Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study

by

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Abstract

The purpose of this study was to explore patient safety priorities as perceived by clinical experts working in a northern Ontario adult ICU. A modified Delphi was used to elicit consensus regarding patient safety priorities from the perspective of an expert panel of registered nurses and intensivists. At the onset of the study, the consensus level was set at 70%. Data was collected through serials rounds with researcher-developed questionnaires. Descriptive statistical analysis was completed. No consensus was reached at Round 1. Three points of consensus regarding patient safety priorities were reached at Round 2: *improving pain and agitation management; incorporating a checklist into the bullet round reporting tool*; and *implementing use of visual cues for high-risk lines.* These strategies support the need for anticipation, recognition, and management of at risk situations. The results have the potential to guide the advancement of the patient safety mandate within an ICU setting.

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Chapter 1
Introduction

> Patients who are admitted to hospital believe that they are entering a place of safety, where they, and their families and carers, have a right to believe that they will receive the best possible care (National Institute for Health and Care Excellence, 2007, p. 5).

Patients requiring critical care services within an intensive care unit (ICU) are dependent upon healthcare service providers to meet their needs and ensure their safety. Patient safety has been defined as "the reduction and mitigation of unsafe acts within the health-care system, as well as through the use of best practices shown to lead to optimal patient outcomes" (Davies, Hébert, & Hoffman, 2003, p. 5). Canadian critical care nurses fulfill a pivotal role of balancing patients' physiological needs in a highly technological environment, with their needs for safety, privacy, dignity and comfort (Canadian Association of Critical Care Nurses, 2009). Standards of practice for critical care nurses require clinicians to assess, plan, implement, and coordinate care in collaboration with members of the ICU interdisciplinary health care team. In addition, clinicians are obligated to participate in safety initiatives and adhere to best practice for quality improvement (Canadian Association of Critical Care Nurses, 2009). The complexity of the ICU setting and the nature of patient illness, involving multiple systems and warranting multiple diagnostics and rapidly fluctuating treatment regimes, renders ICU patients particularly vulnerable to errors and adverse events that compromise their safety (Louie et al., 2010; Mansour, James, & Edgley, 2012). As such, nurses providing critical care services are accustomed to directing efforts toward safer care through development of, and adherence to, quality improvement initiatives (Richardson, 2015).

An often-cited document related to patient safety, *To Err is Human: Building a Safer Health Care System* (Kohn, Corrigan, & Donaldson, 1999) revealed the substantive incidence of adverse events within the American healthcare system. The authors reported that annually, almost four percent of all hospital-admitted patients experience an adverse event. Mortality rates for this population range from 8.8 to 13.6. Individuals are at risk for adverse events due to a dynamic of interacted variables. These include, but are not limited to patient, clinician, team, organizational, and system characteristics. The World Health Organization (2009) described this constellation of variables as constituting human variables. More specifically, human factors are "environmental, organizational and job factors and human and individual characteristics which influence behavior at work in a way which can affect health and safety" (WHO, 2009, p. 5).

In 2004, Baker and associates published a landmark study which focused attention on the threat to patient safety within Canadian hospitals. They reported an adverse event incident rate of 7.5 percent across 20 hospitals located in British Columbia, Alberta, Ontario, Quebec and Nova Scotia. One fifth of these adverse events ended in death. Based on this incidence rate, they estimated that approximately 185 000 adverse event occurs annually within Canada. Further, nearly 70 000 of these events are identified as potentially preventable. These alarming statistics drew national attention from decision makers, researchers and clinicians. More recently, Forster and colleagues (2008) reported an adverse event rate of 19% specific to a population of Canadian ICU patients. Patient safety was compromised due to procedural complications, nosocomial infections, and adverse drug events. As a result, hospital length of stay was extended, impacting patients, families, care providers and the system.

Historically, efforts to address adverse patient events have focused on the monitoring of reported incidents of compromised patient safety followed by the blaming of clinicians most

closely involved in the events. For some, this blame resulted in disciplinary action. In contrast, a more contemporary approach directs efforts toward exploring individual and organizational practices and processes that underlie adverse events. Knowledge gained from a comprehensive examination of error attributes has the potential to improve patient safety (Naresh, Brown, & Hicks, 2009). It has been suggested that purposeful and evidence-informed modifications within the healthcare environment plays a role in optimizing patient safety (Mark et al., 2008).

Baker (2014) presented a retrospective review of Canadian progress relative to patient safety subsequent to the release of the Canadian Adverse Events Study (Baker et al., 2004). He acknowledged the substantive modifications to support patient safety that have transpired within the walls of Canadian acute care organizations through the actions of both leaders and bedside clinicians. In addition, he noted that government agencies and healthcare associations have crafted policy, regulations and governance to positively structure patient safety (Baker, 2014). And finally, he identified the evolution of agencies to support frontline evidenced-informed practices.

At a national level, the Canadian Patient Safety Institute offers a safety competency framework that while not specific to ICU contexts, is relevant for enhancing patient safety across multiple disciplines and sectors of practice. This framework has six domains that guide the practice of educators, learners, clinicians and researchers. The six domains include: contribute to a culture of patient safety; work in teams for patient safety; communicate effectively for patient safety; manage safety risks; optimize human and environmental factors; and recognize, respond to and disclose adverse event (Canadian Patient Safety Institute, 2009). This resource emphasizes the interprofessional nature of patient safety. The Canadian Patient Safety Institute houses a community forum comprised of an interdisciplinary membership focused on critical care, entitled

the ICU Collaborative. The focus of this national collaborative is communication about care improvements and safety for critically ill individuals. Identified topics of discourse include: pain, sedation, delirium, team collaboration, and medication records (tools.patientsafetyinstitute.ca/Communities/ICUCollaborative/default.aspx).

At a provincial level, Critical Care Services Ontario, a group of system leaders, was commissioned by the Ministry of Health and Long Term Care to review Ontario's critical care services with the intent of improving their management. This group released a report, entitled the Critical Care Strategy (2005), outlining a framework to improve Ontario's critical care services. This document contained seven core initiatives for improving and standardizing critical care services. The seven core initiatives include: critical care information system; critical care response teams; system-level training initiatives; performance improvement collaborative; ethical issues of access; health human resource investments; and finally, surge planning and capacity management. Subsequent to the release of the Critical Care Strategy, Critical Care Services Ontario, released a resource entitled the Critical Care Unit Balanced Scorecard Toolkit (Critical Care Secretariate, 2012). A component of this toolkit was the *High Performing ICU Checklist*, a tool developed to support quality care and patient safety, while optimizing performance within provincial critical care units. *The High Performing ICU Checklist* offers evaluative feedback about an individual ICU's alignment with recognized provincial practices. The metrics allow for comparison of ICU performance across the province. In one ICU, located in northern Ontario, receipt of a positive outcome, has confirmed alignment with provincially recognized safety practices. In the pursuit of continuous quality improvement, a value within the organization housing the northern ICU, is the quest for improvements for patient safety beyond the external assessment of high performance. What remains unknown are the perceived priorities

for strengthening the current repertoire of safety practices within the unique context of this local ICU.

Purpose

The purpose of this study was to explore patient safety priorities as perceived by clinical experts working in a northern Ontario adult ICU. The core research question guiding this study was "What are the priorities for strengthening the safety practices in this ICU?"

Chapter 2
Literature Review

This chapter presents a review of literature about patient safety practices within intensive care settings. Given the volume of publications relative to this topic, it was decided to apply the Matrix Method (Garrard, 2011) in an effort to present a structured representation of the search, identification of individual reports, selection of relevant reports, analysis of pertinent elements of each report. This chapter concludes with a grouping and summation of the published findings from the reviewed literature.

An electronic search was undertaken in the following academic databases: Cumulative Index to Nursing and Allied Health Literature (CINAHL); ProQuest Nursing and Allied Health; and MEDLINE. The search parameters were: peer-reviewed reports; available electronically; full-text reports; published in English subsequent to the release of the historic Canadian study regarding adverse events in acute care hospitals (Baker et al., 2004) and prior to April 2014. The search terms intensive care unit and patient safety, were used to locate published reports. These two phrases had to appear in the abstract of the publication. In consultation with a librarian, this was deemed an appropriate strategy to locate the reports of authors who presented patient safety, and intensive care unit as salient components within their publication. The search was refined through exclusion of papers that did not involve adult populations or ICU settings. The search was not limited by healthcare discipline. Using the identified search parameters, and removing duplications, 463 reports were identified.

The Matrix Method provided an efficient and structured management of the identified literature through: creating a paper trail, selecting relevant documents, creating a matrix and synthesizing the literature findings. Application of this method is particularly useful for the researcher, who undertakes a focused review of the literature to yield a product that has clinical

specificity and utility (Garrard, 2011). The paper trail, in this study, involved the use of RefWorks (2009) to record the author, title, source of publication, and abstract for each of the 463 reports identified through the academic search. These abstracts were read for relevance to the purpose of this study. A total of 44 reports were accepted for inclusion in the literature review based on the initial reading of each abstract and in some cases, the full manuscript. The 419 reports were not included in the review for two primary reasons. First, dissertation and theses were not included in the review. Second, reports that did not align with the delivery of services in the study ICU were excluded. For example, papers were eliminated if: adult safety in ICU was not addressed; the focus was on pharmacological or treatment-specific interventions; telehealth was the mode of delivery, or the primary focus was the healthcare provider.

The full-text of each of the initially accepted 44 reports were retrieved, printed and repeatedly read to ascertain the authors' stated purposes, methods, and results specific to patient safety for adult populations in ICU settings. An additional 13 reports were excluded from the review given that a research method was not reported or evident. Of the remaining 31 reports, the following information was extracted and tabulated from the individual reports to create the review matrix: first author, year, country of origin, discipline; purpose; design; and methods. Given the diversity of disciplines, purposes, designs and methods in the reviewed reports, the created matrix was an essential step in presenting the extracted information and allowed the researcher to construct a summation of the pertinent features in the literature. The matrix is presented as Table 1.

Table 1

Matrix

First Author (Year), Country, Discipline	Purpose	Design	Methods	
			Sample	Data Collection
Liao (2014), South Taiwan, Nursing	Examine the association between an oral hygiene intervention and ventilator-associated pneumonia	Quasi-experimental	Mechanically ventilated patients (N=199) Experimental group (n=99); Control group (n=100)	Oral Assessment Guide; Endotracheal tube cuff pressure measurement; Sputum cultures; Knaus' Acute Physiology and Chronic Health Evaluation (APACHE II); Chest x-ray
Askari (2013), The Netherlands, Health Services	Describe potential drug-drug interactions and implications for clinical outcomes including safety	Observational	Medication Administration Records (N=1,469,880)	Medication administration data from the Patient Data Management system
Bjurling-Sjöberg (2013), Sweden, Nursing	Describe ICU nurses conceptions of critical pathways for patients undergoing aortic-surgery	Phenomenology	ICU nurse (N=8)	Individual semi-structured interviews
Davis (2013), United States, Medicine	Examine feasibility and outcomes of early mobilization for critically ill patients	Pilot prospective cohort	Medical /Surgical ICU patients aged ≥65 years (N =15)	RAND 36-Item Short From Health Survey; Intensive Care Delirium Screening Checklist; Riker Sedation Agitation Scale; Demographic information; Apache II score; Barthel Index score
Grundgeiger (2013), Australia, Psychology	Examine ICU nurses use of planning aids and behaviours to support prospective memory for safety	Quasi-experimental	Nurses with > 2.5 years ICU experience (N=24)	Observation of simulated scenarios using visual cues; Performance questionnaire; Individual interviews
Jansson (2013), Finland, Health Services	Examine effectiveness of educational programs in promoting safety and preventing ventilator-associated pneumonia	Systematic review	Peer-reviewed empirical studies published between 2003-2012 (N=8)	Population, Intervention, Outcomes, and Study design
Sandahl (2013), Sweden, Health Services	Describe the use of simulation training to improve ICU team communication for patient safety	Case study	One general intensive care unit	Observations and Interviews

First Author (Year), Country, Discipline	Purpose	Design	Methods	
			Sample	Data Collection
Adapa (2012), England, Medicine	Compare use of bedside prepared infusions and prefilled syringes to minimize medication errors and delays	Randomized, blinded, control	Nurses with critical care experience (N=48)	Audio-visual recordings of nursing performance in simulated scenarios Measurement of drug concentrations
Adler (2012), United States, Physiotherapist	Synthesize evidence about mobilization of critically ill patients for functional and safety outcomes	Systematic review	Peer-reviewed empirical studies published between 2000-2011 (N=15)	Level of evidence
Al-Dorzi (2012), Saudi Arabia, Medicine	Describe the impact of a multidisciplinary surveillance program on ventilator associated pneumonia risk factors and outcomes for ICU patients	Retrospective cohort	Records of mechanically ventilated patients in a tertiary medical-surgical- trauma intensive care unit (N=2812)	Demographics, clinical characteristics (APACHE II score, medical history, immunocompromise, Glasgow coma scale), risk factors (elective vs emergent intubation, H2 blockers, antibiotic therapy), and outcomes for ventilator associated pneumonia (length of mechanical ventilation, tracheostomy insertion, hospital mortality)
Berney (2012), Australia, Physiotherapist	Compare model of rehabilitation for ICU patients to local standard care in relation to safety	Cohort	ICU patients (N=74)	Physiological measures using modified Borg Scale; time of exercise endurance
Iedema (2012), Australia, Health Services	Examine an incident disclosure	Case Study	ICU patient who died following a medication overdose (N=1)	Video recorded interviews
LeBlanc (2012), Canada, Pharmacy	Describe availability and types of ICU protocols relative to utility, fidelity, cost, implications for patient safety	Descriptive non-experimental	Clinicians (physicians, nurses, pharmacists) (N=551)	Study-designed survey
Lili (2012), China, Respiratory Medicine	Examine impact of an infection control program to reduce ventilator associated pneumonia	Pre-post	Patients admitted to one of three ICUs (N=16,429)	Ventilator associated pneumonia rates; Length of mechanical ventilation
Özden (2012), Turkey, Nursing	Determine impact of endotracheal suctioning training on knowledge and performance	Descriptive	Nurses in a cardio-vascular ICU (N=48)	Observation of nursing care Study-designed questionnaire

First Author (Year), Country, Discipline	Purpose	Design	Methods	
			Sample	Data Collection
Ronnebaum (2012), United States, Physiotherapy	Compare Mobility Protocol with Standard Physical Therapy for ICU patients with respiratory failure	Retrospective	Clinical Records of ICU patients (N=40)	Length of ICU stay, Mechanical ventilation, Physiological measures (heart rate, blood pressures, respiratory rate, ambulatory status)
Collins (2012), United States, Health Services	Examine the nature of nurses' and physicians' handoff documentation	Descriptive	Handoff artifacts (N=22)	Audio-recorded observation of clinical-to-clinical handoff ; review of paper-based and computer-based handoff artifacts
Morris (2011), Scotland, Medicine	Determine effect of implementing a bundle of care on the reduction of ventilator-associated pneumonia	Pre-post	Medical record of patients requiring ICU admission for ≥48hours (Control: n=1460; Experiment: n=501)	Radiographs, blood chemistry and cultures, pleural fluid cultures, respiratory assessments, duration of ventilation, duration of antibiotic treatment, length of ICU stay, mortality
Salazar (2011), United States, Nursing	Examine utility of an electronic tool to identify and prioritize patient needs in a trauma ICU.	Descriptive	Electronic records of ICU patients between October 2007 to September 2010	Reviewed completion rates of the Electronic Trauma Patient Outcomes Assessment tool (eTPOAT)
Ksouri (2010), France, Medicine	Evaluate the utility of regular morbidity and mortality ICU conferences in relation to improving quality care and patient safety	Prospective	360 adverse events documented for 300 ICU patients	Chart Review; Demographics; admission diagnosis; Simplified Acute Physiology Score (SAPS) II , APACHE II score; Organ dysfunctions and/or infection (ODIN) score; McCabe and Jackson classification for comorbidity; length ICU stay; time and nature of adverse event
Leaf (2010), United States, Medicine	Examine association between patient visibility to nurses' station and negative clinical outcomes	Retrospective	Patients admitted to medical intensive care unit (N=664)	Mortality; Length of ICU stay; Ventilator free days within 28-day period; APACHE II score
Shehabi (2010), Australia, Medicine	Examine association between delirium duration and clinical outcomes for lightly sedated and mechanically ventilated patients	Prospective cohort	Medical and intensive care patients (N=354)	Demographics; diagnosis; APACHE II score; hemodynamics and biochemistry; ventilation duration; level of arousal; length of ICU stay; Confusion Assessment Method; mortality

First Author (Year), Country, Discipline	Purpose	Design	Methods	
			Sample	Data Collection
Tanios (2010), United States, Medicine	Identify the nature of unplanned and near-miss extubations as a threat to patient safety	Survey	Critical care clinicians, N=1976 (Respiratory therapists n=419; Nurses n=870; Physicians n=605)	Study-designed web-survey (demographics; causes of unplanned extubation; 2 case vignettes)
Hejblum (2009) France, Medicine	Compare effectiveness of routine versus on-demand chest radiographs for mechanically ventilated ICU patients	Cluster Randomized	ICU units at 18 hospitals (N=21) Mechanically ventilated ICU patients (N=849)	Number of chest x-rays per patient day of mechanical ventilation
Iedema (2009) Australia, Health Services	Investigate an approach to improve handover communication for safety	Descriptive	Health care providers (n=95) Patients (n=5)	Interviews about use of HELiCS (Handover-Enabling Learning in Communication for Safety)
Kendall-Gallagher (2009), United States, Nursing	Examine the association between the proportion of specialty-certified ICU nurses and patient safety	Cross-sectional	Hospitals (n=29) Intensive Care Units (n=48)	Percentage of certified nurses per unit; medication administration error rates; total falls; skin breakdown; infection rates (central catheter, bloodstream and urinary tract)
Porat (2009), United States, Health Services	Compare new color coded labels for intravenous high-risk medications with current labels to promote patient safety	Cohort	Nurses (N=61)	Observation of tasks performed in laboratory simulation; task completion times; safety of medication treatment; study-designed questionnaire
Romero (2009), Chile, Medicine	Examine feasibility, safety, and effects of extended prone position ventilation greater than 24-hours with patients in severe acute respiratory distress syndrome	Pilot	Patients with severe acute respiratory distress syndrome (N=15)	National Pressure Ulcers Advisory Panel to score cutaneous pressure lesions; Daily chest x-rays to assess barotrauma and/or monobronchial incursion of the orotracheal tube; blood gases; respiratory volumes
Treggiari (2009), United States, Medicine	Examine the mental health outcomes of light and deep sedation	Randomized controlled trial	Patient with light sedation (n = 65) Patients with deep sedation (n = 64)	Post-traumatic Stress Disorder Checklist; Impact of Event scale; days of mechanical

First Author (Year), Country, Discipline	Purpose	Design	Methods	
			Sample	Data Collection
				ventilation; ICU length of stay; Multiple Organ Dysfunction score; hospital length of stay; mortality; agitation; physical restraint use; unplanned extubations; tracheotomies; hypertension, tachycardia
McLean, (2006), United States, Nursing	Assess clinical outcomes of a mechanical ventilation weaning protocol using the Model for Accelerated Improvement	Prospective comparison	Patients (n = 129) Health care providers (n = 112)	Focus group with health care providers (perception about mechanical ventilation protocol); unsuccessful extubation rates; APACHE II score; Riker Sedation Agitation Scale; ventilator-associated pneumonia rates; bloodwork; chest x-rays; duration of mechanical ventilation; Protocol-Directed Weaning Survey; Safety Climate Survey; demographics
Pronovost. (2006), United States, Medicine	Evaluate the frequency and type of factors involved in incidents reported to web-based patient safety reporting systems	Prospective cohort	Intensive Care Units (n=23) Incident reports (n=2075)	Patient demographics; medical therapies; surgery; type of providers reporting incident; type of providers participating in incident; incident location and time frame; type and degree of patient harm; type of event; factors contributing to event

The reviewed literature was predominantly authored by researchers in North America (38.7%), with only one publication originating in Canada. The next largest geographical grouping of literature originated in European countries (29.0%) including: France, Sweden, Scotland, Turkey, England and the Netherlands. Two Australian studies had the same primary authors (Iedema & Allen, 2012; Iedema et al., 2009). The largest proportion of lead authors were from the discipline of medicine (41.9%), followed by health services (22.6%), and nursing

(19.4%). The remaining reports were authored by allied health professionals (16.1%). The extracted purpose statements focus on a broad range of topics relevant to patient safety including in order of frequency: airway management and related issues; mobilization and positioning; clinical pathways and protocols; educational initiatives; medication related issues; communication; mental health; and physical location of patients. The designs used across the 31 reports varied, with prospective studies being the most common. The study samples that directly involved ICU patients or their records ranged from one to over one million. For those studies involving healthcare practitioners, a number of disciplines were represented including nurses, physicians, physiotherapists, and respiratory therapists. The sample sizes of service providers ranged from 8 to 3,870. The methods of data collection were varied across the studies. Within each study the authors used up to nine data collection tools. A common source of information collection was related to physiological indicators of patient status. Notably absent from the reviewed literature was detailed information regarding the psychometric properties of data collection instruments.

The extracted findings of each study, pertinent to patient safety in the ICU, are presented in Table 3. Given the diverse purposes, methods, samples, and data collection tools, it is not surprising that the study findings were broad in nature. To manage the information, six principle topics were identified to represent the foci of extracted study findings. These principle topics were assigned a descriptive label inclusive of: human factors; mechanical ventilation; mobility; health care provider communication; health care provider education; and clinical tools and processes. Although a single study may have addressed more than one of the six identified principle topics, each study was assigned only a single label to designate its principle

contribution to the patient safety evidence. A description of each of the six principle topic labels follows the matrix presented as Table 2.

Table 2
Academic Literature: Extracted Findings and Principle Topic Labels

First Author (Year)	Extracted Findings	Assigned Principle Topic Label
Liao (2014)	• Most cases of ventilator-associated pneumonia (VAP) are identified as compromising physiological safety within the first five days of hospitalization • Most cases of VAP were found to be caused by inhalation of oropharyngeal or gastrointestinal bacteria. • Mechanically ventilated patients receiving an oral hygiene intervention, specifically mouth care, had significantly lower incidence of (VAP) than those patients without the intervention ($p<.005$)	Mechanical Ventilation
Askari (2013)	• Physicians and pharmacists identified 36 types of potential drug-drug interactions as relevant safety threats to ICU admitted patients • During ICU stay, each patient had on average 1.67 potential drug-drug interactions • The two medication therapeutic classes that cause potential drug-drug interactions are antithrombotic agents and antibacterials	Human Factors
Bjurling-Sjöberg (2013)	• ICU nurses conceived a critical care pathway for post- aortic surgical patients as a means to promote patient safety in caring through: knowledge of patient needs and planning of care based on identified standards	Clinical tools and processes
Davis (2013)	• Implementation of standardized early mobilization protocol for mechanically ventilated older adults was feasible 92% of the time • Lack of feasibility of the intervention was most frequently altered neurological and respiratory status. • Of the 171 mobilization sessions for the 15 participants, there was only one adverse event, transient hypotension	Mobility
Grundgeiger (2013)	• Within simulated scenarios, nurses' use of visual cues as reminders to carry out aspects of care, resulted in performance with less errors, in particular errors of omission, in comparison to when no visual cues were used	Human Factors
Jansson (2013)	• Education of ICU clinicians increased their level of knowledge; adherence to guidelines; and ultimately improved patient safety • Positive patient outcomes included: decreased incidence of VAP, and decreased length of hospital and ICU stay	Health Care Provider Education
Sandahl (2013)	• Simulation-based inter-professional training of ICU staff increased their awareness of the importance of effective communication for patient safety • Training promoted an awareness that effective communication is necessary for patient safety in both difficult and more routine situations, such as daily care planning and exchange of information	Health Care Provider Education
Adapa (2012)	With use of pre-filled medication syringes in comparison to bed-side preparations by nurses: • patient safety was increased • medication errors were 17.0 times less likely • administration was more timely • drug concentration was more precise	Human Factors

First Author (Year)	Extracted Findings	Assigned Principle Topic Label
Adler (2012)	• Ten of the reviewed studies specifically examined early mobilization in light of patient safety. Variable of interest included: line removal, extubation, physiological responses (e.g. blood pressure, heart rate, oxygen saturation), and need for modified medical treatment (e.g. sedation, vasopressors). • With early mobilization, untoward events occur in $\leq$ 4% of total patient interactions, most commonly desaturation. No untoward event was assessed as serious.	Mobility
Al-Dorzi (2012)	To improve patient safety, VAP rates were reduced through: • active surveillance and reporting (VAP microbiology) • implementation of evidence based preventive strategies included in a VAP bundle: 30-45 degree head of bed elevation; daily interruption of sedation and daily assessment of readiness to extubate; peptic ulcer disease prophylaxis; and deep vein thrombosis prophylaxis	Mechanical Ventilation
Berney (2012)	• The exercise rehabilitation program, using strict safety criteria, is safe and feasible for ICU patients including those mechanically ventilated • During ICU stay, 55% of potential exercise sessions were delivered and 95% were complete • Non-delivery or incomplete sessions were due to patient fatigue • No adverse events occurred during exercise training • Outcome of the rehabilitation program was higher mobility in the ICU	Mobilization
Iedema (2012)	• Disclosure of a drug error to a family member stimulated dialogue between clinicians and family • A family member acknowledged the value of providing input regarding care received • A family member has insight regarding the unique needs of their family member and the risk inherent in ICU, such as patient care planning, communication, inter-department handovers, and problematic family/patients relationships • Through open-dialogue, patients and family can fulfill a critical role in patient safety	Health Care Provider Communication
LeBlanc (2012)	• ICU protocols and order sets, such as thrombosis prophylaxis, stress ulcer prophylaxis, sedation, pain management, breathing treatments and bowel regimes supported clinician practice • The development of protocols is motivated by creating a standard approach to care and adhering to national safety recommendations • Protocols improved patient outcomes, and consistency in ordering. • nurses and physicians indicated that sedation protocols were most useful in promoting patient safety •	Clinical tools and Processes
Lili (2012)	• The multi-dimensional infection control approach (including education and training) decreased VAP baseline rate from 24.1 to 5.7 per 1000 ventilator days over the course of four years of implementation • Program associated with decreased ICU length of stay	Health Care Provider Education
Özden (2012)	• Significant increase in knowledge of the nurses to the standard practice guidelines for open and closed suctioning after theoretical and practical training • Significant increase in nurse compliance with the standard practice guidelines for open and closed suctioning after theoretical and practical training • Compliance with standard practice guidelines minimizes threats to patient	Health Care Provider Education

First Author (Year)	Extracted Findings	Assigned Principle Topic Label
	safety such as VAP	
Ronnebaum (2012)	Early mobilization outcomes: • Shorter ICU length of stay (by half) • Fewer days of mechanical ventilation (non-mobilized patients had twice the number of MV days) • Reduced risk of ventilator co-morbidities • Better outcomes such as increased independence with mobility independence • savings of $22 000 per ICU patient	Mobility
Collins (2012)	• High degree of structure and overlap in the content of nursing and physician hand-over communication • Use of communication tools (Kardex, print-out sheets) coordinated work activities and served as a memory aid and supported • Use of hand-over tools not integrated with the electronic health record may be linked to ineffective communication and be a potential source of error in patient care • Development of semi-structured patient-centered interdisciplinary handoff tools with discipline specific views customized for specialty settings may effectively support handoff communication and patient safety	Health Care Provider Communication
Morris (2011)	• Overall compliance with a bundle of care to reduced VAP was 70% • VAP rated reduced in the post intervention period from 15% to 9% • Length of MV not impacted by implementation of VAP reduction bundle of care	Mechanical Ventilation
Salazar (2011)	• In the first year following implementation of the Electronic dashboard electronic (used to identify and prioritize ICU patient needs) 64% compliance was reported, which increased to 100% compliance in the third year • Clinical outcomes were not assessed	Clinical Tools and Processes
Ksouri (2010)	• regular morbidity and mortality ICU conferences in relation to improving quality care and patient safety allowed for discussion of patterns of events • Adverse event rate was 16.6 per 1000 ICU patient days • Major adverse events involved the older adult with longer ICU length of stay and prolonged duration of invasive respiratory support • 6.1% Adverse events resulted in deaths • 36% of adverse events were preventable • The distribution of adverse events peaks from noon to 4 pm in the time distribution of adverse events • The primary causes of events and death included: underlying disease, iatrogenesis and nosocomial infections, human errors, unit management dysfunctions, and failure of coordination between departments	Health Care Provider Communication
Leaf (2010)	• Severely ill patients (high APACHE II scores) had significantly higher hospital and ICU mortality when admitted to an LVR than did similarly ill patients admitted to an HVR • ICU length of stay and Ventilator free days did not differ significantly between groups	Human Factors
Shehabi (2010)	Among ventilated and lightly sedated ICU patients, delirium duration associated with: • ICU death, • Increased length of time ventilated • Increased ICU length of stay	Mechanical Ventilation

First Author (Year)	Extracted Findings	Assigned Principle Topic Label
Tanios (2010)	• 95% of ICU clinicians viewed near-miss unplanned extubations as a threat to patient safety • 44% considered unplanned extubation a medical error High Risk for unplanned extubation: • Absence of physical restraints • Patient tugging on the endotracheal tube • Nurse/patient ratio of 1:3 • Trips out of the ICU • Light sedation • Bedside portable radiographs	Mechanical Ventilation
Hejblum (2009)	• Substantial reduction (32%) in use of chest radiographs in the on-demand group (compared to the routine radiograph groups) in all participating ICU's • No reduction in patients quality of care or safety with on-demand chest radiographs • No change in days on mechanical ventilation, length of ICU stay or mortality with on-demand chest radiographs	Mechanical Ventilation
Iedema (2009)	Challenges to ICU handover communication that compromise patient safety were: • Inconsistent timing of handover communication between different disciplines • Physical separation from other clinicians • Incongruent judgements regarding important information to communicate during handover Strategies to improve physician-nurse handover communication: • Handover at patient bedside	Health Care Provider Communication
Kendall-Gallagher (2009)	• Unit proportion of certified staff registered nurses inversely related to rate of falls (p=.04) • Total hours of nursing care positively related to medication administration errors (p=.006) • Mean number of years of experience of registered nurses in the unit was inversely related to frequency of urinary tract infections (p=.01) • Specialty certification and competence of registered nurses are related to patients safety	Human Factors
Porat (2009)	Use of new color coded labels for intravenous high-risk medications: • Improved proper identification of IV bags (p< 0.0001) • Reduced time required for description of overall drugs and lines (p= 0.04) • Improved identification of errors at the treatment setting- drugs and lines (p= 0.03) • Reduced the average performance time for overall tasks (p< 0.0001).	Human Factors
Romero (2009)	• Extended prone position ventilation (PPV) , greater than 24-hours with patients in severe acute respiratory distress syndrome, is safe and effective when it is carried out by a trained staff and within an established protocol • No patient developed hemodynamic instability with extended PPV • Displacement of arterial lines, central venous lines, or orotracheal tubes were not observed when changing positions or while in the prone position • Improved blood gases with extended PPV	Mechanical Ventilation

First Author (Year)	Extracted Findings	Assigned Principle Topic Label
Treggiari (2009)	• Patients having received deep sedation in the ICU had an increase in post-traumatic stress disorder symptoms, difficulty remembering ICU experiences and more disturbing memories of ICU experiences than those receiving light sedation as assessed at a 4 week follow-up • Patients having received light sedation in the ICU had an average one day less of mechanical ventilation and 1.5 Shorter ICU length of stay than those receiving heavy sedation	Human Factors
McLean, (2006)	Introducing the mechanical ventilation weaning protocol, using the Model for Accelerated Improvement: • Decreased the rate of unsuccessful extubations (12.7% to 3.0%) • No significant change in rate of VAP, duration of mechanical ventilation or staff perception of the practice safety climate following introduction of the protocol	Mechanical Ventilation
Pronovost. (2006)	• The Intensive Care Unit Safety Reporting System, a web-based system, provides a mechanism for multiple ICU to identify incidence of harm or hazards to patient safety. • Data trends show a correlation between multiple contributing factors and higher rates of harm, • The most common types of harm reported are physiologic in nature • 42% of reported incidents involve medication error • Teamwork factors and patient factors collectively were major contributors to incidences • Knowledge and competency were also contributing factors	Human Factors

Human Factors. The structural and procedural aspects of the ICU environment were reported as having an impact on the care provided by clinicians for patient safety. Within the reviewed literature, eight reports addressed human factors. This broad grouping addressed evidence about individual factors such as clinical qualifications (Kendall-Gallagher & Blegan, 2009) and use of practice cues (Grundgeiger et al., 2013); environmental factors such as ICU design and physical location of patients (Leaf, Homel, & Factor, 2010); organizational factors including procedures for pharmacological intervention (Adapa et al., 2012; Askari et al., 2013; Porat, Bitan, Shefi, Donchi, & Rozenbaum, 2009; Treggiari et al., 2009) and surveillance of adverse events (Pronovost et al., 2006). The involvement of highly qualified registered nurses, profiled as holding specialty certification and experienced in the care of ICU patients, was attributed to fewer medication errors, infections, and patient falls, suggestive of improved

patient safety outcomes (Kendall-Gallagher & Blegan, 2009). Nurses' use of purposeful reminders, such as visual cues, was identified as helpful in prompting completion of care responsibility to minimize errors of omission (Grundgeiger et al., 2013). The proximity of patents to the nursing station offered visualization by nurses. This visual cue not only supported the execution of necessary care, but resulted in lower hospital mortality in comparison to patients located in rooms where they were less visible (Leaf et al., 2010). With respect to pharmacological interventions, reducing complexity and increasing standardization was identified as contributing to patient safety. For example, the use of pharmacy-prepared, pre-filled medication syringes was found to prevent medication dose errors and treatment delays (Adapa et al., 2012). In addition, the use of a computerized decision support tool was found to prevent drug-drug interactions (Askari et al., 2013). Porat and colleagues (2009) suggested that the use of standardized visual cues, such as colour coded labels on IV medications and IV lines facilitated the identification of potential errors prior to occurrence. The work led by Treggiari (2009) suggests the need to scrutinize dosing to sedation to optimize emotional, cognitive, and physiological stability for patient safety. Use of light sedation was associated with fewer days with mechanical ventilation and a shorter ICU stay in comparison to patients' receipt of heavy sedation. An additional organization factor for consideration in patient safety was the organization use of a surveillance system to understand past and prevent future adverse events (Pronovost et al., 2006).

Mechanical ventilation. Collectively, the literature related to the principle topic of mechanical ventilation addressed the following considerations for patient safety: surveillance (Al-Dorzi et al., 2012, Tanios, Epstein, Livelo, & Teres, 2010); diagnostics (Hejblum et al., 2009; Tanios et al., 2010); and interventions to prevent adverse events (Al-Dorzi et al., 2012;

Liao, Tsai, & Chou, 2014; McLean, Jensen, Schroeder, Gibney, & Skjodt, 2006; Morris et al., 2011; Romero et al., 2009; Shehabi et al., 2010; Tanios et al., 2010). In this group of extracted findings, interventions for mechanically ventilated patients were considered meritorious in the prevention of adverse events such as ventilator-associated pneumonia, unplanned extubations, delirium, and mortality. Some researchers reported the value of single intervention such as mouth care (Liao et al., 2014), sedation (Shehabi et al., 2010) and prone positioning (Romero et al., 2009). Others presented positive results with the implementation of multi-component initiatives (Al Dorzi et al., 2012; Mclean et al., 2006; Morris et al, 2011).

Mobilization. Traditionally early mobilization has been a concern for patient safety given the associated risks of line removal, accidental extubation, and physiological stress (Adler & Malone, 2012). The reviewed literature suggests that mobilization that adheres to a protocol has the potential to shorten ICU length of stay, reduce the risk of ventilator co-morbidities, decrease length of mechanical ventilation, promote independence, muscle strength, and increased mobility tolerance (Adler & Malone, 2012; Davis et al., 2013; Ronnebaum, Weir, & Hilsabeck, 2012). With early mobilization for mechanically ventilated patients, few adverse events have been reported (Adler & Malone, 2012; Davis et al., 2013). The most common reason for discontinuation of a mobilization protocol was patient fatigue, not an adverse event (Berney, Haines, Skinner, & Denehy, 2013).

Healthcare Provider Communication. A grouping of four studies addressed healthcare provider communication as an important facilitator of patient safety. Communication was addressed with regards to: handing over patient care from one clinician to another (Collins et al., 2012; Iedema et al., 2009) routine exchange of information regarding patient status (Collins et al., 2012); and finally, the detailing of adverse events (Iedema & Allen, 2012; Koursi et al.,

2010). The communicated content during handover interactions was similar for nurses and physicians (Collins et al., 2012; Iedema et al., 2009). Differences, however, existed with respect to the tools used and the expected frequency of communication, perceived to compromise patient safety. These researchers suggested that standardizing a patient-centered handoff tool and protocol offered the possibility of improving interdisciplinary communication for patient safety. The location of patient handovers was identified as an important consideration, with bedside communication offering a patient-centered focus (Iedema et al., 2009). In addition, family inclusion in communication between healthcare providers can offer a source of information to enhance patient safety (Iedema & Allen, 2012). Holding forums for supportive peer dialogue regarding adverse events was presented as a strategy to facilitate communication and improve quality of care (Ksouri et al., 2010).

Healthcare Provider Education. Collectively, a grouping of four studies in the reviewed literature identified an association between staff education and improved patient safety. Education was reported to increase clinicians: awareness of patient safety issues (Sandahl et al., 2013); knowledge of patient safety practices (Jansson, Kääriäinen, & Kyngäs, 2013; Özden & Görgülü, 2012); and application of safety practice (Jansson et al., 2013; Lili, Hu, Rosenthal, Zhang, & Gao, 2012; Özden & Görgülü, 2012). The foci of educational material were interprofessional communication and care of mechanically ventilated patients. Learners included nurses and to a lesser extent, physicians. The reported positive outcomes associated with education were: decreased incidence of ventilator-associated pneumonia (Jansson et al., 2013; Lili et al., 2012; Özden & Görgülü, 2012), decreased patient length of hospital and ICU stay (Jansson et al., 2013; Lili et al., 2012), and improved care planning through interdisciplinary

communication of patient information (Sandahl et al., 2013). Limited information was presented regarding the nature of the educational initiative.

Clinical Tools and Processes. Three studies described different resources intended to guide the safety practices of clinicians. Adoption of clinical tools and adherence to organization processes were identified as conducive to standardizing the management of care for patient safety. Implementation of clinical pathways supported effective management of care through dissemination of knowledge for practical uptake in the planning of care and evaluation of patient outcomes (Bjurling-Sjöberg, Engstrom, Lyckner, & Rydlo, 2013). Use of electronic dashboards (Salazar, Tyroch & Smead, 2011) assisted in clinician adherence to standardized protocol within an organization. The use of ICU care protocols not only made the work of clinician easier, but was reported to promote positive patient outcomes, in particular rated to sepsis prevention (LeBlanc, Kane-Gill, Pohlman, & Herr, 2012).

In addition to the search of academic literature, the website of the provincial organization responsible for the implementation of the Critical Care Strategy, Critical Care Services Ontario was searched (http://www.critical careontario.ca). A document, entitled Critical Care Unit Balanced Scorecard Toolkit (Critical Care Secretariat, 2012) was retrieved. This document is intended to guide the use of unit level scorecards to support quality care and patient safety while optimizing performance within local critical care units. This document was developed collaboratively with critical care clinicians, administrators, and decision makers using multiple methodologies, including document retrieval, stakeholder consultation, and surveys. A product of these processes is the *High Performing ICU Checklist*. The full checklist is made available upon request through the Critical Care Secretariat. This checklist identifies provincial best practices to optimize quality care and patient safety within Level 3 critical care units. A Level 3

critical care unit, as described by Critical Care Services Ontario, provides care to patients who require basic and/or invasive ventilator support along with the support of more than one organ system (https://www.criticalcareontario.ca/EN/AboutUs/Pages/What-is-Critical-Care.aspx). Use of this checklist is intended to facilitate awareness and adoption of innovative actions and ideas with established success within the province.

The same six principle topics labels, used to represent the foci of extracted findings from the academic literature, were assigned to categorize the extracted patient-safety content from the *ICU High Performing Checklist* (Table 3). Mobilization was not explicitly identified as a principle topic relevant to patient safety.

Table 3

ICU High Performing Checklist: Extracted Patient-Safety Content and Principle Topic Labels

Extracted Patient-Safety Content	Principle Topic Labels
• Offer of nurse orientation program • Implement annual educational events for nurses	Health Care Provider Education
• Develop standards and protocols for ventilator weaning • Implement recognized best practices for ventilator-associated pneumonia prevention	Mechanical Ventilation
• Implement multidisciplinary daily rounds to communicate the status of a patient • Adoption of formal morbidity and mortality case conferences • Institute a multidisciplinary discharge plan with family • Establish processes to ensure availability of laboratory and radiology services	Health Care Provider Communication
• Standardize mechanisms to facilitate ICU transfers and flow • Utilize standardized clinical scales to assess delirium • Establish multi-disciplinary protocols for high-volume care processes • Evaluate and address needs of families	Clinical Tools & Processes
• Use order sets, reminders, and technology to support evidence informed practices • Develop organizational processes to ensure timely supply of medications	Human Factors

Chapter 3
Methodology and Methods

The purpose of this study was to identify priorities for strengthening the patient safety practices in an intensive care unit in Ontario. Exploring safety priorities within this context is of particular relevance given the organization's safety mandate and multiple competing demands. The modified Delphi technique, which was used to guide this exploration, facilitated the development of consensus regarding priorities about a phenomenon by a group of experts. In this chapter the research methodology and methods used to conduct this study are presented.

Methodology

The first Delphi study was conducted by the American Air Force sponsored Rand Corporation in the early 1950s. Coined the Delphi-Project, it's mission was to obtain a reliable and cost effective forecasting regarding a prospective atomic bomb attack on United States (Linstone & Turoff, 2002; Dalkey & Helmer, 1963). This approach is grounded in group communication and consensus building processes in an effort to examine real world problems and opportunities through serial questionnaires and controlled opinion feedback from experts. This results in the elicitation and convergence of experts' opinions regarding the phenomenon of inquiry. Reliable expert opinion is important when tacit information is unavailable or elusive. Delphi approach facilitates the systematic and non-confrontational development of consensus in order to identify projections about the study phenomenon (Crisp, Pelletier, Duffield, Adams, & Nagy, 1997; Daphne & Warren-Forward, 2015; Hsu & Sandford, 2007, Kenney, Hasson & McKenna, 2001). The four key features of the classic Delphi approach include: anonymity of participants; iteration between serial data collection phases; controlled feedback that informs participants of others perspectives; and statistical aggregation of group responses (Crisp et al., 1997; Kenney et al., 2001; Skulmoski, Hartman, & Krahn, 2007). The classic Delphi commences

with the generation of preliminary ideas from experts regarding the focus of inquiry, which form the basis of the first of a series of questionnaires.

Since its inception, this methodology has been used across multiple sectors including business, technology, education, law, and healthcare (Keeney, Hasson, & McKenna, 2011; Skulmoski et al., 2007). Within the discipline of nursing, Delphi technique has been used to identify nursing competencies (Eskes et al., 2014; Staykova, 2012; Wihlborg, Edgren, Johansson, & Sivberg, 2014), develop clinical practice guidelines (Conway, Rolley, Rage, & Fulbrook, 2014; Temkin-Greener et al., 2015) and identify research priorities (Brenner et al., 2014; Moreno-Casbas, Martin-Arribas, Orts-Corets, & Comet-Cortes, 2001; Ranse, Hutton, Jeeawody, & Wilson, 2014). Specific to the critical care context, the Delphi technique has been used to identify nursing practice standards and competencies (Barr et al., 2013; Gill, Leslie, Grech, Boldy, & Latour, 2015; Lakanmaa, Suominen, Perttilä, Puukka, & Leino-Kilpi, 2012), quality patient care practices (Marshall, Elliott, Rolls, Schacht, & Boyle, 2008), ICU research priorities (Blackwood, Albarran & Latour, 2010; Wielenga, Joke, Tume, Latour, & van den Hoogen, 2015), and learning outcomes from education programs (Marshall et al., 2007; Tweed & Tweed, 2008).

The popularity of the Delphi relates to the multiple research objectives that can be achieved through consensus building (Keeney et al., 2011). These include: planning of programs based on a range of possible initiatives; revealing the rationale that informs expert opinion; correlating opinions from a diverse group of experts; and educating participants to the complexity of the topic of inquiry (Kenney et al., 2001). In particular to this study, the Delphi approach was suitable for the identification of patient safety priorities informed by the reviewed literature. This may be achieved through expert prioritization of evidence-informed statements

about the study topic and aggregation of opinions to represent points of consensus. A potential benefit of this methodology is to sensitize others, including participants to those practices that could support patient-safety in their ICU.

Methods

Design

The design of this study was a modified Delphi. One way that a modified Delphi can differ from a classic Delphi is the initial provision of information to the experts rather than elicitation of such from the participants themselves (Keeney et al., 2011; Logue & Effken, 2012; McKenna, 1994). This particular modification was chosen for this study due to presence of emerging literature regarding patient safety in acute care contexts, and more specifically the ICU. The reviewed literature can form the basis of the questionnaire that is distributed to content and context experts to explore what is unknown (Kenney, Hasson, & McKenna, 2006). This study seeks to reveal priorities for enhancing patient safety in this study's setting. Through group consensus building among identified content and context experts, the modified Delphi has the potential to identify setting-specific priorities for enhancing patient safety.

Setting

This study's setting was a single adult intensive care unit with over 25 beds, designated as providing Levels 2 and 3 critical care. A Level 2 unit provides care to patients who have the need for thorough observation or intervention, the support of a single failed organ system, and a brief period of non-invasive ventilation or post-operative care (https://www.criticalcareontario.ca/EN/AboutUs/Pages/What-is-Critical-Care.aspx). The hospital in which the ICU is located is a health centre which services a population of approximately 565,000 Ontarians residing in a 400,000 square kilometres area. The ICU beds, in the study setting, are designated for physiologically unstable adults requiring immediate intervention

through intensive monitoring and treatment in one of two subspecialties: adult medical/surgical and cardiovascular-thoracic. The study ICU has over of 2000 annual admissions.

Sample

Given that the aim of Delphi method is to obtain consensus among a group of experts on an important issue, published authors have debated its use of non-random sampling. The cornerstone of Delphi, however, is the purposeful identification and selection of a group of prospective participants who are deemed as experts in topic of study (Kenney et al., 2001). An expert or informed participant is one who possesses valid experience and knowledge in addition to interest and current involvement in the phenomenon under investigation (Hsu & Sandford, 2007; Kenney et al., 2001).

To identify content and context experts, it is advisable to create and adhere to a strict list of characteristics that are required for a participant to be included or excluded from the study (Keeney et al., 2011). In addition, it is important to consider inclusion of a variety of individuals required to represent different perspectives (Keeney et al., 2011). As such, a sample of experts, inclusive of Registered Nurses, Intensivists and Registered Respiratory Therapists, were the target study sample of experts identified to render a range of opinions about patient safety priorities. In the study setting, direct care provision was a responsibility shared by members of these disciplines allowing them to render a range of opinions about patient safety priorities. Respiratory Therapists in Canada are required to complete a three-year community college program or a four-year respiratory degree program. As such, within a team approach, they have the requisite knowledge, skills, and abilities to provide professional services and respiratory support to contribute to the best possible outcomes for their patients (Canadian Society of Respiratory Therapists, ND). In Canada, intensive care physicians come from a broad

background with base specialties including: internal medicine, respiratory, anaesthesia, surgery, emergency medicine and paediatrics (Galvin & Steel, 2010). Critical care certification for physicians requires two years of adult Critical Care training, and certification in their primary specialty.

To generate a list of attributes for expertise in patient safety, review of clinical documentation and consultation with organizational management occurred. Critical Care Services Ontario (2014) defines an experienced nurse as one who has three to five years of ICU experience, criteria of expertise adopted for this study. This criterion was shared with organization management. They confirmed its relevance to the setting, and recommended that both registered nurses and respiratory therapists with three or more years of work experience within the study ICU, be deemed as experts relative to patient safety. Intensivists undergo extended formal and experiential education in intensive care medicine with an emphasis on quality care. As such, intensivists with greater than one year of experience in this study setting were deemed as expert respondents. Finally, in consultation with management in the study setting, years of experience and exposure to the current repertoire of safety practices and processes within the ICU setting, was analogous to content and context expertise.

There has been no agreement on the appropriate sample size for a Delphi study. Delbecq, Van de Ven and Gustafson (1975) suggested that optimal Delphi small panel of experts is ideal for a homogeneous population. Ludwig (1997) identified that "[t]he majority of Delphi studies have used between 15-20 respondents and run over periods of several weeks" (p. 2). More recently, Skulmoski and colleagues (2007) found that the sample sizes in Delphi studies were variable and ranged from 3 to 171. The total population of the ICU clinicians that met the inclusion criteria was 174 (Registered nurses=131; Registered respiratory therapists=32;

Intensivists=11). Of these, 30 experts participated in the initial data collection process, representing a response rate of 17.2 %. Through the course of the study, an attrition rate of 36.7 % of the original participants resulted in a final study sample of 19 experts. Based on a review (Kenney et al., 2011), these rates are consistent with published literature.

Data Collection and Analysis

Data were collected through the serial administration, of two researcher-created questionnaires, the *Patient Safety Priority Questionnaire,* Round 1 and the *Patient Safety Priority Questionnaire,* Round 2, subsequently referred to as Round 1 and 2. Questionnaires are used to elicit judgements from the expert participants regarding statements of relevance to the study topic (Keeney et al., 2011). In a modified Delphi, the pilot-tested Round 1 questionnaire commonly includes statements generated through a review of the literature. This approach is suitable given that there is applicable evidence concerning patient safety in ICU settings (Hsu & Sandford, 2007). Specific to this study, the researcher integrated the key findings from the reviewed academic literature (Table 2) and the pertinent content from the *High Performaning ICU Checklist* (Table 3). As a result, an initial list of 32 statements about ICU patient safety was created. Table 4 presents the six principle topics identified in the literature review and the resultant 32 questionnaire statements.

Table 4

Six Groupings of Questionnaire Statements generated from Literature Review

Principle Topic Label	Questionnaire Statements (N=32)
Clinical Tools and Processes	• Incorporate a checklist into the Bullet Round Reporting Tool to provide visual identification of best practice standards relevant to each patient. • Develop a standardized intra hospital patient transport decision tool to decrease the risk of incidents for ICU patients. • Develop clinical pathways to manage care of patients aligning with existing standard orders sets. • Encourage reporting of incidents into the incident reporting system to assist in identifying contributing factors and system opportunities for improvement.

Principle Topic Label	Questionnaire Statements (N=32)
	• Develop a process to identify and address family members' immediate needs such as social work or chaplain referral. • Improve pain and agitation management in the ICU patient. • Improve standardized protocols and transfer orders to facilitate ICU patient flow to in-patient units. • Implement delirium prevention and management strategies to reduce mortality, patient falls, ventilation time, ICU length of stay and long term cognitive impairment.
Human factors	• Implement use of visual cues such as colour-coded labels to identify high-risk intravenous medications and lines. • Advocate for drug infusions in pre-filled syringes to reduce medication errors and treatment delays. • Explore strategies for early identification of drug-drug interactions. • Initiate visual and auditory cues to promote completion of time dependent tasks such as daily check of crash cart or adjustment of heparin drip according to protocol (i.e. visual duty board, timer etc…) • Place severely ill patients within rooms that are visible to the nurses' station. • Develop a nurse assignment decision making tool to assist the charge nurse in matching patient acuity with nurse's skills, such as years of experience and certifications. • Initiate discharge planning shortly after ICU admission. • Investigate barriers to timely supply of medications.
Mechanical Ventilation	• Establish patient care protocols for prone position ventilation. • Optimize use of the ventilator-associated pneumonia care bundle. • Explore clinically required daily order for chest x-rays in mechanically ventilated patients vs routine daily orders. • Improve the use of established ventilator weaning standards and protocols. • Improve use of daily spontaneous awakening trials combined with spontaneous breathing trials for effective ventilator weaning.
Mobilization	• Implement standardized criteria for initiating and terminating mobilization of critically ill patients.
Healthcare Provider Communication	• Increase use of multidisciplinary team simulation training to improve effective communication. • Develop a standardized patient handoff tool with ICU staff to promote comprehensive transfer of patient information. • Develop patient/family incident disclosure guidelines to improve communication and improve patient/family involvement in quality improvement. • Advocate for timely diagnostic/laboratory services. • Involve family shortly after ICU admission in the anticipated discharge plan. • Expand regular Morbidity and Mortality Rounds using a framework for review and inclusion of multidisciplinary staff to mitigate patient risks.
Healthcare Provider Education	• Increase use of simulation for complex and infrequently encountered skills to promote clinical competency • Promote voluntary Critical Care Nursing Specialty certification • Review the ICU nurse orientation program to identify gaps in training for nurses new to this ICU. • Assess learning needs of all ICU staff/disciplines.

The timeline and activities carried out during data collection is detailed in Figure 1. The timeline was planned in accordance with the literature (Kenney et al., 2011) and upheld to optimize participant involvement, robustness, and yield timely information for action within the

study setting. An initial version of the questionnaire, including a random ordering of the 32 statements about ICU patient safety, was piloted by a panel of three clinicians with relevant ICU experience. The piloting process it considered a critical step for promoting content validity and specificity to the study setting (Kenney et al., 2011). Based on their individual assessments of the questionnaire's content, relevance, and clarity, minor modifications were completed to yield the Round 1 Questionnaire during the first week of the data collection process (Appendix C).

The Round 1 questionnaire, which takes approximately 10 minutes to complete, has two parts. Part A contains three items for the collection of information about the participant including: practice discipline; years of experience in the study ICU; total years of ICU experience. Part B is designed to elicit judgments about each of the pre-selected 32 statements, as a priority for patient safety in the study ICU. Participants are asked to read each statement and record their judgement on a 7-point Likert scale. The seven points include: disagree very strongly; disagree strongly; disagree; neutral; agree; agree strongly; and agree very strongly. An open ended question provides participants with an opportunity to record additional ideas that were not included by the researcher, but are perceived as a patient safety priority in the study ICU.

Round 1

The managers of the ICU and Respiratory Therapy departments were provided with the inclusion criteria in order for them to generate a list of eligible clinicians. This list was forwarded to a designated administrative secretary. Based on this list, the administrative secretary sent an email inviting all eligible clinicians to participate in the study. Interested participants were instructed to pick-up a study package containing a detailed study information letter (Appendix A), consent form (Appendix B), and the Round 1 questionnaire (Appendix C) from the

designated pick-up box in their department. In addition, all packages included a coded ticket attached to the questionnaire. Return of the coded ticket provided them with a chance to win a draw for a $75 gift card to a local restaurant, a $25 gift card to a movie theatre, or one of five, $10 coffee shop gift cards. The participant code was used for the draw and the winners were contacted by the designated administrative secretary. Incentives, such as those used in this study, have been reported as reasonable and ethical practices in the recruitment and retention of study participants (Grant & Sugarnam, 2004; Halpern, 2011).

Round 2

Data were inputted into the Statistical Package for Social Sciences, Version 20, as recommended by Kenney and colleagues (2011). Non-parametric descriptive statistics to represent the nominal data (disciplinary background), ordinal data (ranking of individual statements on Likert scales), and interval data (total years of practice, years of practice in the study ICU) were generated. The 7-points on the Likert scale were converted to numeric values as follows: 1, *disagree very strongly*; 2, *disagree strongly*; 3, *disagree*; 4, *neutral*; 5, *agree*; 6, *agree strongly*; and 7, *agree very strongly*. Descriptive statistics are commonly used to present information concerning the collective judgements of participants (Hsu & Sandford, 2007; von der Gracht, 2012).

Figure 1: Data Collection Plan and Timeline

Phases	Weekly Timeline	Activities
Pilot Test		Three individuals asked to critique the questionnaire in relation to content, relevance, and clarity.
	1	The questionnaire instructions and wording of some of the statements was modified based on feedback to finalize the Round 1 Questionnaire.
		⬇
Round 1		Study sample inclusion criteria were provided to ICU and Respiratory therapy department managers to generate a list of eligible participants.
	2	The designated administrative secretary was asked to send an internal email inviting all listed staff to participate in the study.
		Prospective participants picked-up a study package containing the information letter, consent form and the Round 1 questionnaire from a designated pick-up box located within their department.
	3, 4, 5	Participants completed and returned the Round 1 questionnaire to the labelled drop-off box within their department.
		Regular communication with designated administrative secretary to arrange pick-up of completed questionnaires.
		⬇
Round 2	6, 7, 8	Round 2 questionnaire developed based on analysis of Round 1 data.
	9, 10, 11	Each Round 1 participant was provided via email from the Administrative Secretary, their own Round 1 questionnaire responses. In a separate email, the Administrative Secretary informed the Round one participants the Round 2 questionnaire was available in the designated box located within their department.
		Participants completed and returned Round 2 questionnaire.
	12	Completed questionnaires picked-up. Data collection period closed.

Note. Boxes with dark shading indicate researcher activities. Boxes with light shading indicate participant activities

The aim of the analysis of the Round 2 ordinal data is to identify consensus among the participants regarding what constitutes a priority for advancing patient safety in the study ICU. Although there are no finite rules of what constitutes a minimal threshold for consensus in

Delphi method, it has been recommended that the consensus level be set by the researcher prior to data analysis (Keeney et al., 2011). A consensus parameter can range from 51% to 100% (Keeney et al., 2011; von der Gracht, 2012). In this study, it was deemed necessary for the consensus level to exceed more than two-thirds majority. As such, 70% of participants had to agree on the ranking of an individual statement in order for consensus to be achieved.

Based on the analysis of Round 1 data, the Round 2 questionnaire (Appendix D) was developed. It is customary to remove those statements that are found to achieve the pre-determined level of consensus in serial rounds of data collection. Upon analysis of Round 1 data, no individual statements were found to have a common ranking by 70% of the participants. As such, consensus was not achieved. Each of the original 32 statements was therefore included in the Round 2 questionnaire.

All responses to the opened-ended item in the Round 1 questionnaire, "Are there any other priorities for patient safety in your ICU that are not listed above? If so, please identify these priorities," were analysed using content analysis (Elo & Kyngäs, 2008). This involved reading each of participant's entry, eliminating duplications, creating groups of similar statements, and developing representative statements. This resulted in a list of 10 new statements about patient safety priorities in the study ICU (Table 5).

Table 5

New Statements Created from the Expert-Identified Safety Priorities

- Explore strategies to most effectively communicate changes to policies/procedures (i.e. highlight modifications in colour).
- Advocate for improvements to the automated medication dispensing system to allow for inclusion of patients allergy information.
- Review patient restraint use in this ICU and compare to best practice standards.
- Request review of process for timely access to critical lab values.
- Review current medication documentation processes and practices.
- Review break coverage during periods of patient high acuity.
- Implement multidisciplinary staff debriefing sessions following critical events with skilled debriefers.
- Develop guidelines for appropriate choice and use of patient lifts.
- Encourage incident reporting for injuries related to restraint use to determine changes in resources and practices.
- Examine evidence regarding the use of central line with all vasopressors.

The Round 2 questionnaire differed from the Round 1 questionnaire in four ways. First, a new column was added to report the Round 1 most commonly ranked category for each of the 32 statements. This disclosure was intended to reveal the preliminary judgments of the group. Such controlled feedback, as described by Yousuf (2007), allows for the sharing of information among participants without face-to-face contention or compliance. Based on this information, participants may individually choose to maintain consistency with their Round 1 ranking, or alter their ranking to coincide with the group. Second, the 10 new statements were added to the original 32, to yield a total of 42 statements. Third, the *neutral* ranking option was removed to create a 6-point Likert scale. This structural modification was made to "force" participants to make a choice regarding their level of disagreement or agreement. Finally, the open-ended response question was removed.

Three weeks following the distribution of the Round 1 study package, each Round 1 participant was provided, via an email from the designated administrative secretary, their own answers to each study statement. In a separate email, from the administrative secretary, the Round 1 participants were informed the Round 2 study package was ready to be picked up in the familiar location. In Round 2, participants were instructed to once again rate each statement, with the purpose of moving towards consensus concerning the most important priorities for strengthening patient safety practices in the ICU. The active involvement of participants during sequential rounds of data collection allows the group to converge in agreement regarding those identified practices and processes that require further action to optimize patient safety.

Ethics

Ethical approval for this research study was obtained from the Research Ethics Board at Laurentian University where the researcher is a student, followed by the Research Ethics Board at the study site (Appendix E). This design is particularly conducive to preserving anonymity, which supports open and honest disclosure of opinions without being known to, or pressured by other participants (McKenna, 1994).

The population from which the potential sample was taken are regularly encouraged and requested to provide feedback regarding the regular functioning of the unit. This is an Accreditation Canada Standard. This study did not pose any additional psychological or emotional risk than is already present in the participants work expectations. Participation was voluntary and anonymous. All information was stored in accordance with Tri-Council Policy and ethical protocol approved by Laurentian University and the study's ethics committee. At no time did the principle investigator, as an employee of the setting where the data was collected, know who did or did not participate in any component of the study.The administrative assistant collected and denominized the questionnaires before forwarding to the principle investigator. Individual questionnaire responses were grouped with other participants to preserve anonymity.

Rigor

There is debate regarding the indicators of rigor for the modified Delphi method. Hasson and Keeney (2011) contend that the Delphi is a reliable snapshot of expert opinion within a circumscribed group at moment in time. In this study, quality was demonstrated through the suitability of the approach to the research question; the systematic identification and resultant participation of credible informants on the defined topic of interest; asynchronous completion of the questionnaire to avoid premature consensus; and distribution of individualized and grouped

responses to each participant following phase one to facilitate anonymized group communication (Hasson & Keeney, 2011; Yousuf, 2007). Quality was demonstrated through the development of the questionnaire informed by relevant published literature which was pilot-tested by non-participant content and context experts.

Chapter 4
Findings

This chapter presents the results obtained from each of the two Rounds of Delphi data collection. The findings from each Round are presented separately. The consensus level of each statement is presented descriptively in tabulated form. In addition, those statements that reached the established consensus level of 70% are identified.

Round 1 Delphi

Thirty individuals participated in Round 1 of this Delphi. The majority of the participants were registered nurses (n = 23; 76.7%). In addition, seven intensivists (23.3%) submitted a completed questionnaire. No registered respiratory therapists participated in the initial Round of data collection. The average years of practice experience within the study ICU reported by participants was 12.2 years (SD = 6.4 years). One third of all participants (n = 10) had worked at another ICU prior to their current work at the study site.

Table 6 presents the frequency counts, for each of the 32 statements, ranked on the seven-point scale (1 = *disagree very strongly* to 7 = *agree very strongly*). The percentage identified next to each frequency count, represents the proportion of the participant population in agreement relative to the level of that each statement was ranked. The established consensus level of 70% agreement in ranking any of the 32 ICU safety priority statements was not reached. The highest level of consensus was 56.7%, that is, 17 participants *agree* that a patient safety priority was to *develop a standardized patient handoff tool*. Overall, completion of the questionnaire was comprehensive, with the exception of missing data for two of the 32 statements: *develop a nurse assignment decision making tool* and *review the ICU nurse orientation program to identify gaps*. The highest median ranking of 6 (agree strongly) was in relation to two statements: *establish patient care protocols for prone position ventilation* and

improve pain and agitation management. The lowest mean ranking was 4.07 (*SD* = 1.17) for the statement *initiate discharge planning shortly after ICU admission*. The highest mean ranking of 5.73 (*SD* = .87) was identified for the statement *improve pain and agitation management*.

Table 6

Round 1 Results on 7-Point Likert Scale

Abbreviated Statements	7-Point Likert Scale Ranking *n* (%)							Missing Data	Mean Ranking/ Median Ranking	*SD*
	Disagree Very Strongly	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Agree Very Strongly			
Increased use of simulation for complex and infrequently encountered skills.	1 (3.3)	1 (3.3)	3 (10.0)	1 (3.3)	13 (43.3)	6 (20.0)	5 (16.7)	0 (0.0)	5.07/5	1.48
Develop a nurse assignment decision making tool.	1(3.3)	0(0.0)	3(10.0)	8(26.7)	11(36.7)	4(13.3)	2(6.7)	1(3.3)	4.66/5	1.26
Review the ICU nurse orientation program to identify gaps.	0(0.0)	0(0.0)	3(10.0)	3(10.0)	13(43.3)	4(13.3)	6(20.0)	1(3.3)	5.24/5	1.21
Assess learning needs of all ICU staff.	0(0.0)	0(0.0)	4(13.3)	3(10.0)	11(36.7)	6(20.0)	6(20.0)	0(0.0)	5.23/5	1.28
Increase use of multidisciplinary team simulation training.	0(0.0)	1(3.3)	5(16.7)	4(13.3)	11(36.7)	8(26.7)	1(3.3)	0(0.0)	4.77/5	1.22
Promote volunteer critical care nursing specialty certification.	0(0.0)	1(3.3)	6(30.0)	2(6.7)	14(6.7)	5(16.7)	2(6.7)	0(0.0)	4.73/5	1.26
Incorporate a checklist into the bullet Round reporting tool.	1(3.3)	0(0.0)	4(13.3)	8(26.6)	6(20.0)	9(30.0)	2(6.7)	0(0.0)	4.77/5	1.38
Establish patient care protocols for prone position ventilation.	0(0.0)	0(0.0)	0(0.0)	4(13.3)	10(33.3)	12(40.0)	4(13.3)	0(0.0)	5.54/6	.89
Improve standardized protocols and transfer orders.	0(0.0)	1(3.3)	3(10.0)	4(13.3)	11(36.7)	3(10.00	8(26.6)	0(0.0)	5.20/5	1.42
Initiate discharge planning shortly after ICU admission.	0(0.0)	2(6.7)	9(30.0)	7(23.3)	10(33.3)	1(3.3)	1(3.3)	0(0.0)	4.07/4	1.17
Develop a standardized patient handoff tool	0(0.0)	0(0.0)	2(6.7)	0(0.0)	17(56.7)	8(26.7)	3(10.0)	0(0.0)	5.33/5	.92
Develop a process to identify and address family members' immediate needs.	0(0.0)	0(0.0)	3(10.0)	2(6.7)	19(63.3)	4(13.3)	2(6.7)	0(0.0)	5.00/5	.95
Involve family shortly after ICU admission in the anticipated discharge plan.	0(0.0)	1(3.3)	1(3.3)	8(26.7)	16(53.3)	2(6.7)	2(6.7)	0(0.0)	4.77/5	1.01

Abbreviated Statements	7-Point Likert Scale Ranking *n* (%)							Missing Data	Mean Ranking/ Median Ranking	*SD*
	Disagree Very Strongly	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Agree Very Strongly			
Implement standardized criteria for mobilization.	0(0.0)	0(0.0)	4(13.3)	6(20.0)	10(33.3)	9(30.0)	1(3.3)	0(0.0)	4.90/5	1.09
Optimize use of the ventilator-associated pneumonia care bundle.	0(0.0)	0(0.0)	3(10.0)	7(23.3)	10(33.3)	6(20.0)	4(13.3)	0(0.0)	5.03/5	1.19
Develop a standardized intra hospital patient transport decision tool.	0(0.0)	2(6.7)	3(10.0)	15(50.0)	5(16.7)	3(10.0)	2(6.7)	0(0.0)	4.33/4	1.21
Develop clinical pathways to manage care of patients.	0(0.0)	2(6.7)	2(6.7)	10(33.3)	8(26.7)	6(20.0)	2(6.7)	0(0.0)	4.67/5	1.27
Implement delirium prevention and management strategies.	0(0.0)	0(0.0)	0(0.0)	2(6.7)	16(53.3)	11(36.7)	1(3.3)	0(0.0)	5.37/5	.87
Improve pain and agitation management.	0(0.0)	0(0.0)	0(0.0)	2(6.7)	10(33.3)	12(40.0)	6(20.0)	0(0.0)	5.73/6	.87
Improve use of daily spontaneous awakening trials with spontaneous breathing trials.	0(0.0)	0(0.0)	0(0.0)	3(10.0)	14(46.7)	8(26.7)	5(16.7)	0(0.0)	5.5/5	.90
Explore clinically required daily order for chest x-rays.	0(0.0)	0(0.0)	0(0.0)	9(30.0)	10(33.3)	8(26.7)	3(10.0)	0(0.0)	5.17/5	.99
Improve the use of established ventilator weaning standards and protocols.	0(0.0)	0(0.0)	2(6.7)	2(6.7)	15(50.0)	8(26.7)	3(10.0)	0(0.0)	5.27/5	.98
Implement use of visual cues for high-risk lines .	0(0.0)	0(0.0)	4(13.3)	5(16.7)	6(20.0)	5(16.7)	10(33.3)	0(0.0)	5.40/5.5	1.45
Advocate for drug infusions in pre-filled syringes.	0(0.0)	2(6.7)	2(6.7)	8(26.7)	6(20.0)	6(20.0)	6(20.0)	0(0.0)	5.00/5	1.49
Explore strategies for early identification of drug-drug interactions.	1(3.3)	0(0.0)	2(6.7)	3(10.0)	11(36.7)	8(26.7)	5(16.7)	0(0.0)	5.23/5	1.36
Initiate visual and auditory cues to promote completion of time dependent tasks.	0(0.0)	2(6.7)	7(23.3)	7(23.3)	4(13.3)	9(30.0)	1(3.3)	0(0.0)	4.47/4	1.41
Place severely ill patients near nurses' station.	0(0.0)	0(0.0)	5(16.7)	1(3.3)	10(33.3)	6(20.0)	8(26.7)	0(0.0)	5.37/5	1.38

Abbreviated Statements	7-Point Likert Scale Ranking *n* (%)							Missing Data	Mean Ranking/ Median Ranking	*SD*
	Disagree Very Strongly	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Agree Very Strongly			
Develop patient/family incident disclosure guidelines.	0(0.0)	0(0.0)	2(6.7)	8(26.7)	12(40.0)	7(23.3)	1(3.3)	0(0.0)	4.90/5	.96
Expand morbidity and mortality Rounds.	0(0.0)	1(3.3)	3(10.0)	6(20.0)	11(36.7)	8(26.7)	1(3.3)	0(0.0)	4.83/5	1.15
Encourage reporting of incidents into the incident reporting system.	0(0.0)	1(3.3)	0(0.0)	7(23.3)	13(43.3)	5(16.7)	4(13.3)	0(0.0)	5.10/5	1.12
Advocate for timely diagnostic/laboratory services.	0(0.0)	1(3.3)	0(0.0)	4(13.3)	10(33.3)	8(26.7)	7(23.3)	0(0.0)	5.50/5	1.20
Investigate barriers to timely supply of medications.	0(0.0)	1(3.3)	0(0.0)	3(10.0)	12(40.0)	5(16.7)	9(30.0)	0(0.0)	5.57/5	1.22

Round 2 Delphi

Nineteen individuals completed the Round 2 Questionnaire (Appendix E) that was distributed to the original 30 Round 1 participants. This represents an acceptable response rate of 63.3%. Round 2 participants exclusively included nurses (*n* = 13; 68.4%) and physicians (*n* = 6; 31.6%). The average years of practice experience at the study site ICU was 11.6 years (*SD* = 5.9 years). Twenty-six percent of the participants had worked at another ICU prior to their current work at the study site (*n* = 5).

Table 7 presents the frequency counts of the patient safety rankings, on a six-point scale (1 = disagree very strongly and 6 = agree very strongly), for 42 statements, The 42 statements are a composite of the original 32 statements from the Round 1 questionnaire and the 10 statements created from Round 1 expert-identified safety priorities. In an effort to move towards consensus regarding disagreement or agreement that each statement was a patient safety priority, participants were not presented with a neutral ranking option in Round 2.

The recorded percentages of Round 2 participants, sharing a common ranking for each statement, represent the level of consensus. The established consensus level (70%) was reached on four statements. There was consensus that a safety priority was to *improve pain and agitation management* at the ranking level of *strongly agree* (*n* = 14, 73.7%). In addition, three statements reached consensus at the ranking of *agree.* These three statements were: *encourage reporting of incidents into the incident reporting system*; *develop guidelines for appropriate choice and use of patient lifts*; and *encourage incident reporting for injuries related to restraint use*. There was missing data for ten statements.

The highest median ranking of 5 (*agree strongly*) was identified for eight statements, the remainder of statements received a median ranking of 4 (*agree*). The lowest mean ranking was

3.72 (*SD* = .61) for the statement: *develop critical pathways to manage care of patients*. The highest mean ranking of 5.32 (SD = .77) was identified for the statement: *review current medication documentation process and practices*.

Table 7

Round 2 Results on 6-Point Likert Scale

Abbreviated Statements	6-Point Likert Scale Rankings *n* (%)						Missing Data	Mean Ranking/ Median Ranking	SD
	Disagree Very Strongly	Disagree Strongly	Disagree	Agree	Agree Strongly	Agree Very Strongly			
Increased use of simulation for complex and infrequently encountered skills.	0(0.0)	0(0.0)	3(15.8)	9(47.4)	2(10.5)	5(26.3)	0(0.0)	4.47/4	1.07
Develop a nurse assignment decision making tool.	0(0.0)	0(0.0)	5(26.3)	12(63.2)	1(5.3)	1(5.3)	0(0.0)	3.89/4	.74
Review the ICU nurse orientation program to identify gaps.	0(0.0)	0(0.0)	1(5.3)	11(57.9)	7(36.8)	0(0.0)	0(0.0)	4.31/4	.58
Assess learning needs of all ICU staff.	0(0.0)	0(0.0)	1(5.3)	11(57.9)	7(36.8)	0(0.0)	0(0.0)	4.32/4	.58
Increase use of multidisciplinary team simulation training.	0(0.0)	0(0.0)	4(21.1)	8(42.1)	7(36.8)	0(0.0)	0(0.0)	4.16/4	.76
Promote volunteer critical care nursing specialty certification.	0(0.0)	1(5.3)	1(5.3)	12(63.2)	5(26.3)	0(0.0)	0(0.0)	4.11/4	.74
Incorporate a checklist into the bullet Round reporting tool.	0(0.0)	0(0.0)	1(5.3)	4(21.1)	12(63.2)	2(10.5)	0(0.0)	4.79/5	.71
Establish patient care protocols for prone position ventilation.	0(0.0)	0(0.0)	0(0.0)	7(36.8)	9(47.4)	3(15.8)	0(0.0)	4.79/5	.71
Improve standardized protocols and transfer orders.	0(0.0)	0(0.0)	3(15.8)	8(42.1)	6(31.6)	2(10.5)	0(0.0)	4.37/4	.90
Initiate discharge planning shortly after ICU admission.	0(0.0)	0(0.0)	6(31.6)	9(47.4)	3(15.8)	1(5.3)	0(0.0)	3.95/4	.85
Develop a standardized patient handoff tool	0(0.0)	0(0.0)	4(21.1)	9(47.4)	5(26.3)	1(5.3)	0(0.0)	4.16/4	.83
Develop a process to identify and address family members' immediate needs.	0(0.0)	0(0.0)	4(21.1)	10(52.6)	4(21.1)	1(5.3)	0(0.0)	4.11/4	.81
Involve family shortly after ICU admission in the anticipated discharge plan.	0(0.0)	0(0.0)	4(21.1)	13(68.4)	2(10.5)	0(0.0)	0(0.0)	3.89/4	.57
Implement standardized criteria for mobilization.	0(0.0)	0(0.0)	1(5.3)	13(68.4)	5(26.3)	0(0.0)	0(0.0)	4.21/4	.54

Abbreviated Statements	6-Point Likert Scale Rankings *n* (%)						Missing Data	Mean Ranking/ Median Ranking	SD
	Disagree Very Strongly	Disagree Strongly	Disagree	Agree	Agree Strongly	Agree Very Strongly			
Optimize use of the ventilator-associated pneumonia care bundle.	0(0.0)	1(5.3)	0(0.0)	13(68.4)	3(15.8)	2(10.5)	0(0.0)	4.26/4	.87
Develop a standardized intra-hospital patient transport decision tool.	0(0.0)	1(5.3)	5(26.3)	10(52.6)	2(10.5)	0(0.0)	1(5.3)	3.94/4	.75
Develop clinical pathways to manage care of patients.	0(0.0)	0(0.0)	8(42.1)	9(47.4)	1(5.3)	0(0.0)	1(5.3)	3.72/4	.61
Implement delirium prevention and management strategies	0(0.0)	0(0.0)	1(5.3)	9(47.4)	9(47.4)	0(0.0)	0(0.0)	4.42/4	.61
Improve pain and agitation management.	0(0.0)	0(0.0)	0(0.0)	4(21.1)	14(73.7)	1(5.3)	0(0.0)	4.84/5	.50
Improve use of daily spontaneous awakening trials with spontaneous breathing trials.	0(0.0)	0(0.0)	0 (0.0)	11(57.9)	5(26.3)	3(15.80	0(0.0)	4.58/4	.77
Explore clinically required daily order for chest x-rays.	0(0.0)	1(5.3)	1(5.3)	11(57.9)	6(31.6)	0(0.0)	0(0.0)	4.16/4	.76
Improve the use of established ventilator weaning standards and protocols.	0(0.0)	0(0.0)	0(0.0)	13(68.4)	5(26.3)	1(5.3)	0(0.0)	4.37/4	.60
Implement use of visual cues for high-risk lines.	0(0.0)	0(0.0)	0(0.0)	5(26.3)	8(42.1)	6(31.6)	0(0.0)	5.05/5	.78
Advocate for drug infusions in pre-filled syringes.	0(0.0)	1(5.3)	6(31.6)	8(42.1)	1(5.3)	2(10.5)	1(5.3)	4.06/4	1.04
Explore strategies for early identification of drug-drug interactions.	0(0.0)	0(0.0)	3(15.8)	13(68.4)	2(10.5)	1(5.3)	0(0.0)	4.05/4	.71
Initiate visual and auditory cues to promote completion of time-dependent tasks.	0(0.0)	1(5.3)	9(47.4)	5(26.3)	3(15.8)	0(0.0)	1(5.3)	3.89/3	.86
Place severely ill patients near nurses' station.	0(0.0)	0(0.0)	2(10.5)	10(52.6)	5(26.3)	2(10.5)	0(0.0)	4.37/4	.83
Develop patient/family incident disclosure guidelines.	0(0.0)	0(0.0)	3(15.8)	12(63.2)	3(15.8)	1(5.3)	0(0.0)	4.11/4	.74
Expand morbidity and mortality rounds.	0(0.0)	0(0.0)	5(26.3)	10(52.6)	3(15.8)	1(5.3)	0(0.0)	4.00/4	.82

Abbreviated Statements	6-Point Likert Scale Rankings *n* (%)						Missing Data	Mean Ranking/ Median Ranking	SD
	Disagree Very Strongly	Disagree Strongly	Disagree	Agree	Agree Strongly	Agree Very Strongly			
Encourage reporting of incidents into the incident reporting system	0(0.0)	1(5.3)	0(0.0)	14(73.7)	3(15.8)	1(5.3)	0(0.0)	4.16/4	.76
Advocate for timely diagnostic/laboratory services	0(0.0)	0(0.0)	1(5.3)	6(31.6)	8(42.1)	4(21.1)	0(0.0)	4.79/5	.85
Investigate barriers to timely supply of medications.	0(0.0)	0(0.0)	0(0.0)	9(47.4)	7(36.8)	3(15.8)	0(0.0)	4.68/5	.75
Explore Strategies to most effectively communicate changes to policies/procedures.	0(0.0)	0(0.0)	3(15.8)	13(68.4)	3(15.8)	0(0.0)	0(0.0)	4.00/4	.58
Advocate for improvements to the automated medication dispensing system to allow for inclusion of patient allergy information.	1(5.3)	0(0.0)	2(10.5)	8(42.1)	6(31.6)	1(5.3)	1(5.3)	4.89/4	1.10
Review patient restraint use.	1(5.3)	0(0.0)	3(15.8)	10(52.6)	5(26.3)	0(0.0)	0(0.0)	3.95/4	.97
Request review of process for timely access to critical lab values.	0(0.0)	1(5.3)	3(15.8)	5(26.3)	6(31.6)	4(21.1)	0(0.0)	4.47/5	1.17
Review current medication documentation process and practices.	0(0.0)	1(5.3)	2(10.5)	11(57.9)	4(21.1)	0(0.0)	1(5.3)	5.32/4	.77
Review break coverage during periods of patient high acuity.	0(0.0)	0(0.0)	3(15.8)	11(57.9)	3(15.8)	1(5.3)	1(5.3)	4.50/4	.76
Implement multidisciplinary staff debriefing following critical events.	0(0.0)	0(0.0)	1(5.3)	6(31.6)	6(31.6)	6(36.1)	0(0.0)	4.84/5	1.07
Develop guidelines for appropriate choice and use of patient lifts.	0(0.0)	0(0.0)	3(15.8)	14(73.7)	2(10.5)	0(0.0)	0(0.0)	3.95/4	.53
Encourage incident reporting for injuries related to restraint use.	0(0.0)	1(5.3)	0(0.0)	14(73.7)	2(10.5)	1(5.3)	1(5.3)	4.28/4	.76
Examine evidence regarding the use of central line with all vasopressors.	0(0.0)	1(5.3)	2(10.5)	6(31.6)	8(42.1)	1(5.3)	1(5.3)	5.28/4	.97

For the researcher, it was deemed clinically relevant to identify those statements that achieved group consensus above the ranking of agree to forecast actions that were perceived as having the greatest impact on patient safety. To address this need the Round 2 Likert Scale was collapsed. That is, the rankings for *agree strongly* and *agree very strongly* were combined for each individual statement; and the rankings for *disagree very strongly* and *disagree strongly* were similarly collated. Table 8 represents the frequency count of participants and associated percentage of the participants that ranked each of the 42 statements on the collapsed 4-point scale. The achievement of consensus, at the level of *agree strongly* and *agree very strongly* for three of the 42 statements provides direction for action to promote patient safety. It was most strongly agreed by over 70% of the participants that the patient safety priorities for the study setting were: *incorporate a checklist into the bullet Round reporting tool; improve pain and agitation management; and implements use of visual cues for high-risk lines*. For the majority of statements (n = 29, 69.0%), the level of *disagree very strongly* and *disagree strongly* was not selected by participants.

Table 8

Round 2 Results Collapsed on 5-Point Likert Scale

Abbreviated Statements	5-Point Likert Scale Rankings *n* (%)				Missing Data
	Disagree Very Strongly and Disagree Strongly	Disagree	Agree	Agree Strongly and Agree Very Strongly	
Increased use of simulation for complex and infrequently encountered skills.	0(0.0)	3(15.8)	9(47.4)	7(36.8)	0(0.0)
Develop a nurse assignment decision making tool	0(0.0)	5(26.3)	12(63.2)	2(10.5)	0(0.0)
Review the ICU nurse orientation program to identify gaps.	0(0.0)	1(5.3)	11(57.9)	7(36.8)	0(0.0)
Assess learning needs of all ICU staff	0(0.0)	1(5.3)	11(57.9)	7(36.8)	0(0.0)
Increase use of multidisciplinary team simulation training.	0(0.0)	4(21.1)	8(42.1)	7(36.8)	0(0.0)
Promote volunteer Critical Care nursing specialty certification.	1(5.3)	1(5.3)	12(63.2)	5(26.3)	0(0.0)
Incorporate a checklist into the bullet round reporting tool.	0(0.0)	1(5.3)	4(21.1)	14(73.7)	0(0.0)
Establish patient care protocols for prone position ventilation.	0(0.0)	0(0.0)	7(36.8)	12(63.2)	0(0.0)
Improve standardized protocols and transfer orders	0(0.0)	3(15.8)	8(42.1)	8(42.1)	0(0.0)
Initiate discharge planning shortly after ICU admission.	0(0.0)	6(31.6)	9(47.4)	4(21.1)	0(0.0)

Abbreviated Statements	5-Point Likert Scale Rankings *n* (%)				Missing Data
	Disagree Very Strongly and Disagree Strongly	Disagree	Agree	Agree Strongly and Agree Very Strongly	
Develop a standardized patient handoff tool	0(0.0)	4(21.1)	9(47.4)	6(31.6)	1(5.3)
Develop a process to identify and address family members' immediate needs.	0(0.0)	4(21.1)	10(52.6)	5(26.3)	0(0.0)
Involve family shortly after ICU admission in the anticipated discharge plan.	0(0.0)	4(21.1)	13(68.4)	2(10.5)	0(0.0)
Implement standardized criteria for mobilization.	0(0.0)	1(5.3)	13(68.4)	5(26.3)	0(0.0)
Optimize use of the ventilator-associated pneumonia care bundle.	1(5.3)	0(0.0)	13(68.4)	5(26.3)	0(0.0)
Develop a standardized intra hospital patient transport decision tool.	1(5.3)	5(26.3)	10(52.6)	2(10.5)	0(0.0)
Develop clinical pathways to manage care of patients	0(0.0)	8(42.1)	9(47.4)	1(5.3)	1(5.3)
Implement delirium prevention and management strategies	0(0.0)	1(5.3)	9(47.4)	9(47.4)	0(0.0)
Improve pain and agitation management	0(0.0)	0(0.0)	4(21.1)	15(78.9)	0(0.0)
Improve use of daily spontaneous awakening trials with spontaneous breathing trials.	0(0.0)	0(0.0)	11(57.9)	8(42.1)	0(0.0)
Explore required daily chest x-rays.	1(5.3)	1(5.3)	11(57.9)	6(31.6)	0(0.0)

Abbreviated Statements	5-Point Likert Scale Rankings *n* (%)				Missing Data
	Disagree Very Strongly and Disagree Strongly	Disagree	Agree	Agree Strongly and Agree Very Strongly	
Improve the use of established ventilator weaning standards and protocols.	0(0.0)	0(0.0)	13(68.4)	6(31.6)	0(0.0)
Implement use of visual cues for high-risk lines.	0(0.0)	0(0.0)	5(26.3)	14(73.7)	0(0.0)
Advocate for drug infusions in pre-filled syringes.	1(5.3)	6(31.6)	8(42.1)	3(15.8)	1(5.3)
Explore strategies for early identification of drug-drug interactions.	0(0.0)	3(15.8)	13(68.4)	3(15.8)	0(0.0)
Initiate visual and auditory cues to promote completion of time-dependent tasks.	1(5.3)	9(47.4)	5(26.3)	3(15.8)	1(5.3)
Place severely ill patients near nurses station	0(0.0)	2(10.5)	10(52.6)	7(36.8)	0(0.0)
Develop patient/family incident disclosure guidelines.	0(0.0)	3(15.8)	12(63.2)	4(21.1)	0(0.0)
Expand morbidity and mortality Rounds	0(0.0)	5(26.3)	10(52.6)	4(21.1)	0(0.0)
Encourage reporting of incidents into the incident reporting system	1(5.3)	0(0.0)	14(73.7)	4(21.1)	0(0.0)
Advocate for timely diagnostic/laboratory services	0(0.0)	1(5.3)	6(31.6)	12(63.2)	0(0.0)
Investigate barriers to timely supply of medications.	0(0.0)	0(0.0)	9(47.4)	10(52.6)	0(0.0)

Abbreviated Statements	5-Point Likert Scale Rankings *n* (%)				Missing Data
	Disagree Very Strongly and Disagree Strongly	Disagree	Agree	Agree Strongly and Agree Very Strongly	
Explore strategies to most effectively communicate changes to policies/procedures.	0(0.0)	3(15.8)	13(68.4)	3(15.8)	0(0.0)
Advocate for improvements to automated medication dispensing system to allow for inclusion of patient allergy information.	1(5.3)	2(10.5)	8(42.1)	7(36.8)	1(5.3)
Review patient restraint use.	1(5.3)	3(15.8)	10(52.6)	5(26.3)	0(0.0)
Request review of process for timely access to critical lab values.	1(5.3)	3(15.8)	5(26.3)	10(52.6)	0(0.0)
Review current medication documentation process and practices.	1(5.3)	2(10.5)	11(57.9)	4(21.1)	1(5.3)
Review break coverage during periods of patient high acuity.	0(0.0)	3(15.8)	11(57.9)	4(21.1)	1(5.3)
Implement multidisciplinary staff debriefing following critical events	0(0.0)	1(5.3)	6(31.6)	12(63.2)	0(0.0)
Develop guidelines for appropriate choice and use of patient lifts.	0(0.0)	3(15.8)	14(73.7)	2(10.5)	0(0.0)
Encourage incident reporting for injuries related to restraint use.	1(5.3)	0(0.0)	14(73.7)	3(15.8)	1(5.3)

Abbreviated Statements	5-Point Likert Scale Rankings *n* (%)				Missing Data
	Disagree Very Strongly and Disagree Strongly	Disagree	Agree	Agree Strongly and Agree Very Strongly	
Examine evidence regarding the use of central line with all vasopressors	1(5.3)	2(10.5)	6(31.6)	9(47.4)	1(5.3)

Chapter 5
Discussion and Conclusion

This chapter presents a discussion of the agreed upon patient safety priorities specific to the study ICU. At the onset of the study, it was identified that the organization espouses a commitment to continuous quality improvement. This value is pursued through internal improvements and measured through external assessments. Despite receipt of positive evaluative feedback about this organization's alignment with recognized provincial ICU practices, ICU clinicians wanted to forecast those actions that had the potential to further strengthen their current repertoire of safety practices. The discussion addresses six actions, three of which were strongly or very strongly agreed to be supportive of patient safety by the panel of experts, and three of which achieved a lower consensus ranking at the level of agreement. Each of these patient safety priorities will be addressed relative to the literature and the uniqueness of the organizational setting. This chapter concludes with study limitations.

Consensus of Experts: Strong or Very Strong Agreement

The expert panel agreed, strongly or very strongly, that*: improving pain and agitation management; incorporating a checklist into the bullet round reporting tool*; and *implementing use of visual cues for high-risk lines* had the potential of maximize patient safety. Collectively, these strategies align with a risk management orientation in which clinicians anticipate, recognize, and manage at risk situations within their work environment (Canadian Patient Safety Institute, 2008) in the ICU setting.

Improve pain and agitation management. In the current study, 78.9% of the expert panel agreed *strongly* or *very strongly* that efforts to enhance pain and agitation management was a priority for strengthening the patient safety practices within their ICU. These activities, for patient safety, are supported within contemporary literature (Barr et al., 2013; Davidson,

Winkelman, Gélinas, & Dermenchyan, 2015). The use of standardized pain and agitation assessment tools and treatment protocols has been reported to improve pain and agitation management for ICU patients (Barr et al., 2013; Chanques et al., 2006; Mansouri et al., 2013). Specific to agitation, Burk and colleagues (2014) noted that early identification of risk factors for agitation, at the time of ICU admission and within the initial 24-hours, allowed for the implementation of appropriate interventions to lessen the risk of agitation-related adverse events. Moreover, Shyoko and Siegel (2010) suggested that agitation protocols may support positive patient outcomes. Despite recognition of the merit of pain and agitation management for patient safety Blackwood and colleagues' (2010) Delphi study drew attention to the priority need for further research regarding pain management to guide the practice of intensive care nurses and support quality care.

Within the study site, work has been initiated to address pain and agitation management. For example, a sedation assessment tool is in use, and more recently, a validated pain assessment tool for use with an ICU population has been adopted. In addition, the existing standing preprinted medical orders for pain and agitation management have been up-dated to reflect current best practices. Actions to advance patient safety relative to pain and agitation management in the study setting may include standardizing pain and agitation management through: staff education regarding the adoption of tools and order protocols; evaluate utilization of the existing tools and protocols; and, track patient outcomes.

Tawfic and Faris (2015) have identified that despite advances in pain management, postoperative pain remains a health care challenge. Further, it has been suggested that acute pain service teams offer dedicated and specialized knowledge to address this challenge (Gandhi, Heitz, &Viscusi, 2011; Popping et al., 2008; Tawfic & Faris, 2015). The study hospital has a system-wide acute pain service comprised of one designated registered nurse and a rotating

anesthesiologist. On a daily basis, they review each postoperative patient with an epidural or those receiving patient-controlled analgesia for effective and safe pain management. A potential enhancement of patient safety within the study site could involve exploring models of collaboration between acute pain service members and ICU clinicians. Such collaboration has the potential to augment work in teams for patient safety and manage pain-associated safety risks through application of expert knowledge.

Incorporate a checklist into the bullet round reporting. The Canadian Patient Safety Institute (2008) identified the importance of effective health care communication for patient safety in high risk environments. The introduction of a checklist into the bullet round reporting structure, as identified by 73.7% of the expert panel, has the potential to support effective interprofessional communication. A checklist offers a means to standardize the content to be conveyed among team members with an emphasis on clarity and comprehensiveness. Use of checklists can stimulate discussion and sharing of information (Weiser & Berry, 2013). Byrnes and colleagues (2009) found that a checklist used at the patient bedside improved awareness of ICU best practices. Bullet round dialogue currently is a normative practice within the study ICU. This involves a morning bed-side conference with members of the interdisciplinary care team regarding the patient status and plan of care. The results of this study suggest that the inclusion of a checklist into the bullet round process has the potential to enhance the ICU's repertoire of patient safety practices. The Canadian Association of Critical Care Nurses (2009) has identified the importance of collaborative practice in which each member of the health care team is acknowledged, valued, and contributes to promote continuity of patient care. The structured inclusion of a checklist into bullet round reporting has the potential to foster such inclusive and collaborative practice within the study ICU.

Implement use of visual cues for high-risk lines. In this study, 73.7% of the expert panel agreed *strongly* or *very strongly* that it was a priority to use visual cues to identify high-risk intravenous lines to improve patient safety in their ICU. Ontario researchers led by Cassano-Piché (2012) identified the high risk associated with the administration of multiple IV infusions. They stated that:

> [w]hen managing multiple IV infusions, nurses must be able to quickly identify the contents, location, and infusion pump parameters for each IV line. Misidentifying an infusion—or not identifying a line quickly—can lead to actions performed on the incorrect infusion, no action performed on the correct infusion, or a delay in administering a life-sustaining medication. Any of these errors may lead to patient harm. (p. 45)

To mitigate patient harm, they recommended line identification. They caution, however, that inconsistent labelling practices can led to confusion and potentiate errors.

Within the study setting, there is a Medication Administration Improvement Team that reviews evidence to support best practices in the administration of medication. At present, the team is reviewing labelling practices. The results of this study could inform the use of visual cues to identify high risk lines in order to enhance patient safety.

Consensus of Experts: Agreement

Through participation in the Delphi process, it was identified that 73.7% of the expert clinicians agreed that three individual actions were priorities for enhancing patient safety in the study setting. These included: *develop guidelines for appropriate choice and use of patient lifts; encourage reporting of incidents into the incident reporting system to assist in identifying contributing factors and system opportunities for improvement*; and finally, *encourage incident reporting for injuries related to restraint use to determine need for change in resources and*

practices. Although these three priorities received a lower ranking in comparison to the previously discussed priorities that demonstrated *strong* or *very strong agreement*, such findings may be clinically relevant within the study setting.

Develop guidelines for appropriate choice and use of patient lifts. Participation in the Delphi process provided internal experts with an opportunity to identify site-specific patient safety priorities beyond that which was communicated to them through use of the researcher-developed questionnaire. The development of guidelines for appropriate choice and use of patient lifts was one such priority. In the study ICU, two types of patient lifts are currently used. First, ceiling-mounted lifts are passive mobilization device that allows mobilization of patients through lifting, turning and positioning without a requirement for patient participation. The second type of lift, an electronic mobile floor device, can be used to transfer patients to and from their bed. Elnitsky and colleagues (2014) identified that use of patient mobilization devices can pose risks for patients related to organizational, human and technological factors. Adverse patient events such as falls, integumentary alterations, pain, and decreased functioning make it necessary for care providers to consider the implementation of evidence-informed patient handling and mobilization programs to optimize patient safety (Cameron et al., 2015; Cohen et al., 2010; Elnitsky et al., 2014). In the current study, the expert-identified need for patient-lift guidelines could incorporate information about when, where, how and with whom to use patient lifts safely.

Encourage reporting of incidents. The remaining two priorities focused on the encouragement of health care providers to recognize, respond and report incidents deemed to compromise patient safety. Specifically, these priorities were: *encourage reporting of incidents into a reporting system to assist in identifying contributing factors and system opportunities for improvement*; and, *encourage incident reporting for injuries related to restraint use to determine*

need for change in resources and practices. Generally, the reporting of incidents is done for the purpose of system improvement. Reporting involves: awareness of what constitutes a reportable incident; familiarity with reporting structures; and adherence to professional standards of practice and organizational policies (Canadian Nurses Association, 2009; Canadian Patient Safety Institute, 2009; Davies et al., 2003). A recent study by Anderson, Kodate, Walters, and Dodds (2015) found that staff perceived incident reporting as a positive measure to impact safety through changes in patient care, staff attitudes and knowledge. Timely and comprehensive reporting is promoted in an environment characterized by a "just culture of safety" (Davies et al., 2003). Further, communication about incident analysis has the potential to prevent recurrence. In this study site, an electronic voluntary incident reporting system is used to elicit a record of critical incidents and near misses. The results of this study suggests that staff not only support the merit of an incident reporting system, but also advocate for a safety culture, in which incidents are recognized, reported and analysed to identify areas for change. To further enhance patient safety relative to the reporting of incidents, it may be of value to increase staff engagement in timely incident analysis, reflective practice, learning and planning for the prevention of recurrence as advised by the Canadian Patient Safety Institute (2009) and the Registered Nurses Association of Ontario (2012).

Limitations

This study has a limitation with respect to the participant group. Registered nurses, intensivists and registered respiratory therapists were invited to participate in this study. Both registered nurses and intensivists responded by returning questionnaires in the first Round. No returned questionnaires were received from registered respiratory therapists decreasing the heterogeneity of the study sample. This study could have been strengthened through engagement

of respiratory therapists for the purpose of group communication about patient safety priorities. Inclusivity for consensus measurement would increase rigor (von der Gracht, 2012).

Conclusion

The healthcare environment, and the ICU setting in particular, renders patients susceptible to errors and adverse events that compromise their safety. The purpose of this study was to explore patient safety priorities as perceived by clinical experts working in a northern Ontario adult ICU. Using the Delphi method, an expert panel of registered nurses and intensivists reached strong agreement that the following three actions were patient safety priorities in their workplace: *improving pain and agitation management; incorporating a checklist into the bullet round reporting tool*; and *implementing use of visual cues for high-risk lines had the potential of maximize patient safety.* Despite the study setting's achievement of accepted provincial standards, the level of clinician interest and contribution to knowledge generation demonstrates interest in continuous improvement for patient safety. The study results have been shared within the setting and show promise for guiding advancement of the organization's patient safety mandate.

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Appendix A
Study Information Letter

Study Title: Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study

Investigator: Tiina M. Bloomfield R.N., B.Sc. N. (705-671-5472)

I am inviting you to participate in a study focused on ICU patient safety in the ICU at Health Sciences North (HSN). I am a Master's of Science in Nursing student at Laurentian University. This research study is for the thesis portion of my graduate studies, in which I am exploring patient safety priorities within the ICU setting.

The manager of the ICU or the manager of Respiratory Therapy has identified you as a healthcare provider having specialized training or greater than three years of experience in the Medical/Surgical ICU and/or the Cardiovascular-Thoracic ICU. You have been identified as an expert regarding current safety practices. Your expertise is being requested to rank the importance of patient safety practices within your unit.

You will be asked to complete two questionnaires in succession, approximately six weeks apart. Each questionnaire will take you about 10 minutes to complete. The first questionnaire contains 32 statements that were developed from an extensive review of ICU safety literature and the *High Performaning Checklist* from Critical Care Services Ontario (CCSO). The second questionnaire is similar to the first questionnaire, but with fewer statements. Completed questionnaires can be placed in the drop off box labelled; Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study, located outside of Lisa Weilers Office (Med/Surg Nurse Clinician). The consent forms will be separated from the completed questionnaires and placed in a sealed envelope to ensure anonymity. .

Completion of the questionnaire allows you to offer your expert opinion on patient safety needs within your own ICU. Results of this study may be used to guide priority setting for patient safety initiatives within your workplace. Your participation in this study is completely voluntary and you may withdraw from the study at any time without consequence. If you do not feel comfortable answering any question in either questionnaire you are not obliged to complete them. Your questionnaires will be assigned a code number by an administrative secretary after she collects the questionnaires from the designated drop off box on the unit. Your participation or non-participation will not be revealed to me or your employer.

There are no anticipated risks associated with participating in the study. Data will be kept in locked files in the researcher's office and retained for a period of seven years after which they will be destroyed. Individual questionnaire responses will be grouped with other participants to preserve your anonymity. Results may be published in a professional journal, presented at conferences or at HSN presentations. A summary of results from the researcher will be posted in the ICU lunchroom, Respiratory Therapy lunchroom and Intensivist office.

All potential participants will receive a coded ticket attached to their questionnaire. You may choose to return the ticket to be provided with a chance to win a draw for a $75 gift card to a local restaurant, a $25 gift card to Cineplex Theatres, or 1 of 5, $10 Tim Horton gift cards. Your participant code will be used for the draw and the winners will be contacted by a designated administrative secretary.

Please accept my sincere thank you in advance for taking time to consider participation in my study. Should you have any questions or concerns about the study or about being a subject, please feel free to contact me (705-671-5472). My research supervisor, Sharolyn Mossey R.N., M.Sc.N. may also be contacted regarding the conduct of this study at Laurentian University, School of Nursing (705-675-1151, ext. 3813). In addition, you may contact a Laurentian University Research Ethics Officer, not attached to this research study, regarding possible ethical issues or concerns by telephone at 705-675-1151 ext. 2436 or toll free at 1-800-461-4030 or email at ethics@laurentian.ca. For any comment or questions about your rights as a participant in a study, you can also contact the Research Ethics Board of Health Sciences North at 705-523-7100 ext. 2409 or email your questions or concerns to reb@hsnsudbury.ca. The Research Ethics Board is a group of people who oversee the ethical conduct of research studies. These people are not part of the study team. Everything that you discuss will be kept confidential.

Yours Truly,

Tiina Bloomfield

Tiina Bloomfield R.N., M.Sc.N. student,

School of Nursing,

Laurentian University

Appendix B
Consent Form

Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study

Code _____(supplied by Administrative Secretary)

1. I have read the Letter of Study Information and have had any questions answered to my satisfaction. I understand that I am consenting to participate in the study called: Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study. The purpose of the study is to explore patient safety priorities within the ICU setting. Completion of the study allows me to offer my expert opinion on patient safety needs within my own ICU. Results of this study may be used to guide priority setting for patient safety initiatives within my workplace. I understand that this involves completing two questionnaires in succession, approximately six weeks apart. Each questionnaire will take about 10 minutes to complete.

2. I understand that there are no anticipated risks associated with participating in the study and that my participation in this study is voluntary and I may withdraw at any time. I understand that every effort will be made to maintain the confidentiality of the data now and in the future. My confidentiality and anonymity is assured and my identity will not be revealed. Coding of the questionnaires will be completed by a designated administrative secretary to ensure my anonymity from the researcher.

3. I understand that the data will be kept in locked files in the researcher's office and retained for a period of seven years after which they will be destroyed. My individual responses to the questionnaires will be grouped with other participants to further preserve my anonymity. I understand that results may be published in professional journals or presented at conferences, or at hospital presentations.

4. A one-page summary of the findings from the principal researcher will be posted in the ICU lunch room, the Respiratory Therapy lunch room and Intensivist's office.

5. I am aware that if I have any questions or concerns I can contact the principle researcher, Tiina Bloomfield (705-671-5472) a M.Sc.N. student at Laurentian University. I can also contact her research supervisor, Sharolyn Mossey R.N., M.Sc.N., at Laurentian University (705-675-1151, ext. 3813). I can contact a Laurentian University's Research Ethics Officer, not attached to this research study regarding possible ethical issues or concerns by telephone at 705-675-1151, ext. 2436, or toll free at 1-800-461-4030 or email at ethics@laurentian.ca.

For any comment or questions about your rights as a participant in a study, I can also contact the Research Ethics Board of Health Sciences North at 705-523-7100 ext. 2409 or email my questions or concerns to reb@hsnsudbury.ca. The Research Ethics Board is a group of people who oversee the ethical conduct of research studies. These people are not part of the study team. Everything that I discuss will be kept confidential.

6. I can choose to have my participant code entered into a draw for a $75 gift card to a local restaurant, a $25 gift card to Cineplex Theatres, or 1 of 5, $10 Tim Horton gift cards. Winners will be contacted by the designated administrative secretary.

7. I have read the above statements and freely consent to participate in this research:

Name (please print clearly): _____

Signature: _____ Date: _____

Appendix C
Patient Safety Priority Questionnaire, Round 1

Code _____
(supplied by Administrative Secretary)

Identifying ICU Patient Safety Priorities within a Northern Ontario Setting:
A Delphi Study

This questionnaire will take you approximately 10 minutes to complete. Please submit your completed questionnaire and consent form in the envelope provided and deliver to the drop off box labelled; Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi Study, located outside of Lisa Weiler's Office (Med/Surg Nurse Clinician). .

PART A

1. Please indicate your practice discipline
   - ☐ Registered Nurse
   - ☐ Registered Respiratory Therapist
   - ☐ Intensivist

2. I have worked in the ICU at Health Sciences North for _____ years.

3. I have worked in other ICU's
   - ☐ Yes
   - ☐ No

Part B

Read each of the following statements. Place a check mark in the appropriate box to indicate whether the statement is a **patient safety priority** within **<u>your</u>** ICU.

	Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Neutral**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Increase use of simulation for complex and infrequently encountered skills to promote clinical competency.							
Develop a nurse assignment decision making tool to assist the charge nurse in matching patient acuity with nurse's skills, such as years of experience and certification.							
Review the ICU nurse orientation program to identify gaps in training for nurses new to this ICU.							
Asses learning needs of all ICU staff/disciplines.							
Increase use of multidisciplinary team simulation training to improve effective communication							
Promote voluntary Critical Care Nursing Specialty certification.							
Incorporate a checklist into the Bullet Round Reporting Tool to provide visual identification of best practice standards							

	Disagree Very Strongly	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Agree Very Strongly
relevant to each patient.							
Establish patient care protocols for prone position ventilation.							
Improve standardized protocols and transfer orders to facilitate ICU patient flow to in-patient units.							
Initiate discharge planning shortly after ICU admission.							
Develop a standardized patient handoff tool with ICU staff to promote comprehensive transfer of patient information.							
Develop a process to identify and address family members' immediate needs such as social work or chaplain referral.							
Involve family shortly after ICU admission in the anticipated discharge plan.							
Implement standardized criteria for initiating and terminating mobilization of critically ill patients.							
Optimize use of Ventilator-Associated Pneumonia care bundle.							
Develop a standardized intra hospital patient							

	Disagree Very Strongly	Disagree Strongly	Disagree	Neutral	Agree	Agree Strongly	Agree Very Strongly
transport decision tool to decrease the risk of incidents for ICU patients.							
Develop clinical pathways to manage care of patients aligning with exiting standard orders sets.							
Implement delirium prevention and management strategies to reduce mortality, patient falls, ventilation time, ICU length of stay and long term cognitive impairment.							
Improve pain and agitation management in the ICU patient.							
Improve use of daily spontaneous awakening trials combined with spontaneous breathing trials for effective ventilator weaning.							
Explore clinically required daily order for chest x-ray in mechanically ventilated patients vs routine daily orders.							
Improve the use of established ventilator weaning standards and protocols.							

	Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Neutral**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Implement use of visual cues such as colour-coded labels to identify high-risk intravenous medications and lines.							
Advocate for drug infusions in pre-filled syringes to reduce medication errors and treatment delays.							
Explore strategies for early identification of drug-drug interactions.							
Initiate visual and auditory cures to promote completion of time dependent tasks such as daily check of crash cart or adjustment of heparin drip according to protocol (i.e. visual duty board, timer etc…)							
Place severely ill patients within rooms that are visible to the nurses' station.							
Develop patient/family incident disclosure guidelines to improve communication and improve patient/family involvement in quality improvement.							

	Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Neutral**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Expand regular Morbidity and Mortality Rounds using a framework for review and inclusion of multidisciplinary staff to mitigate patient risks.							
Encourage reporting of incidents into the incident reporting system to assist in identifying contributing factors and system opportunities for improvement.							
Advocate for timely diagnostic/laboratory services.							
Investigate barriers to timely supply of medications.							

Are there any other priorities for patient safety in your ICU that are not listed above? If so, please identify these priorities.

_____
_____
_____
_____
_____
_____
_____
_____

Appendix D
Patient Safety Priority Questionnaire, Round 2

Participant Code:_____

Identifying ICU Patient Safety Priorities Within a Northern Ontario Setting: A Delphi Study

Thank-you for completing the first questionnaire in this study. All Round 1 Questionnaire have been analyzed. The results have led to the development of this Round 2 Questionnaire. Your completion of this questionnaire is essential for determining consensus within the group about the most important safety priorities in your ICU-the purpose of this study.

As in Round 1, your identity remains confidential to the researcher and your managers.

Your completion of both PART A and PART B of this questionnaire is instrumental in shaping patient safety in your ICU.

PART A

1. Please indicate your practice discipline

   - ☐ Registered Nurse
   - ☐ Registered Respiratory Therapist
   - ☐ Intensivist

2. I have worked in the ICU at Health Sciences North for _____ years.

3. I have worked in other ICU's

   ☐ Yes ☐ No

PART B

Please read each statement. Then place an "X" in the appropriate box to indicate your level of agreement that the statement is a priority in your ICU.

Results from the Round 1 questionnaire are listed next to each statement. They identify the most commonly ranked agreement that the statement is a priority in your ICU. These are included for your information purposes and for consensus building in your ICU.

The new statements added to this questionnaire were developed based on frequently raised comments from Round 1 participants. What is notably different in this new questionnaire is the elimination of the neutral ranking option.

Original Statements	**Round 1 Results: Most Common Ranking**	**Your Round 2 Response**					
		Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Increase use of simulation for complex and infrequently encountered skills to promote clinical competency.	Agree						
Develop a nurse assignment decision making tool to assist the charge nurse in matching patient acuity with nurse's skills such as years of experience and certifications.	Agree						
Review the ICU nurse orientation program to identify gaps in training for nurses new to this ICU.	Agree						
Assess learning needs of all ICU staff/disciplines.	Agree						
Increase use of multidisciplinary team simulation training to improve effective communication.	Agree						
Promote voluntary Critical Care Nursing Specialty certification.	Agree						
Incorporate a checklist into the Bullet Round Reporting Tool to provide visual identification of best practice standards relevant to each patient.	Agree Strongly						
Establish patient care protocols for prone position ventilation.	Agree Strongly						

Original Statements	Round 1 Results: Most Common Ranking	Your Round 2 Response					
		Disagree Very Strongly	Disagree Strongly	Disagree	Agree	Agree Strongly	Agree Very Strongly
Improve standardized protocols and transfer orders to facilitate ICU patient flow to in-patient units.	Agree						
Initiate discharge planning shortly after ICU admission.	Agree						
Develop a standardized patient handoff tool with ICU staff to promote comprehensive transfer of patient information.	Agree						
Develop a process to identify and address family members' immediate needs such as social work or chaplain referral.	Agree						
Involve family shortly after ICU admission in the anticipated discharge plan.	Agree						
Implement standardized criteria for initiating and terminating mobilization of critically ill patients.	Agree						
Optimize use of the Ventilator-Associated Pneumonia care bundle.	Agree						
Develop a standardized intra hospital patient transport decision tool to decrease the risk of incidents for ICU patients.	Neutral						
Develop clinical pathways to manage care of patients aligning with existing standard order sets.	Neutral						
Implement delirium prevention and management strategies to reduce mortality, patient falls, ventilation time, ICU length of stay and long term cognitive impairment.	Agree						
Improve pain and agitation management in the ICU patient.	Agree Strongly						

Original Statements	Round 1 Results: Most Common Ranking	Your Round 2 Response					
		Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Improve use of daily spontaneous awakening trials combined with spontaneous breathing trials for effective ventilator weaning.	Agree						
Explore clinically required daily order for chest x-rays in mechanically ventilated patients vs. routine daily order.	Agree						
Improve the use of established ventilator weaning standards and protocols.	Agree						
Implement use of visual cues such as colour-coded labels to identify high-risk intravenous medications and lines.	Agree Very Strongly						
Advocate for drug infusions in pre-filled syringes to reduce medication errors and treatment delays.	Neutral						
Explore strategies for early identification of drug-drug interactions	Agree						
Initiate visual and auditory cues to promote completion of time dependent tasks such as daily check of crash cart or adjustment of heparin drip according to protocol (i.e. visual duty board, timer etc)	Neutral						
Place severely ill patients within rooms that are visible to the nurses' station.	Agree						
Develop patient/family incident disclosure guidelines to improve communication and improve patient/family involvement in quality improvement.	Agree						

Original Statements	Round 1 Results: Most Common Ranking	Your Round 2 Response					
		Disagree Very Strongly	Disagree Strongly	Disagree	Agree	Agree Strongly	Agree Very Strongly
Expand regular Morbidity and Mortality Rounds using a framework for review and inclusion of multidisciplinary staff to mitigate patient risks.	Agree						
Encourage reporting of incidents into the incident reporting system to assist in identifying contributing factors and system opportunities for improvement.	Agree						
Advocate for timely diagnostic/laboratory services.	Agree						
Investigate barriers to timely supply of medications.	Agree						
New Statements							
Explore strategies to most effectively communicate changes to policies /procedures (i.e. highlight modifications in colour).	N/A						
Advocate for improvements to the automated medication dispensing system to allow for inclusion of patients allergy information.	N/A						
Review patient restraint use in this ICU and compare to best practice standards.	N/A						
Request review of process for timely access to critical lab values.	N/A						
Review current medication documentation processes and practices.	N/A						
Review break coverage during periods of patient high acuity.	N/A						

Original Statements	Round 1 Results: Most Common Ranking	Your Round 2 Response					
		Disagree Very Strongly	**Disagree Strongly**	**Disagree**	**Agree**	**Agree Strongly**	**Agree Very Strongly**
Implement multidisciplinary staff debriefing sessions following critical events with skilled debriefers.	N/A						
Develop guidelines for appropriate choice and use of patient lifts.	N/A						
Encourage incident reporting for injuries related to restraint use, to determine need for change in resources and practices.	N/A						
Examine evidence regarding the use of a central line with all vasopressors.	N/A						

Thank you for taking time to complete and submit this Round 2 Questionnaire.

Sincerely,

Tiina Bloomfield

Appendix E
Ethical Approval Letters

APPROVAL FOR CONDUCTING RESEARCH INVOLVING HUMAN SUBJECTS

Research Ethics Board – Laurentian University

This letter confirms that the research project identified below has successfully passed the ethics review by the Laurentian University Research Ethics Board (REB). Your ethics approval date, other milestone dates, and any special conditions for your project are indicated below.

TYPE OF APPROVAL / New X / Modifications to project / Time extension

Name of Principal Investigator and school/department	Tiina Bloomfield (Nursing) Sharolyn Mossey, Phyllis Montgomery (Supervisors, Nursing)
Title of Project	**Identifying ICU Patient Safety Priorities Within a Northern Ontario Setting: A Delphi Study**
REB file number	2014-04-08
Date of original approval of project	June 2, 2014
Date of approval of project modifications or extension *(if applicable)*	
Final/Interim report due on	July 30, 2015
Conditions placed on project	Final report due on July 30, 2015

During the course of your research, no deviations from, or changes to, the protocol, recruitment or consent forms may be initiated without prior written approval from the REB. If you wish to modify your research project, please refer to the Research Ethics website to complete the appropriate REB form.

All projects must submit a report to REB at least once per year. If involvement with human participants continues for longer than one year (e.g. you have not completed the objectives of the study and have not yet terminated contact with the participants, except for feedback of final results to participants), you must request an extension using the appropriate REB form.

In all cases, please ensure that your research complies with Tri-Council Policy Statement (TCPS). Also please quote your REB file number on all future correspondence with the REB office.

Congratulations and best of luck in conducting your research.

Susan James, Chair

Laurentian University Research Ethics Board

Health Sciences North
Horizon Santé-Nord

Research Ethics Office
Children's Treatment Centre
Rooms C905-C911
41 Ramsey Lake Road
Sudbury, ON P3E 5J1
t: 705-522-6237, ext. 2409
email: reb@hsnsudbury.ca

To:	Tiina Bloomfield
Study Title:	Identifying ICU Patient Safety Priorities within a Northern Ontario Setting: A Delphi study
Sponsor/Funding Agency:	Not Funded
REB Review Type:	Delegated Review
Date of Meeting/Review:	June 26, 2014
Expiry Date:	**June 26, 2015**

Notification of REB FINAL Approval

Documents Approved
Application (received June 13, 2014)
Delphi Survey Tool Round 1
Study Information Letter
Consent
Study Protocol

Documents Acknowledged
Letter of Support (April 10, 2014)
Laurentian University REB Approval (June 2, 2014)

Project Number: 987
This Project Number has been assigned to your project. Please use this number on all future correspondence

The Research Ethics Board of Health Sciences North (REB HSN) has reviewed the above research protocol and considers it to be ethically acceptable. The quorum for approval did not involve any member associated with this project.

As Principal Investigator, you are responsible for the ethical conduct of this study as outlined under the *Tri-Council Policy Statement: Ethical Conduct of Research Involving Humans (2nd Edition)*.

Please take note of the following list of ethics requirements you must fulfill over the course of your study:

- You are responsible for renewing the approval for this study prior to the expiry date by submitting an Annual Renewal Form or if the study is complete, a Final Report form. Please add May 14, 2015 to your calendar as a reminder to complete and submit the

appropriate form six weeks prior to the expiry date. There is no grace period. **PLEASE NOTE:** Research participants cannot be enrolled into a study if ethics approval has lapsed.

- You are responsible for reporting any changes to your study (e.g. consent, protocol, study procedures, etc.) by submitting an Amendment Request form prior to implementing the change.
- You are responsible for notifying the REB of all internal serious adverse events, significant deviations, and participant complaints by submitting an Unanticipated Problem form as soon as you become aware of the event.
- In the event of a privacy breach, you are responsible for reporting the breach to the HSN Privacy Officer.

The forms and guidelines can be found on the HSN intranet or by emailing the Research Ethics Office at reb@hsnsudbury.ca should you not have access to same.

The Board wishes you good luck with your study.

Sincerely,

Dr. Martin Shine, Chair, Health Sciences North Research Ethics Board