whenever possible. Frequent visits to each unit allowed staff to 'put a face to the study' and allowed us the opportunity to provide them with support if they encountered difficulties (e.g., lost password, had difficulty logging onto the website). Authors have previously suggested that establishing face-to-face communication with participants can enhance survey response rates (Mond, Rodgers, Hay, Owen, & Beumont 2004). However, during the process evaluation, participants reported that receiving coffee gift certificates with their survey package created "a sense of responsibility" to participate in the study. How much of our 69% response rate was a result of face-to-face communication with participants and how much was a result of the tokens of appreciation we provided? Moreover, the possibility exists that neither of these recruitment strategies was primarily responsible and the high response rate was actually a result of using a new data collection method. Unfortunately, it is impossible to disentangle how much of an effect each of our recruitment strategies had or what other variables may have contributed to our high response rate. This limits our ability to make specific suggestions to researchers searching for strategies to enhance their response rates to web surveys. Future studies could begin to untangle these variables in an effort to establish effective from ineffective strategies. In addition, we need to consider that what worked in this population of acute care neonatal and pediatric nurses may not work for researchers working with other populations.

Objective 2: Factor Structure of the Context Scale of the Alberta Context Tool

Recently, the research team that developed the PARiHS framework has proposed that it could be used as a guide to developing instruments to measure and evaluate key elements in the knowledge translation process (Kitson et al., 2008). The context scale of the ACT was developed using the sub-components of context as presented in the PARiHS framework (leadership, culture and evaluation) as a foundation. The current pilot study is the first test of this instrument in a neonatal and pediatric acute care setting. Instrument testing performed on the nursing sample from this pilot provides the developers of the ACT with some preliminary information on how the instrument performs in this population. Exploratory factor analysis suggests that there are three subscales of the context scale: leadership, evaluation and culture; these are congruent with the components of context proposed in the PARiHS framework, providing initial support for their construct of context and contributing to the initial work of developing an instrument by which to assess context.

The culture subscale of the ACT lost one item in the analysis as it failed to load on a single component. Further assessment of the item revealed that it may be asking about more than one concept and may require further refining. The Cronbach's α for the culture subscale was .65, considerably lower than for the other two subscales (leadership = .89 and evaluation = .85), possibly suggesting that the scale as a whole may need further development. The research team that developed the ACT may wish to revisit this scale prior to future use of the instrument.

The context scale is only one of seven scales included in the ACT. There may be other items within the instrument that are capturing elements of work context. Further assessment of the instrument as a whole, rather than the context scale in isolation, may help to develop and improve each of the scales and the instrument as a whole.

Conclusion

Although the two objectives of this thesis project may appear to be unrelated they are actually working toward the same end. In the more immediate future, these two projects will aid the CIHR Team in Children's Pain in refining the context scale of the ACT prior to commencing the larger study being conducted in 32 neonatal and pediatric units across Canada. In addition, the information gathered on the use of web surveys may provide the research team with some insight on how to maximize response rates while minimizing research costs.

Instrument development and testing is a laborious and costly endeavor; however, it is a necessary antecedent to being able to provide measures of phenomena that are accurate and useful in both research and practice settings. The ACT is a newly designed instrument to assess the influence of organizational factors on knowledge translation in various health care professional groups (Estabrooks et al., 2007). To ensure it is robust and psychometrically sound it will require rigorous testing and re-testing in different health care groups and settings. Using web surveys may facilitate the research team's ability to sample from numerous settings in various locations in a timely and cost effective manner.

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