4-10-2017 12:00 AM

Fall Prevention in an Acute Care Hospital: The Challenges Encountered by Patients, Staff and Administrators

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Graduate Program in Health and Rehabilitation Sciences
A thesis submitted in partial fulfillment of the requirements for the degree in Doctor of Philosophy

Abstract

Falls are frequent and often serious events that take place in hospitals. Healthcare providers find it challenging to minimize fall risk factors. In fact, just being in a hospital is a risk factor in itself! The aim of this thesis was to investigate the reasons behind patient falls, identify gaps in prevention strategies and suggest additional recommendations to improve patient safety. A mixed method approach was used to interpret the data and uncover the reasons for falls.

The first study was a secondary data analysis where 7,721 patient falls were examined. The data were taken from the hospital's central incident reporting system between 2009 and 2014. Most falls occurred in the medicine and neurosciences units. The highest frequency of falls (901) occurred between 10:00 a.m. and 12:00 p.m., a time when staff were generally preoccupied with multiple tasks. Although most falls were not serious, there were 2,275 falls resulting in an injury and 16 resulted in death as a result of the fall. These findings and others were the impetus to follow-up with the next study concentrating on the validity of the fall risk assessment tool.

The second study was a prospective predictive validity study examining 500 patient scores obtained from the Morse Falls Scale (MFS) on medicine units in the hospital. The MFS was used to assess patient risk for falling. Using a cut-off score of 25, the sensitivity was 98 percent, however, the specificity was only 8 percent. An MFS cut-off point of 55 provided the most balanced measure of sensitivity (87%) and specificity (34%) for

accurate identification of fall risk, however still low. These results showed that a change on how the hospital assessed falls risk was indicated.

The third study was a multiple case analysis of patient falls in the same acute care hospital. The findings from eleven cases from two previous studies were explored further to identify key contributing factors which led to the falls. Findings included inadequate hospital policies, lack of staff education and patient cognitive and mobility issues while in hospital. A change in practice across all defense layers was recommended.

KEY WORDS

Patient falls, hospital incident reporting systems, fall prevention strategies, falls risk assessment tools, patient fall case studies

Acknowledgements

I would like to thank Dr. Alan Salmoni, Dr. Aleksandra Zecevic and the other professors in the Health Sciences Faculty who have guided me through school. I would like to acknowledge and thank Sherri Lawson and Dr. Jamie Gregor for their support throughout the years while completing this program.

I would also like to especially thank my colleagues Leah Whalen, Faheed Shah, Douglas Brunton, Diane Strachan and Cathy Litwin who, without their assistance, this would not have been possible.

I dedicate this thesis to my husband Tom and children Mary, Cory and Candace, thank you for your unconditional love and support throughout this journey.

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AC	Accreditation Canada
AE	Adverse Events
AEMS	Adverse Events Management System
AUC	Area under the curve
BPG	Best Practice Guidelines
BR	Bathroom
CEM	Communication Enhancement Model
CNS	Clinical Neurosciences
CQI	Continuous Quality Improvement
ETTO	The Efficiency-Thoroughness Trade-Off
HFRM	Hendrich II Fall Risk Model
IV	Intravenous
LOS	Length of Stay
NICHE	Nurses Improving Care for Health System Elders
MFS	Morse Fall Scale

NPV	Negative Predictive Value
OT	Occupational Therapist
P-E	Person-Environment
PPV	Positive Predictive Value
PSW	Personal Support Worker
PT	Physiotherapist
RD	Registered Dietitian
RN	Registered Nurse
RNAO	Registered Nurses Association of Ontario
ROC	Receiver Operating Characteristic
SBAR	Situation Background Assessment Recommendation
SFIM	Senior Falls Investigative Methodology
STRATIFY	St. Thomas Risk Assessment Tool in Falling Elderly Inpatients
SW	Social Work
SFIM	Systemic Falls Investigative Method
WHO	The World Health Organization

Chapter 1

1 Introduction

Hospitals have a responsibility to keep their patients safe. Yet falls continue to occur in hospital, putting patients at risk. Up to 84 percent of adverse events in hospitals are related to falls (Aranda-Gallardo et al., 2013). Thirty percent of these falls cause injuries, and four to six percent cause serious injuries and death (Hitcho et al., 2004). Patient fall rates can be as high as 11.5 per 1,000 patient days (Oliver, Healey, & Haines, 2010; Currie, 2008), leading quality-improvement organizations such as Accreditation Canada (AC), the Registered Nurses Association of Ontario (RNAO), the Canadian Institute for Health Information (CIHI), and the Canadian Patient Safety Institute (CPSI) to declare a need for a fall prevention program in hospitals (Accreditation Canada, 2015; Safer Healthcare Now, 2015; Registered Nurses Association of Ontario [RNAO], 2006). Many fall prevention strategies have been incorporated into clinical practice in response to this advice. In a Cochrane review by Cameron et al. (2012), the authors sought to identify effective fall prevention strategies. This analysis, which included 60 trials, drew the conclusion that no one strategy is completely successful in reducing falls; however, the authors did find that a multifactorial approach may be successful. Appropriately, hospital fall prevention programs consist of strategies targeting multiple risk factors and include a risk assessment, visual communication signage and patient education (Hempel et al., 2013; DiBardin, Cohen, & Didwania, 2012). Multifactorial interventions focus on multiple risk factors identified during the initial risk assessment. The present studies

illustrate a need for a broader and more comprehensive program that considers an aging population.

Per Safer Healthcare Now (2015), risk factors for falls among seniors consist of multiple conditions stemming from biological, behavioural, environmental, and social issues. One report claims that falls by seniors are preventable, though approximately 10 to 25 percent of older patients fall during their hospital stay (Rubenstein, 2006; Schwendimann, De Geest, & Milisen, 2007), with immense consequences of physical injuries, psychological harm, functional decline, prolonged hospital stays, and increased costs (Krauss et al., 2007). The "post fall syndrome" and the fear of a recurrent fall affect autonomy and mental states and can cause depression (Morisod & Coutaz, 2007; World Health Organization [WHO], 2007). Patients hesitate to move after a fall, which interferes with the healing process and leads to longer stays and increased costs. A hospital can pay up to $30,696 more for a patient with one serious fall than for a patient who does not fall (Zecevic et al., 2012). This difference in burden and costs has led to a concerted effort to identify fall risk factors and to implement fall prevention strategies. The preceding studies examined the effectiveness of risk factors and strategies used to prevent falls and offered alternative proposals to reduce falls in acute care hospitals.

1.1 Definitions

The term *fall* has several definitions as well as several recognized involved factors. The definition that we will use is an event that results in a person unintentionally coming to rest on the ground or at another lower level (WHO, 2007). Falls can be subcategorized as occurring in the home, nursing home, or hospital setting. Evidence shows that falls and,

therefore, strategies for fall prevention may be unique for each setting. For example, the incidence of falls is higher in care facilities than in the community (Rubenstein & Josephson, 2002). These falls tend to be more injurious, with 10 to 25 percent resulting in fractures or lacerations (Rubenstein, 2006). Falls can also be classified as anticipated, unanticipated, or accidental (Morse, 1989). According to Morse, anticipated falls refer to those involving patients who have been identified as high-risk, with contributing factors such as altered mental status and abnormal gait. Unanticipated falls occur when patients have been identified as low-risk but still fall due to situations such as having a seizure or a syncopal episode. Accidental falls refer to those involving patients who were deemed low-risk but fell due to environmental hazards. A "near miss" is another category important to understand from a safety point of view to identify latent risks. The Adverse Events Management System (AEMS) and other incident reporting systems require staff to report potential safety hazards, helping administration review safety hazards and eliminate or provide countermeasures for potential problems.

1.2 Risk Factors

Many risk factors surround falls, and they can be categorized in many ways. Tzeng and Yin (2013) compiled a list of factors perceived by registered nurses to be associated with falls, including confusion, gait problems, Alzheimer's disease, disorientation, and the inability to follow safety instructions. These refer to the patient's specific condition. Bueno-Cavanillis, Padilla-Ruiz, Jimenez-Moleon, Peinado-Alonso, and Galvez-Vargas (2000) categorized risk factors as intrinsic or extrinsic. Intrinsic factors are internal patient conditions, whereas extrinsic factors are environmental conditions that can lead to

falls. Common intrinsic factors include altered mental status, decreased mobility, and incontinence. Common extrinsic factors include type of flooring, clutter from furniture or equipment/device such as intravenous infusion/indwelling urinary catheterization and poor lighting. Mion et al. (2012) added situational risk factors to their study to describe occurrences such as transferring and ambulating to the bathroom. Oliver (2007) developed the D.A.M.E. acronym, which puts all these risk factors into subgroups: *D* stands for drugs, alcohol, and medications such as hypnotics, antidepressants, and sedatives, which can cause drowsiness or orthostatic blood pressures; *A* stands for age-related physiological changes such as cognitive decline, incontinence, comorbidities, and mobility problems; *M* stands for medical causes, such as a stroke; and *E* stands for environmental issues encompassing an array of mobility hazards, including clutter, poor lighting, and sensory overload caused by too much light, noise, and activity.

Screening for risk factors can be a challenge. Scott et al. (2007) conducted a systematic review of studies that looked at the suitability of various fall risk assessment tools. For the acute care hospital setting, they reviewed 12 studies using eight different screening tools (the Berg Balance Scale, Conley Scale, Downton index, Elderly Mobility Scale, fall risk assessment, Functional Reach Test, Morse Fall Scale [MFS], Schmid Scale and St. Thomas's Risk Assessment Tool in Falling Elderly Inpatients [STRATIFY]). They found two fall risk assessment tools rated over 70% for both sensitivity and specificity (Schmid: sensitivity at 93%, specificity at 78%; STRATIFY: sensitivity at 93%, specificity at 88%) and concluded the screening tool should first be validated by analyzing the sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), as well as by using a receiver operating characteristic (ROC) curve analysis to select the optimal

cut-off point. Another consideration outlined was the amount of time it took to complete the assessment. At the current hospital, the MFS is used to identify those patients with an elevated risk of falling.

1.3 Morse Fall Scale

The MFS is a fall risk screening tool used in many health care settings as an adjunct to patient assessment. It takes approximately 1 to 3 minutes to complete by answering questions that pertain to contributing factors associated with the risk of falling. The MFS was developed by Janice Morse in 1985 in Alberta, Canada. It consists of six items to score, with a higher score signifying the patient is at a higher risk for falling. The items included are as follows:

1. History of falling (immediate, or within 3 months) (Score 25 points for "yes," 0 for "no.")
2. Secondary diagnosis (Score 15 for "yes," 0 for "no.")
3. Ambulatory aid (Score 30 for "furniture," 15 for "crutches/cane/walker/wheelchair/needs assistance," 0 for "none/bedrest.")
4. IV/saline lock (Score 20 for "yes," 0 for "no.")
5. Gait transferring (Score 20 for "impaired," 10 for "weak," 0 for "normal/bedrest/immobile.")
6. Mental status (Score 15 for "overestimates/forgets limitations," 0 for "oriented to own ability.")

Low-risk levels are at 0 to 24 points, and moderate- to high-risk levels are at 25 points or more. Morse (2009) saw 25 as the optimal cut-off point in acute care hospitals, stating that the most accurate sensitivity and specificity is within the 25 to 55 cut-off ranges. It was further stressed that in acute care hospitals this cut-off is acceptable, since some areas may only have high-risk patients and all fall prevention strategies should be in place to protect this group. The screening tool is to be completed on admission or transfer to

the unit as well as weekly, after a fall, and when there is a change in condition to capture any changes that can increase the risk for falling.

1.4 Aim and Research Questions

The aim of this thesis was to investigate the reasons behind patient falls in an acute care hospital, identify gaps in prevention strategies already in place, and suggest additional recommendations to improve patient safety. This was accomplished by conducting three studies.

The first study provided a broad picture of falls in the hospital. The study analyzed statistical data and examined trends that identified the major contributing factors. The hospital AEMS reporting system provided the data, and staff and physicians provided their perspectives on reporting through a central reporting system.

In the second study, a predictive validity analysis was conducted on the MFS. Morse (2009) suggests performing validity tests on the screening tool prior to its use in a particular setting, since different hospitals and areas in a hospital may vary in patient type and circumstances. After the results were known, a qualitative component was added to obtain the staff's views on the tool's usefulness. It was important to seek their perspectives before making recommendations on the use of an assessment tool.

The third study looped all falls information together, using case studies from the Systemic Falls Investigative Method (SFIM) approach, which delivered a rich, in-depth account on the causes of falls. All three of these studies had both quantitative and qualitative components in their methodology.

The overall research questions for the 3 studies intended to answer were the following:

1. What variables were associated with falls and injurious falls over the five years?
2. What were some of the problems associated with using a central incident reporting system?
3. Was the MFS appropriate to use to identify patients at risk for falling?
4. What contributing factors can be uncovered from in-depth case studies of hospital falls?
5. What fall prevention strategies are suggested from the case study analysis to reduce the incidence of falls in acute-care hospitals?

1.5 Research Methodology Perspective

Components of a mixed method approach were used to include quantitative and qualitative data collection and analysis. Statistical data was obtained for trends, and then subjective data was obtained from the participants involved in the study. This allowed the researcher to acquire a greater understanding of the experience and context of the fall event than would be acquired with quantitative data only (Guba & Lincoln, 2005). The mixed method model that describes this study is the explanatory sequential design (Ivankova, Creswell, & Stick, 2006), in which quantitative data was collected and analyzed prior to collecting qualitative data. Both sets of results were then combined to produce a fuller interpretation of the results.

Another approach is Outcome Research which seeks to understand health care practices and the effects on the quality of care (Polit & Beck, 2004). Outcome Research also concentrates on what interventions are ineffective and what can be added to improve the problem (reduce falls rates in this instance). This approach targets administrative leaders and other policy makers to utilize cost-benefit analysis to determine the efficacy of added interventions to reduce falls.

1.6 Ethics

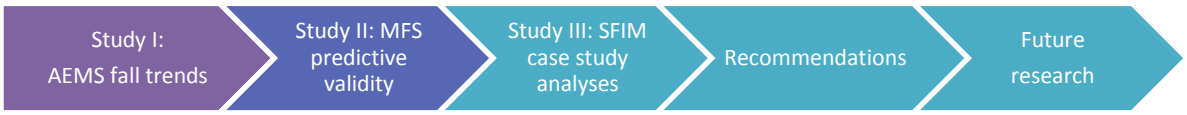
The studies did not require approval by the hospital's Research Ethics Board, since they were quality improvement initiatives that used de-identified secondary data.

1.7 Setting

The setting for these studies was a large, acute care teaching hospital. Located in Ontario, Canada, it is a multisite facility with nearly 15,000 physicians, staff, students, scientists, and volunteers who provide service for more than one million patient visits per year. The broad range of patient services consists of 28 different programs, including Emergency Care, Children's Care, Oncology, Medicine, Surgery, and Mental Health Services.

Quality assurance agencies such as Accreditation Canada and the Canadian Patient Safety Institute have driven the hospital to meet patient safety standards by implementing a fall prevention program. Every patient admitted to the hospital is screened for his or her fall risk level. The patient is then placed on standard fall precautions, which can include making sure the patient's call bell is within reach, orientation to his or her room, and removal of any hazardous clutter. If the risk assessment score is moderate to high, then extra strategies are put in place, such as applying nonskid socks on the patient or hanging a fall-risk sign over the patient's bed to alert others of the risk. If a fall does occur, it is reported in the AEMS system by the staff. All contributing factors identified at the time of the fall are entered. The fall event goes to leadership and risk management, where a post fall follow-up takes place.

1.8 Research Schema



Study I of the thesis was an analysis of 5 years of falls data at the acute care hospital. This study revealed risk factors associated with being in the hospital and identified areas where resources could be invested to reduce falls and/or fall injuries. It also showed that falls were not reduced from the introduction of the AEMS and the fall prevention program. Subsequently, aspects of the prevention strategy were examined.

Study II was a predictive validity analysis of the MFS conducted to see if the assessments using the MFS were effective in providing an accurate picture of the patient's fall risk. This could result in costly resources being applied when unnecessary. The follow-up questionnaire to staff indicated their view was that the tool was not effective in reducing falls.

Study III was a multiple case study analysis addressing issues outlined in the first two studies. Eleven case studies from two previous studies were used to gather more information about falls in the neuroscience and medicine units. Additional strategies were offered to prevent falls.

As a result of the findings in these three studies, recommendations are offered that reflect best practice as supported by the fall prevention literature:

- Provide education on all aspects of falls, including the need to report fall events in a central incident reporting system.
- Conduct a predictive validity test on the screening tool first, before using it to identify risk in a particular area.
- Increase staff in high fall-risk units.
- Include additional strategies, such as cognitive care, integrated patient mobility, and enhanced communication techniques with patients.

Future research would consist of implementing strategies that were recommended. Strategies such as comfort rounds and verbal bedside reporting were introduced to evaluate their effectiveness in reducing falls on some acute medicine units. Preliminary results have shown a reduction falls in these units.

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Chapter 2

2 Falls in an Acute Care Hospital as Reported in the Adverse Event Management System

2.1 Introduction

Hospitals have a responsibility to keep their patients safe. Falls are common adverse events in acute care hospitals. Patients fall 1.3 to 11.5 times per 1,000 patient days (Oliver, Healey & Haines, 2010; Currie, 2008). Falls are a burden for patients, families and hospitals. They affect the physical and psychological health of patients through pain, injuries, immobility and decreased function. Complications from falling lead to longer hospital stays, a loss of independence and have a significant financial cost (Titler et al., 2005). Zecevic et al. (2012) examined the cost of falls in an acute care hospital. They found the hospital cost for a patient who experienced a serious injurious fall while in hospital was on average $30,696 more than a matched patient who did not fall. They also found, that on average, length of stay increased for fallers by 34 days. Being in the hospital lends itself to an increased risk for falling. Elderly and frail patients admitted with one or more co-morbidities have a heightened risk of falling in a hospital environment (Cumbler & Likosky, 2011). Hospitals have identified falls as a systemic issue and from a risk management and patient safety perspective, institutional strategies to prevent falls and fall injuries must be developed (Fischer et al., 2005). Corporate goals include fall reduction as a strategic priority and quality assurance organizations such as Accreditation Canada have highlighted fall prevention as a required standard of practice (Accreditation Canada, 2013). One way hospitals are meeting this standard is by

implementing institution-wide incident reporting systems. This safety practice makes it possible to methodically gather information which can be tracked and potentially lead to changes in unsafe circumstances in the hope of minimizing future falls. However, collecting data in an incident reporting system can be a challenge even with a standardized reporting process in place. Issues such as under-reporting, missing data and limited detail can miss risk factors and distort the information on falls (Shojana, 2008; Shorr et al., 2008; Haines, Massey, Varghese, Fleming & Gray, 2009). Capturing accurate information is vital for identifying risk factors and preventing further falls.

There have been many studies focusing on risk factors for falls in all settings. Tzeng and Yin (2013) compiled a list of factors perceived by registered nurses to be associated with falls. The list included confusion, gait problems, Alzheimer's disease, disorientation and the inability to follow safety instructions. Bueno-Cavanillis, Padilla-Ruiz, Jimenez-Moleon, Peinado- Alonso and Galvez-Vargas (2000) categorized risk factors as intrinsic or extrinsic. Intrinsic factors are internal patient conditions whereas extrinsic factors are environmental elements that can lead to falls. Common intrinsic factors include altered mental status, decreased mobility and incontinence. Common extrinsic factors include type of flooring, clutter, and poor lighting. Mion et al. (2012)] added situational risk factors to their study to describe occurrences such as the transfer of patients and patients going to the bathroom. Risk factors can also be categorized as modifiable and non-modifiable (The Center for Disease Control and Prevention, 2014). An understanding of the various risk factors can be used to advance fall prevention strategies.

Some falls however may not be preventable (Oliver, 2007). Balancing rehabilitation needs and patient autonomy is a challenge for institutions and care providers who are

trying to respect patient wishes and promote functional independence while keeping patients from falling. This balancing act produces instances where some falls are difficult to prevent (Oliver, 2007). As a result, there has been interest in understanding the risk factors which contribute to serious injuries as these factors are clearly a heightened concern (Fischer et al., 2005; Tzeng & Yin, 2013; Krauss et al., 2007).

The purpose of this study was to identify the variables associated with falls and injurious falls in an acute care hospital over the five years from the implementation of the Adverse Event Management System (AEMS). A secondary inquiry was to identify problems associated with the AEMS. In acute care hospitals falls are one of the adverse events that impact patients, staff and the integrity of the hospital. By identifying the variables associated with falls, hospitals can intervene to improve overall patient safety.

2.2 Methods

The setting for the study was a large, urban-centered, acute care teaching hospital located in Canada. This facility has 15,000 physicians, staff, students, scientists and volunteers who provide services for more than one million patient (inpatient and outpatient) visits per year. There are 1,000 beds across two sites and over 50,000 admissions per year. The broad range of patient services consist of 28 different programs including Emergency Care, Neurology, Oncology, Medicine, Surgery, and Mental Health Services. The data used in this study were gathered from front-line staff who submitted reports to the Adverse Events Management System (AEMS) data base. The use of this de-identified secondary data was approved by the Western University Research Ethics Board. This was also a continuous improvement project on the unit. The study period was from February

2009 to February 2014. The AEMS reporting system was set up in February 2009 to collect data from adverse events (e.g. falls, medication errors and other iatrogenic errors) across the organization into one database. This software program, purchased from Canadian Courseware Development (CCD) Health Systems, was adapted to fit the needs of the hospital (Canadian Courseware Development Health Systems, 2014). A staff member, for example, logs onto the program using an electronic signature and confidential password. The initial instructions prompt the staff to create a report on general information such as the department and location of an event. The content of subsequent pages is dependent on the initial information. A patient fall report will probe for details and contributing factors related to the fall while a medical error report will probe for other information pertaining to the event.

In window one of the falls report, collected data include whether the fall was witnessed, describes the position in which the patient was found and whether or not any fall prevention strategies were being implemented at the time of the fall. Answers are offered in drop down menus to make it easier to check the correct response; however, there is also a text box available to add comments and/or more details. The second window with a drop down menu asks for contributing factors which can indicate possible reasons for the fall event. Certain situations or conditions might explain why the fall took place. For example, factors may be related to the condition of the environment (e.g. poor lighting, wet floor and cluttered area), staff factors (e.g. fatigue, haste, knowledge deficit) or patient related factors (e.g. unsteady gait, non-compliance or confusion). If equipment or medical devices were involved, that will also be noted in this section. Third window

records the actions taken, the staff member's immediate and post fall assessments and follow-up procedures.

Charts and reports can be created in AEMS for different types of events in order to show trends over time. This gives the organization an effective method to examine the number and characteristics of falls. Staff are instructed to complete as much information as possible about each event. This process may take up to 20 minutes and staff have 24 hours to complete an AEMS report after an adverse event. The event report is then sent to unit management for review and follow-up as required. Comments from coordinators are recorded along with the corrective actions implemented. The severity of the consequences determines the individuals who will receive the report for follow-up actions. Email alerts are used for this purpose. A link in the email message provides a direct connection to view the incident. The degree of injury associated with each fall is recorded using a severity level scale: 1. No injury/harm-assessment required; 2. No injury/harm-intervention/monitoring required. An example could be a patient who receives a cut or scratches; 3. Minor to moderate injury/harm. An example could be a patient who experiences pain and has bruises; 4. Serious injury/harm/disability. An example could be a patient who sustained a head injury or fracture; and 5. Death. In the higher severity levels (four and five), where further review of the event is needed, senior management, physicians and the risk management department get involved with the follow-up assessments. Comments are provided which may recommend further corrective interventions to prevent the event from reoccurring. The event is then closed.

The study design was a retrospective secondary data analysis of all falls occurring during this time. Frequencies were the main statistic used to describe the fall incidents. They

were extracted from the AEMS report and entered into an Excel Pivot Table for analysis. Frequencies were calculated for patient ages, number of falls, location of falls, the severity of falls, the time of day falls occurred and the patient's activity prior to the fall. To describe change over time, yearly fall rates were also computed. Fall rates were based on staff reported incidents and calculated as the number of patient falls divided by the number of patient days multiplied by 1,000 (Nurses Improving Care for Health System Elders [NICHE], 2014).

Problems associated with use of the AEMS system were identified by nursing staff (n = 3), coordinators (n = 2), physicians (n = 2) and those in risk management (n = 3). These stakeholders (n = 10) were selected because they represented the different points in the AEMS notification algorithm. Questions posed to them were:

(1) What are the problems using the AEMS system?

(2) How is AEMS used to reduce falls?

(3) How can the AEMS system be improved?

The responses were analyzed by the primary researcher who had experience with the AEMS system since its implementation in 2009.

2.3 Results

A total of 7,592 inpatient falls were reported over the five years from 2009 to 2014. The fall rate was 4.5 falls per 1,000 inpatient days in 2009 to 2010 and 4.4 falls per 1,000 inpatient days in 2013 to 2014 as described in table 1.

Table 2.1 Hospital's yearly inpatient fall rates and actions taken in those years

Year	Action	Significance to Fall Safety	Falls	Patient Days	Yearly Falls Rate
2009-10	Western Researcher completed a study on the cost of falls in Hospitals. Medicine Program formed a working group to introduce measures to reduce falls. AEMS was implemented as a central incident reporting system.	Provided evidence of the financial costs associated with falls	1357	302 834	4.48
2010-11	"The Many Faces of Patient Falls" fall prevention strategy was introduced in Medicine Program. Initial assessment of patients using the Fall Risk Assessment and Intervention Flow sheet Fall risk checkbox was incorporated into the patient's kardex Non-slip socks were purchased for patients Blue paper slippers were removed from units Information was provided to patient and families on fall prevention strategies. Education was given to the Medicine staff on falls prevention.	Implementation of a fall prevention program on Medicine in hopes to reduce fall rates	1464	297 056	4.93
2011-12	"Quality and Patient Safety" and "Risk Management" became separate departments. Corporate Group formed to develop a corporate falls prevention strategy Combined Medicine fall prevention strategies with corporate strategies "Call don't fall" arm bracelets were introduced for patients with moderate-high risk for falling Signage at the head of bed for moderate-high risk fallers Patients at moderate-high risk for falling were noted on Patient Capacity Management Board	Corporate goals included patient safety and reduction of falls	1537	336 863	4.56

	Bed exit alarms and chairs alarms used Patient/family brochures were developed.				
2012-13	Evaluation of fall prevention program conducted by audits and data on falls. Fall prevention program presented at the Quality and Patient Safety Summit Conference. Verbal bedside reporting introduced to coincide with patient safety checks.	Safety culture becoming prominent corporate goal	1652	357 854	4.62
2013-14	Communication white boards put in patient rooms to note patient mobility status. Learning package for staff on the different bed exit alarms iLearn module for fall prevention in development.	Patient safety initiatives added	1582	362 659	4.40
Totals			7592	165 266	4.60

Note. Fall Risk Assessment and Intervention Flow sheet based on Morse Fall Scale. iLearn module is part of the corporate education system.

2.3.1 Variables associated with falls

The inpatient units where falls occurred most frequently were the Medicine, Surgery, and Neurosciences Programs (see Table 2). These three units collectively accounted for 65 percent of all falls reported. The least number of falls occurred in the ambulatory and clinic areas where patients enter and are expected to return home after being examined and assessed. Falls occurred in all areas of the hospital including both inpatient and outpatient departments.

Table 2.2 Falls per program

Row Labels	Count of Incident
Medicine Program	2,432
Cancer Services	481
Cardiac Care	731
Clinical Neurosciences	823
Surgical Care	1,750
Grand Total	6,217

The times during which falls were consistently high were during 10:00 a.m. to 12:00 pm. 1:00 to 2:00 a.m. and 4:00 p.m. to 5:00 p.m. (see Figure 2.1).

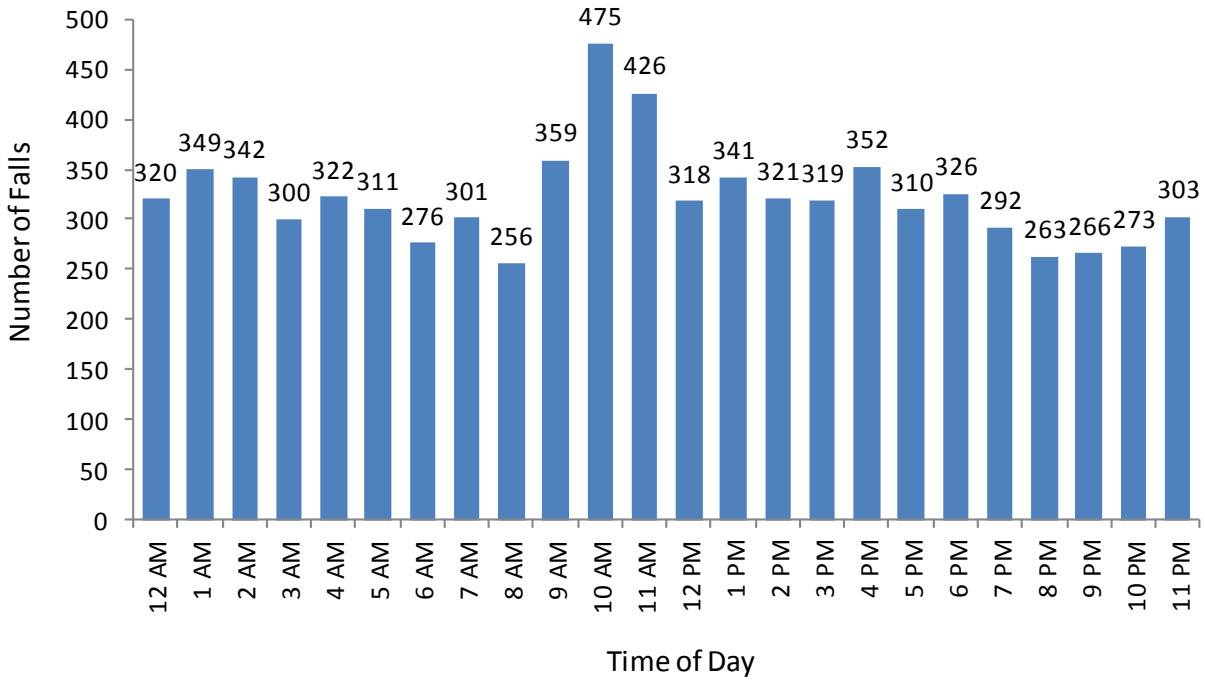

Figure 2.1 Time of day falls occur. Most of the falls in the hospital occurred between the hours of 9:00 a.m. and 12:00 p.m. This was a period of high activity on the units often with fewer-than-normal staff present.

Most falls (72%) occurred in the patients' rooms with 5,557 incidents reported. The activities prior to a majority of falls were transfer routines (55%) and walking or standing (43%). The most frequent reported factors associated with falls were unsteady gait (12%), patients requiring assistance and not calling for help (12%), having a history of falls (10%), weakness (9%) and impaired balance (8%).

2.3.2 Variables associated with injurious falls

During the study period there were a total of 2,275 falls with injuries recorded at severity levels three, four and five (see Figure 2). Most falls (70%) did not result in injuries. The highest number of falls were at levels one and two and required minimal post fall

assessments and interventions. There were 2,179 (29%) level three (i.e. bruises and skin tears), 80 (1%) level four (i.e. fractures), and 16 (0.20%) level five (i.e. deaths related to falls). Adults age 65 years and older were most prone to injuries after a fall, and accounted for 63 percent of all injurious falls on levels 3 and 4. The 16 deaths that occurred were also from this age group. The majority of injurious falls occurred on the medicine units. The most common type of severe injury from a fall was a fracture.

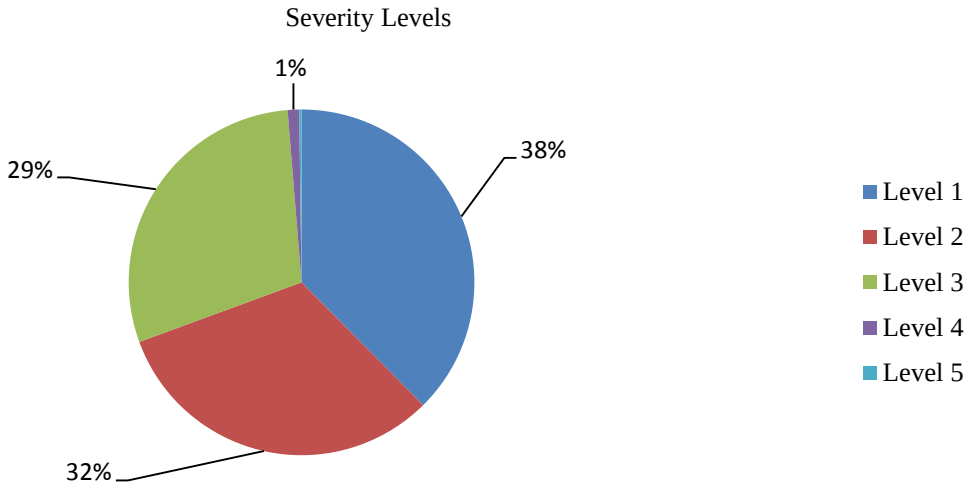

Figure 2.2 Severity level of falls
Note. There were 287 falls not specified on any level.

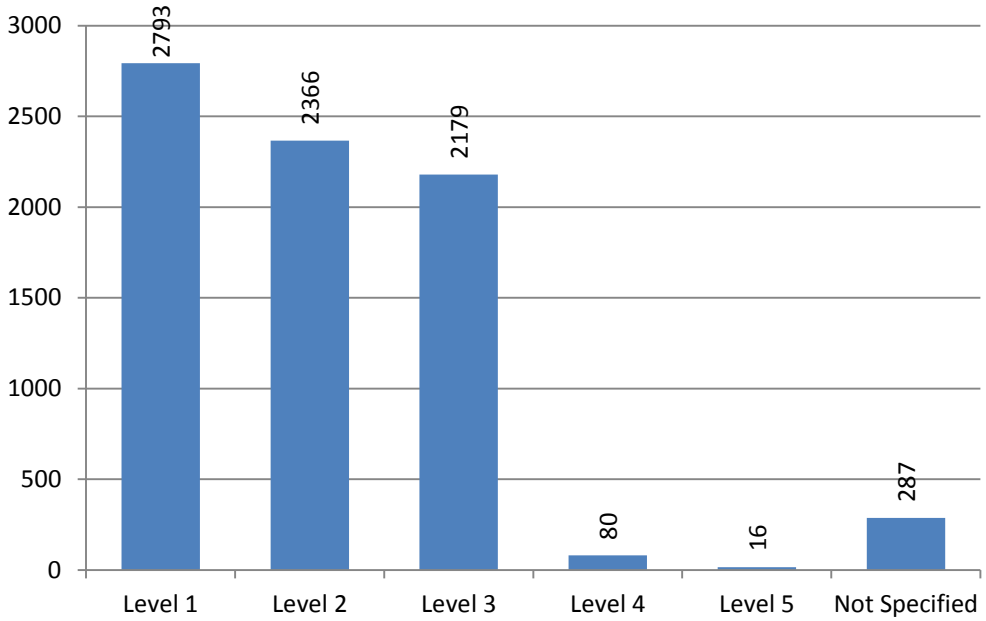

Figure 2.3 Severity level of falls

Note. Level 1. No injury/harm—assessment required; 2. No injury/harm—intervention/monitoring required; 3. Minor to moderate injury/harm; 4. Serious injury/harm/disability; and 5. Death.
There were 287 falls not specified.

2.3.3 Problems associated with incident reporting systems

The AEMS is used for documentation of a fall or any other hospital adverse event. The overview of the incident begins with the creation of the event report. At this initial stage, there are challenges associated with filling out the reports. Through the AEMS questions, nurses indicated that they may be too busy at certain times for them to report falls information or to fill out the report comprehensively. According to corporate policy, these events can be documented in the AEMS up to 24 hours after the event. However, staff may not be at work to complete the AEMS within that timeframe. The majority of nursing shift rotations are two day shifts, followed by two night shifts and then five days off before the next set of shifts. A positive view of reporting in AEMS was realized when

one nurse commented that action towards safety can be achieved by reporting adverse events and “near misses”. For example, bed exit alarms were elevated to a significant fall prevention strategy after staff indicated that inactivation of this feature could potentially contribute to the risk for falls. As a result, leadership and staff came together and developed a learning module to educate staff on applying the bed exit alarms for patients deemed high risk for falls. The purpose of the AEMS has shown to empower staff to make positive changes for patient safety. During the management review stage, unit coordinators indicated that follow-up can be time consuming due to the other demands on the unit. Another issue identified by coordinators was the lack of detail about the fall circumstances in the reports. Coordinators said they could get a better sense of the event if more details are included, such as what may have led up to the fall. Going to the staff member to gather more information was time consuming. Respondents from the Risk Management Department suggested that there may be an education gap where staff lacked knowledge about the purpose of AEMS and thereby cannot see the value of reporting and entering details. It was suggested that more training in the AEMS can improve the reporting by staff. Physicians concluded as well that more education on the AEMS can lead to improved reporting which is the catalyst to promote a safer culture.

2.4 Discussion

A primary purpose of this study was to identify variables associated with falls and injurious falls. The Neuroscience and Medicine Programs reported a high rate of falls. This result is consistent with other studies indicating these patient units are where most falls occurred (Hitcho et al., 2004). Hitcho et al (2004) found that Medicine and

Neurology services fall rates were both 6.12 falls per 1,000 patient days, which is slightly higher but comparable to the present study results. The Neuroscience Program at the present hospital consists of both Neurology and Neurosurgical patients. The most frequent diagnoses that patients were admitted with were stroke, brain tumor and spinal surgery. The Medicine Program consists of sub-specialty units such as: respiratory, acute care of the elderly and sub-acute units which care for more medically stable patients. Patients admitted to the Medicine Program have diagnoses such as chronic obstructive pulmonary disease, pneumonia, heart failure and diabetes. Both Neurosciences and Medicine patients share complex diagnoses linked to increased risks for falling which include comorbidities, weakness, impaired gait and cognitive impairment. Mobile patients with increased medical needs can lead to falls. This is illustrated with the data showing 55 percent of falls take place during a patient transferring without assistance. One recommendation to prevent these falls is conducting a more thorough assessment of the patient prior to each transfer. For example, assess whether there is a change in cognition or risk for orthostatic hypotension (which can cause imbalance) and whether the patient requires visual or hearing aids. This assessment may lead to a more appropriate transfer device and/or call for more staff assistance.

The highest number of falls occurred between 10:00 a.m. and 12:00 p.m. When observing a busy medicine unit during this time of day, there were multiple patient transfers taking place in patient rooms. For example, from bed to chair, chair to walking, bed to stretcher and from the bathroom back to a chair or bed. This is also a time when patients go for tests and procedures and staff assists them to get ready. Medical teams make rounds during this time of day and new patient care orders may need to be processed which adds

to the already high activity on the unit. Interdisciplinary team members such as physiotherapists and occupational therapists assess patients on mobility and function which can consist of getting them up and walking. As well, morning discharge time is at 11:00 a.m. Staff are given the task of providing patients with information and instructions upon their discharge. Morning breaks for nursing staff are also taken at this time. Consequently, there is less staff to supervise patients during a high activity level on the unit. Some of these activities may not be modifiable. However, some activities such as non-urgent hospital tests and procedures (e.g. routine blood work and x-rays) can be delayed or re-scheduled for alternative times. Another high risk time is 1:00 a.m. to 2:00 a.m. Again, this is a high activity time at night with reduced staff. Nursing rounds and medication administration during this time necessitate waking the patients and this can lead to bathroom transfers. More staff during busy times may reduce this fall risk. Nursing staff to patient ratios are based on Workload Measurement Indicators 21 that are used in conjunction with the unit needs. Staff enter their patients' plans of care for each shift into a workload computer data base. Workload measurement analysts along with administrators examine the data in order to allocate the resources (staff in this case) necessary for the care of the patients. These indicators are used to assess and adjust staff workload ratios. Reassessing the staff to patient ratios at high risk hours may be an effective strategy to reduce falls.

The age group that experienced the most injurious falls (levels 3-5) were patients over 65 years of age. Older people are the largest consumers of hospital care with 60 percent of admissions over the age of 65 (Oliver, 2007). At this hospital 67 percent of patient admissions to the Medicine Program were patients 65 years of age or older. During their

hospital stay older patients are at risk for functional decline such as having difficulty with mobility, activities of daily living and cognition (Covinsky, Pierluissi & Johnston, 2011; Fischer et al., 2005). Functional decline and other characteristics of geriatric syndromes put older patients at a heightened risk for falls and fall related injuries. There is also evidence that the hospital environment plays a role in injurious falls. A safer environment, such as reduction in noise has been shown to reduce injurious falls (Tzeng, Hu & Yin, 2011). The Medicine Program units are busy with many people, noisy call lights, bed alarms and pagers. This leads to a sensory overload on patients' mental abilities which can cause confusion (Inouye, 2000). Staff, being aware of this, can minimize the noise and bright lighting to ensure a calming atmosphere. Patients taking anti-hypertensive medications increased risk for injurious falls (Quigley et al., 2009; Mion et al., 2012). A review of high fall risk medications can help to decrease injuries. Beers Criteria is a list of high risk medications which can potentially harm older adults. It summarizes the need to avoid certain medications that are associated with falls (American Geriatrics Society, 2012).

The secondary purpose of this study was to identify problems associated with the computerized adverse event reporting system. The AEMS is a centralized incident reporting system meant to permit analysis of data to inform improvements to be made. Computerized incident reporting systems in acute care hospitals are an important component of a multifactorial fall prevention program (Hutchinson et al., 2007). According to the present study's five year trend, there has not been a substantial reduction of the number of falls (from 4.48 falls per patient days to 4.40 falls per patient days). In order for the reporting system to be effective in gathering information there is a

need for timely reporting and for staff to provide as much information and as soon after an event occurs as possible (Wang, Li & Huang, 2013). Hill et al. (2010) examined three different methods of recorded falls in an acute care hospital. The three recording methods were: participants (fallers) reported fall events to a research assistant, falls were recorded through case notes and falls were recorded in the hospital's incident reporting system. The authors found under-reporting occurred in all three recording methods. The greatest proportion of the total number of falls was recorded in the patient case notes (92%), followed by the hospital incident reporting system (76%). Falls reported to the research assistant were the least comprehensive method with only 60 percent of the number of falls recorded. The researchers also found that falls were less likely to be reported in the hospital reporting system if they were recurrent falls or if the fall occurred during the morning or afternoon shift. As well, falls causing injuries were reported more than non-injurious falls. Even with these limitations however, and importantly for the present study, the authors reported that the adverse event reporting system represented variables associated with the occurrence of falls in the hospital.

Efficient and effective reporting depends on the staff and his/her circumstances. On a busy unit, staff may find it difficult to report falls at certain times. Nurses are occupied in the morning dispensing medication and performing other duties that can deter the reporting of a fall. During those work intensive times the nurses require more time and access to computers to be able to report the incidents. The efficiency-thoroughness trade-off (ETTO) principle speaks to the common response of people to adjust what they do to meet their work needs (Hollnagel, 2009). According to the ETTO principle, demands on productivity tend to reduce thoroughness and vice versa. In a busy shift it is easy for

efficiency needs to dominate thoroughness and thus drive safety to a secondary concern. Another explanation for why adverse events occur can be found in the Swiss Cheese Model of Accident Causation. Unlike the ETTO principle, the Swiss Cheese Model moves away from the human element towards the system as a whole (Reason, 1998). In this analogy, each slice of cheese is a defensive layer in the process or system. The holes represent opportunities for failures in the system such as inadequate policies, not enough education, poor process designs and unsafe acts. When the holes on all defense levels align, the result is for increased potential for an adverse event. The Systemic Falls Investigative Method (SFIM) studies a broader view of why falls occur (Zecevic, Salmoni, Lewko & Vandervoort, 2007). This method uses multidisciplinary interviews, process mapping and fall re-enactments. Once the data is collected and analyzed and entered into a web-based database, contributing factors to an adverse event are uncovered. One research suggestion emanating from the present study would be to use the SFIM methodology to collect in-depth system-wide information on specific types of falls or fall situations. One area of obvious importance are falls resulting in serious injuries or death. Reducing or eliminating such costly falls (in human and financial terms) would be important.

Another area for future research comes from the fact that data collected from a single institution may lack the power to complete an in-depth analysis of factors associated with falls. For example, Healey et al. (2008) analyzed fall data taken from a national incident reporting system. The 472 organizations in the database recorded 206,350 falls. Using this pooled database, they found the “time of day” (between 10:00 a.m. and 12:00 p.m.), the patient’s age (between 85 and 89 years old) and the care setting (Mental Health) were

significant risk factors for falls. A province-wide database and research strategy would be advantageous.

2.5 Conclusions

This study exposed the variables associated with patient falls while in an acute care hospital. Two consistent variables for increased falls occurrences were the hospital unit and the time of day. With this information, hospital administrators can allocate resources to high risk units during high risk times. They could have, for example, more supervision to deal with situations such as insufficient staffing on units with heavy workloads. Identifying the risk factors and determining which factors can be modified would require staff to be educated about the potential risks associated with patients in hospitals. It is also recommended that administrators collaborate with staff and inform them of the benefits of thoroughly filling out fall incidents reports in the AEMS. Finally, future research supporting in-depth fall incident analyses should be conducted.

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Chapter 3

3 The Use Of The Morse Fall Scale In An Acute Care Hospital

3.1 Introduction

Up to 84 percent of adverse events in hospitals are related to falls (Aranda-Gallardo et al., 2013). Thirty percent of these falls cause injuries including serious injuries and death (Hitcho et al., 2004). Healthcare quality improvement organizations such as Accreditation Canada, the Registered Nurses Association of Ontario, the Canadian Institute for Health Information and the Canadian Patient Safety Institute have declared that falls jeopardize patient safety and have recommended practice standards to include a fall prevention program in hospitals (Accreditation Canada, 2015; Safer Healthcare Now, 2015; Registered Nurses Association of Ontario [RNAO], 2002). With a growing older population, falls will continue to be a major concern for hospital staff and administrators. Fall rates can be as high as 11.5 per 1000 patient days in hospitals (Oliver, Healey & Haines, 2010; Currie, 2008). Patient falls account for a substantial amount of physical and psychological harm, functional decline, prolonged length of hospital stays, increased costs and death (Krauss et al., 2008). Up to 25 percent of older patients fall during their hospital stay (Rubenstein, 2006; Schwendimann, De Geest & Milisen, 2007). The World Health Organization (WHO) at its first World Congress for Healthy Ageing deemed falls a “geriatric giant”, a term first coined by Bernard Isaacs and is used to illustrate the immense problem related to falls (The World Health Organization [WHO], 2012). This safety threat has mandated the need for effective hospital fall prevention programs.

Fall prevention programs also include an assessment for patient risk using a screening tool specifically designed for hospitalized patients (Hendrich, Bender & Nyhuis, 2002; Vieira et al., 2012). There are several fall risk assessment screening tools developed for hospital settings, however, none have consistently high predictive validity (Scott, Votova, Scanlan & Close, 2007). Choosing the correct tool takes careful deliberation to find the one best suited for the particular hospital program, since one hospital setting can be different from another with their own unique medical specialties and patient populations (Aranda-Gallardo et al., 2013; Baek, Piao, Jin & Lee, 2013). Although it is recommended to ask risk questions at the time of admission, such as has the patient previously fallen (Morse, 2009, National Institute for Health and Care Excellence [NICE], 2004), some other risk factors associated with falls may not be evident at this time. The inability to score mobility, assess medication treatments and screen for cognitive decline are examples of risk factors that staff may not be able to assess at the time of admission. Other situations such as an aging patient population may pose a higher falls risk than a falls risk score indicates. For example, a study by Chelly et al. (2008) found that patients over the age of 55 fell more frequently than patients under the age of 55; and an 80 year old patient had 3 times more risk of a fall resulting in injury than a 50 year old patient on the same ward. Inversely, patients scoring high on the screening tool may experience an improvement in health which has a lower falls risk than first identified by the risk assessment. Patient conditions and fall risk fluctuate during a hospital stay (Oliver, 2006).

Morse and her colleagues have written several articles on the “fall-prone patient” and the use of the MFS screening tool to identify patients at high risk for falls (Morse, 2009). In Morse’s view, some falls can be prevented and the MFS was an appropriate screening

tool to identify fall risk. To develop the MFS, Morse, Morse & Tylko (1989) conducted a study with 100 fallers and 100 non-fallers as a control group. Stepwise discriminant analysis was used to determine the six subscales used in the MFS. The authors found that 25 percent of participants in the fallers group had previously fallen, 32 percent were disoriented and patients in the fall group had an intravenous (IV) device. Mobility problems requiring gait aid or assistance with transferring and secondary diagnoses were also significant factor in the fall group. Using 45 as the cut-off point, the sensitivity was 78 percent and the specificity was 83 percent. Morse, Black, Oberle & Donahue (1989) were able to validate the MFS in acute care, long-term and rehabilitation clinical areas. They analyzed the type of patient falls that occurred over a 4-month period. They found that the scores from the MFS correlated with the risk for falling and severity of injuries sustained from the falls. However Morse asserts that each hospital unit should carry out a pilot project to determine the best sensitivity and specificity for their population but stay within the 25-55 cut-off range. Morse stresses that in acute care hospitals a risk score as low as 25 can be acceptable, since some areas may only have high risk patients. Patients who have a score of 25 or greater and all fall prevention strategies should be in place in order to protect this group (Morse, 2009).

Scott et al. (2007) conducted a systematic review of studies that looked at the suitability of various fall risk assessment tools. Their study included screening tools used in the community and home support as well as in long-term and acute care hospitals. For the acute care hospital setting, they reviewed 12 studies using 8 different screening tools (Berg Balance, Conley Scale, Downton Index, Elderly Mobility Scale, Fall-risk Assessment, Functional Reach, MFS and the STRATIFY). They extracted the predictive

validity of these tools which included a sensitivity and specificity analysis. According to their findings, two fall risk assessment tools rated over 70 percent for both sensitivity and specificity (Schmid: sensitivity 93%, specificity 78%; STRATIFY: sensitivity 93%, specificity 88%). Scott et al. (2007) recommended validating fall risk assessment tools in all settings including acute care hospitals by analyzing sensitivity, specificity, PPV and NPV values, as well as using a Receiver Operating Characteristic (ROC) curve analysis to select the optimal cut-off point. Other important considerations in choosing a correct screening tool include the amount of time it took for completing the screening tool, how much equipment was needed and what kind of training was necessary.

A study by Ang, Mordiffi, Wong, Devi & Evans (2007) in Hong Kong evaluated three different fall risk assessment tools in an acute care hospital. The analysis was based on the predictive values of sensitivity, specificity, PPV, NPV and inter-relater reliability. The study concluded that the Hendrich II Fall Risk Model (HFRM) was more effective in the hospital setting than the MFS or the St. Thomas Risk Assessment Tool in Falling Elderly Inpatients (STRATIFY). The predictive validity of the HFRM was for both 70 percent sensitivity and 61.8 percent specificity when using a cut-off of 51. The HFRM was developed to be used in hospitals (Hendrich, Bender & Nyhuis, 2003) and has categories related to geriatric conditions (history of falls, altered elimination, confusion/disorientation, depression, dizziness, poor mobility/weakness and poor judgment).

In another study by Aranda-Gallardo et al. (2013) the STRATIFY was viewed as a more useful fall prevention screening tool than the HFRM and MFS. They conducted a systematic review and meta-analysis of fall risk assessment tools, ultimately examining

14 research articles assessing predictive validity. Comparing the MFS, STRATIFY and HFRM they found that the STRATIFY more accurately predicted patient falls in an acute care hospital. The STRATIFY fall risk tool is short and has 5 items addressing previous falls, agitation, visual impairment, frequent toileting and mobility issues. The predictive validity scores for sensitivity (93%) and specificity (88%) were high when it was tested in the original setting (Oliver, Britton, Seed, Martin & Hopper, 1997).

Another study by Baek et al. (2013) conducted in Korea validated the MFS in a hospital setting. The authors accessed falls information from the patients' electronic chart. There were 151 fallers and 694 non-fallers during the study period. The results showed high sensitivity (72%) and high specificity (91%) when the cut-off point was 51 at admission (Baek et al., 2013).

The contrasting findings in these studies confirm that screening tools need to be tested in each setting prior to use due to the diversity in patient populations and the hospital environments (Spoelstra, Given & Given, 2012). Ang et al, (2007) found the HFRM to be most effective for identifying patients at risk for falling. Aranda-Gallardo et al, (2013) found the STRATIFY to be most effective for identifying patients at risk for falling. Baek et al, (2013) found the MFS to be most effective for identifying patients at risk for falling. These findings also suggest that a periodic analysis of a tool's effectiveness is warranted.

The present acute care hospital adopted the Morse Fall Scale in 2007 in order to assess patient fall risk and to use the assessment to initiate fall prevention strategies. To date the choice of the MFS had not been validated. The purpose of this study was to test the predictive validity of the MFS by assessing the sensitivity, specificity, PPV and NPV on

the medicine units in an acute care hospital. The predictive validity of the scale using different cut-off points was determined.

3.2 Methods

3.2.1 Research design

The study was a cross-sectional prospective emergent design consisting of both quantitative and qualitative measures. The quantitative analysis used MFS scores to evaluate the predictive validity of the MFS fall risk screening tool. The qualitative analysis examined the views and experiences emanating from the use of the MFS screening tool by hospital staff in their everyday clinical practice. Emergent design allows a study to unfold and develop in the course of the research to provide a richer interpretation of the data (Lincoln & Guba, 1985). Surveys were given to the Continuous Quality Improvement (CQI) staff to gather their perspectives on the scale's utility. This study did not require approval by the hospital's Research Ethics Board since it was a quality improvement initiative which used un-identified secondary data.

3.2.2 Setting

The setting for the study was medicine units in a large acute care teaching hospital located in Ontario, Canada. The hospital is a multisite facility which has more than one million patient visits per year. The falls rate per 1000 inpatient days was 4.4 over the last five years for the whole hospital and the Medicine Program had a fall rate of 6.0 patient

falls per 1000 patient days (Watson et al., 2015). The Medicine Program is made up of different units ranging from subacute to higher acuity units.

3.2.3 Participants

Quantitative. Participants were adult patients aged 18 years and over who were admitted or transferred to a medicine unit between November 2014 and March 2015. The average age of patients in the Medicine Program was 65 years old and common diagnoses included chronic obstructive pulmonary disease, congestive heart failure and diabetes.

Qualitative. The RNs taking part in the survey had 3-5 years of experience administering the MFS screening tool to patients. They worked on different medicine units in full-time nursing positions, were mainly female (n=6 female, n=1 male) and were members from the Medicine Program's CQI council.

3.2.4 Assessment and recording of fall risk

The MFS for predicting falls risk was developed by Morse in Alberta, Canada in 1985. It is composed of six subscales where each subscale identifies situations that put patients at higher risk for falls (Morse et al., 1989). The subscales are:

- History of falling: (produced a score of 25 for 'yes' to a fall and 0 score for 'no'). A history of falling was coded if the patient had a fall in the 3 months prior to admission/transfer to the unit. One example was a patient who recalled falling on a slippery floor at home 3 months prior to admission to the hospital.

- Secondary diagnosis: (produced a score of 15 for ‘yes’ and 0 score for ‘no’). A secondary diagnosis was coded if the patient had more than one medical diagnosis listed in the patient’s chart. An example was a patient diagnosed with renal failure who also had a previous stroke.
- Ambulatory aid: (produced a score of 30 for ‘using furniture’, 15 for ‘crutches/cane/walker/wheelchair/needs assistance’ and, 0 for ‘no/bedrest’). Ambulatory aids were coded if they were required for mobility at the time of assessment. If a patient needs an ambulatory aid, and the nurse noticed him/her grasping tables and other furniture as they walked, a score of 30 was given.
- IV/saline lock: (produced a score of 20 for ‘yes’ and 0 score for ‘no’). IV therapy was coded if the patient had a continuous IV or a saline lock for intermittent IV therapy. For instance, when a patient was getting intermittent intravenous antibiotic medication which required a saline lock device in his/her hand.
- Gait/transferring: (produced a score of 30 for ‘yes’, 0 for ‘no’). Gait was assessed for normal, weak or impaired gait which needed higher assistance. An example was a patient with a decreased level of mobility who required assistance to transfer from the bed to a chair. Anything other than normal was scored as 30.
- Mental status: (produced a score of 15 for ‘overestimates/forgets’ and 0 for ‘oriented’). Changes in mental status could be acute (delirium) or chronic (dementia).

The total possible score on the MFS is 125. In the original study, Morse found that a cut-off score of 45 correlated with a high fall risk and recommended that a cut-off point should not exceed 55 (Morse, 2009). Statistically, the best cut-off point for a screening

tool is determined by calculating a Receiver Operating Characteristic (ROC) curve for the available data. At the hospital used for the study, reaching the high risk score alerts staff to implement advanced strategies along with the standard care already put in place to prevent falls. For this study, the hospital chose to have a cut-off score of 25 as the point between low and high risk. Low risk (< 25) meant standard fall procedures such as call bell in place, adequate lighting, bed at lowest level with brakes on, and ensuring that non-slip footwear was available. Additional interventions for a score of 25 or greater included a bed exit alarm, high risk bracelet and a sign over the patient's bed identifying the patient as high risk for falls. Nursing staff assessed adult inpatients using the MFS on admission to the hospital, after every transfer from one unit to another within the hospital, weekly on Thursday, after a fall and if there was a change in medical condition. The MFS score was documented in the patient's bedside chart.

Falls were defined as events that result in a person unintentionally coming to rest on the ground or other lower level (WHO, 2007). In this study a faller was defined as a patient who experienced a fall within 7 days of an admission or transfer to the Medicine Program. Admissions meant patients coming directly from the Emergency Department, whereas transfers were movement from one hospital unit to another unit.

3.2.5 Data Collection

Quantitative. The MFS data were collected in two stages from November 2014 to March 2015. The first stage consisted of gathering the MFS scores from the patient's bedside chart. The initial MFS score for each patient was extracted from the score for each of the six MFS subscale items. These scores were obtained by nursing staff who assessed the

patient using the MFS. The second stage consisted of a follow-up to identify patients who experienced a fall within 7 days of the initial admission/transfer score. This was chosen because the MFS would be re-scored 7 days after the admission/transfer which left room for changes in scoring and uncertainty (Healey & Haines, 2013). Data on fall occurrences were collected using three sources: a) from the hospital's adverse event management system (AEMS), a computerized incident reporting system where staff reported adverse events within 24 hours of the incident, b) nursing documentation notes in patient charts, and c) from the self-report by nursing staff. The actual fall may have been witnessed (seen by staff) or unwitnessed. All nursing and other interdisciplinary staff (physiotherapists, occupational therapists, speech-language pathologists, registered dietitians, social workers and personal support workers) on the medicine units were provided with information on the research study and informed that the MFS scores would be collected from bedside charts.

Qualitative. Participants in the survey were seven nurses from the Medicine Program's continuous quality improvement (CQI) council. The medicine CQI council is part of the hospital's larger inter-professional CQI group that is committed to implementing initiatives to improve patient and staff safety. The CQI council was chosen because of its mandate to improve patient care and increase staff satisfaction. A convenience sample of nurses were invited to participate (n=10). Seven returned the surveys anonymously. The survey was handed out during a CQI council meeting. Questions posed to them were:

In your opinion, is the MFS a useful tool in the hospital's fall prevention program? Explain why it is or is not.

Could the MFS be improved? (If "yes", how could it be improved?)

Are there other strategies that could be used to improve fall prevention?

A PowerPoint presentation of the quantitative results i.e., sensitivity and specificity findings was made prior to handing out the survey. Seven questionnaires were returned to the researcher anonymously by placing it in a marked folder.

3.2.6 Data Analysis

Statistical analysis was carried out by using the SPSS version 22.0 (International Business Machines [IBM] Corporation, 2015) and by hand calculations using the following equations with the hospital's cut-off point of 25:

Quantitative. Statistical analysis was carried out by using the SPSS version 22.0 (IBM SPSS Version 22, 2015) and by hand using the following equations:

	Had a fall	Did not have a fall
Predicted to fall	A (True positive)	B (False positive)
Not predicted to fall	C (False negative)	D (True negative)

Sensitivity = A/A+C (True positive/True positive + False negative)
Specificity=D/B+D (True negative/False positive + True negative)
PPV=A/A+B (True positive/True positive + False positive)
NPV=D/C+D (True negative/False negative + True negative)

Sensitivity refers to testing the tool's ability to obtain a 'true positive'. This is the percentage of patients who fell that were predicted to fall (identified as high risk). Specificity tests the tool's ability to obtain a 'true negative'. This is the percentage of the patients who did not fall and were predicted not to fall (identified as low risk). The PPV shows the likelihood that a person testing positive for the risk of falling will actually have

a fall. The NPV shows the likelihood that a person testing negative for the risk of falling will not fall (Walsh, Bennell, Vu & Haines, 2011; Thompson & Dowding, 2002). The cut-off point is where a decision is made as to whether or not a person has an increased risk of falling. This value separates the lower risk fallers from those higher risk fallers who may benefit from more fall prevention strategies. The ROC analysis was used to maximize the MFS accuracy in predicting falls in this sample. This statistical test plots true positive (sensitivity) frequencies and true negatives (specificity) frequencies at specific cut-off values to generate the ROC curve. The analysis determines the statistically optimal cut-off value and determines the ability of the MFS to discriminate between patients at risk for falling and those that are not. The point at the upper left-hand corner represents the greatest discriminative point on the graph as in Figure 1. The maximum for this analysis is area under the curve (AUC) equal to 1 which describes a strong screening tool to distinguish between patients with risk for falling and those not at risk. An AUC level close to 0.5 describes a chance risk using the screening tool, while an AUC close to 0 indicates incorrect classifications with high risk patients classified as low risk and non-fallers classified as high risk (Hajian-Tilaki, 2013). It is important to determine the optimal point which distinguishes the different cut-off points for patients putting them in either the risk for falling or not at risk. The optimal point is usually where the sensitivity and specificity are at their highest (0,1) on the curve (Fawcett, 2005; Oliver, 2006). When the cut-off point is high with a high specificity value, sensitivity is lost and patients at risk may be missed. When the cut-off point is lower producing a higher sensitivity value, more patients could be mistakenly deemed as high risk. Along with these data analyses, two researchers reviewed the responses of the surveys together

and common themes were identified. Both researchers had extensive knowledge of the MFS screening tool and one had experience using the MFS screening tool in clinical practice. The themes that emerged were brought back to the CQI council for clarification and to ensure they reflected the nurses' views and experiences.

3.3 Results

From November 19, 2014 through March 4, 2015 there were 508 MFS scores collected. Eight scores were excluded due to repetition (same patient transferring within the Medicine Program), leaving a total of 500 scores in the study (238 female and 262 male patients). There were 174 patients below the age of 65 and 326 were 65 years or older. Within the 7 days of admission/transfer onto a medicine unit there were 46 patients who fell. The mean age of the fallers was 68 (range: 18-100 years of age). Gait/transferring problems, having a secondary diagnosis and patients requiring an ambulatory aid were the top indicators checked off as shown in Table 3.1. With the cut-off score of 25, there were 37 who scored as a low fall risk and 463 who scored as a high fall risk. As shown in Table 3.2, the sensitivity was calculated as 98 percent and the specificity was calculated as 8 percent.

Table 3.1 Summary of risk factors on 6 sub-scales of MFS

Risk Factors	n (Total = 500)	Percent	n (Fallers =46)	Percent
History of falling	215	43	27	59
Secondary diagnosis	404	81	41	89
Ambulatory aid	323	65	39	85
Intravenous/Saline lock	472	94	38	83
Gait/transferring	362	72	42	91
Mental status	177	35	15	33

Note. MFS's 6 sub-scale indicators and the number and percentage patients scored on each of the items

Table 3.2 MFS Predictive values and cut-off scores (n = 500)

Cut-off Points	**25**	10	20	30	40	50	**55**	60	70	80	90	100	110	120
Sensitivity %	**98**	0	0	98	93	91	**87**	87	70	52	28	7	2	0
Specificity %	**8**	1	3	9	19	27	**34**	39	54	67	83	64	94	100
PPV %	**10**	0	0	10	10	11	**12**	13	13	15	15	7	3	0
NPV %	**97**	100	100	98	97	97	**96**	97	95	94	92	70	90	100

Note. The cut-off points estimations for sensitivity, specificity, PPV and NPV (n=500). A cut-off point of 55 is recommended

The ROC curve, as shown in figure 3.1, represents all falls collected during the study. The point closest to one (0, 1) depicting the overall ideal sensitivity and specificity point in the tool shows a cut-off point of 55 representing 87 percent sensitivity and 34 percent specificity. An AUC percentage of 0.65 (95% CI 0.575-0.719, $p < 0.05$) demonstrates that the MFS has a weak predictive validity to discriminate between patients with falls risk and those not at risk (Fawcett, 2005; Oliver, 2006; Schwendimann et al., 2007).

Medicine Units

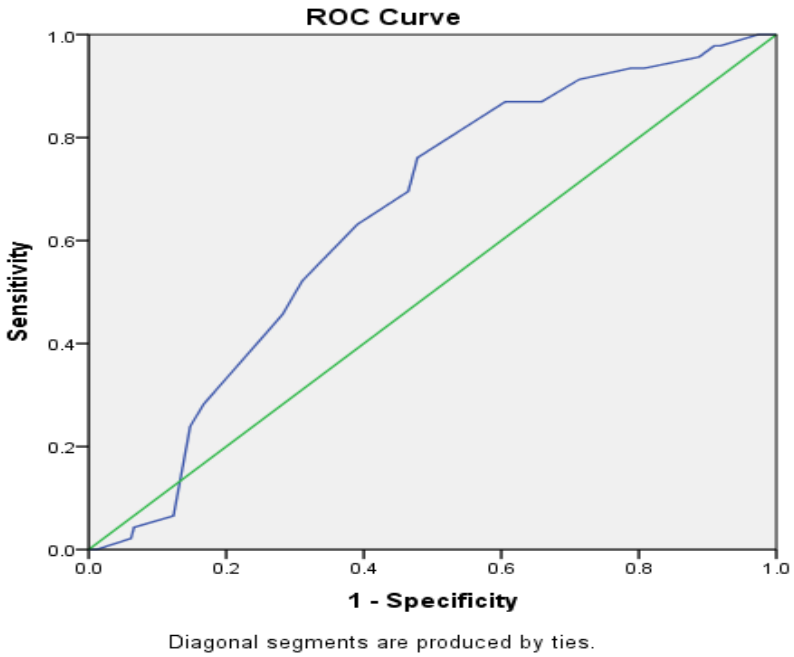

Figure 3.1 ROC Curve

Note. The AUC for all of the units collectively was 0.65 (95% CI 0.575-0.719, $p < .05$) showing a poor balance between sensitivity and specificity

Surveys regarding the MFS were distributed to 10 nurses on the CQI council and seven responded. Positive comments were that the MFS was useful—"Yes I think the MFS is useful but it is not always taken seriously". Nurses felt the MFS needed to be revised and more education was needed for staff on fall prevention. Themes with staff comments are illustrated in Table 3.3. Within these data, two major themes were identified: Change or adjustment of the screening tool and Education.

Table 3.3 MFS study questionnaire themes

Themes	Comments
Change or adjust screening tool	"Increase the high falls risk score"
	"Add an unsteady section"
	"Having a [saline lock] is not maybe a strong indicator but being on a continuous IV is"
	"I find staff complain it is just more paperwork and just check them all off"
Education	"Provide specific steps to prevent falls"
	"More emphasis on near misses"
	"Unit specific analyzing of individual fall in [the hospital] based on available data"
	"[We need to be] looking [at the] primary root causes of fatal falls"

Notes. Comments from nursing staff on the MFS

3.4 Discussion

The purpose of this study was to evaluate the predictive validity of the MFS in identifying falls occurrence by assessing the values of sensitivity, specificity, PPV, NPV

and cut-off score on a sample of 500 patients on the medicine units in an acute care hospital. Predictive validity shows the ability of the MFS to discriminate between patients with an increased risk of falling versus patients with a low risk. Using the cut-off of 25, the screening tool's sensitivity was high (98%), however, the specificity was very low (8%). A consequence though of this low cut-off point is that 93 percent of the patients were deemed high risk which could lead to the adoption of inappropriate fall prevention strategies. Only 7.2 percent of patients were rated as low risk for the Medicine Program. This meant that nearly all of the patients in the study received bed and chair alarms along with increased observation. According to the findings, the optimal cut-off point for the MFS in this setting is 55 (sensitivity=87%, specificity=34%) as opposed to 25 (sensitivity=98%, specificity=8%) currently used. This supports a study conducted by Healey and Haines (2013) who found 55 to be more useful in a similar hospital setting, and reflects Morse's (1998) suggestion that a cut-off not be greater than 55.

To help determine the optimal cut-off point, a ROC analysis was conducted. The AUC was 0.65 (95% CI 0.575-0.719, $p < .05$) which illustrates the relationship between the sensitivity and the specificity of the screening tool. A result around 0.5 would indicate a lack of accuracy for this tool (Myers & Nikoletti, 2003; Hajian-Tilaki, 2013) signifying that this tool had only moderate accuracy.

Fall prevention strategies such as implementing a falls risk screening tool are meant to reduce patient falls. Risk assessment is supposed to be used to separate the high risk fallers from the low risk fallers so that limited resources can be applied to those most in need. An inaccurate screening tool and/or cut-off point can result in unnecessary interventions which impose a burden on staff time and hospital costs. By conducting a

validity analysis of a falls risk screening tool, hospital administrators can examine the results and determine an acceptable sensitivity and specificity balance.

As a follow-up to the findings of this study, a questionnaire was posed to the nurses on the CQI council to elicit feedback on the MFS screening tool. They were asked whether or not they thought screening tools are effective for assessing the risk for falls? The survey went to medicine nurses on the CQI council who regularly fill out the MFS as part of their nursing practice. Positive comments came back indicating that the tool was helpful for awareness and for implementing appropriate strategies. However, there were two main areas that the nurses wanted addressed (Table 3); (a) change the screening tool; and (b) provide more education to staff around fall risks and prevention.

In regards to changing the tool, one recommendation was to change the cut-off point. Another was to consider using a different screening tool. For a screening tool to be effective it needs predictive validity, easy completion, short minimal training, and high sustainability (Oliver & Healey, 2010).The STRATIFY and the Hendrich II are two screening tools that have been validated in similar settings (Heinze, Dassen, Halfens & Lohrmann, 2008). However, any screening tool still need to be validated for the setting in which it is to be utilized (Scott et al., 2007; McFarlane-Kolb, 2004).

Staff workload ratios need to be considered as well since documentation takes time away from patient care. Nurses spend approximately 25 percent of their time completing forms in the hospital (Trossmann, 2002). The general nurse to patient ratio levels in this area were four patients to one nurse during the day (7:00 a.m.—7:00 p.m.) and six patients to one nurse at night (7:00 a.m.—7:00 p.m.). According to anecdotal narratives by nurses,

this “does not leave room for unpredictable patient behaviours” which can lead to falls. Staff-patient ratios are based on acuity measurement indicators which administrators review regularly to help determine staffing levels (Watson et al., 2015). Alternative nursing patterns should be explored during busy times on the unit. A fall risk screening tool has to be used as part of a larger fall prevention program and it should not replace a more thorough individualized clinical assessment and the implementation of additional resources to reduce falls.

The premise of a screening tool is to score the risks on a regular basis and implement strategies to reverse the risk factors thereby reducing the score and risk level. Opponents say each case should be treated individually in order to look for reversible risk factors on all patients (Coussement et al., 2008), or concentrate on capturing recurrent fallers and focus more on post-fall assessment and interventions. Ganz, Bao, Shekelle & Rubenstein (2007) searched the literature and determined that having a previous fall (within one year) and having problems with gait or balance put patients at high risk. They suggested that clinicians identify particular patient attributes that can predict falls and then implement effective multifactorial interventions. In a study by Healey, Monro, Cockram Adams & Heseltine (2004), the authors developed a falls reduction program with elderly patients in a general hospital. A care plan was adopted for patients in order to target individual fall risk factors. Risk factors were identified through a general patient assessment and appropriate interventions were applied to reduce falls. The result was a positive reduction in falls. A study by Myers & Nikoletti (2003) compared the use of a risk assessment on admission versus a risk assessment on patients placed on a fall risk care plan. Their research showed there was no significant difference between patients

who had fallen and those who had not. For this to be successful enough resources need to be in place.

The combination of older adults with high acuity and multiple co-morbidities put more demand on nurses and makes it difficult to be at the bedside supervising patients as they transferred, for example, to the bathroom (Hendrich, 2006). To manage resources better the types of falls in hospitals have to be evaluated as well.

When developing the MFS three types of falls were proposed by Morse et al. (1987). In the hospital setting the most prevalent type was 'physiological anticipated' falls which were the type identified by the MFS. The authors found that this kind of fall made up 78 percent of hospital falls. These falls were related to impaired gait, use of walking aids and patients who were intermittently confused. These falls call for immediate preventative measures such as increased supervision and assistance when ambulating. 'Physiological unanticipated' refer to falls related to dizziness and fainting. These occur 8 percent of the time in hospitals. Interventions should include patient teaching on the disease process and medication reactions. 'Accidental' falls can result from tripping over obstacles or slippery floors. These occur 14 percent of the time. Adjusting the environment such as providing proper lighting and flooring could prevent these types of falls. Being educated on the three types of falls that occur in hospitals, along with implementation of prevention strategies, allows staff to modify their care to prevent a fall.

3.5 Study Strengths and Limitations

There are limitations to this study. Firstly, an ideal study would assess falls risk without falls prevention practices in place. However, this practice was not possible, making results suggestive rather than definitive. Secondly, the scope of the findings was confined to the inpatient medicine units in the hospital. Further research needs to be conducted in multiple programs in order to generalize the results across the entire hospital. Thirdly, although the CQI council was representative of the nurses on the units, only some views on the MFS were captured. Interviewing more nurses would have provided greater insight concerning the use of the MFS in clinical practice. This study did inform the hospital of the advisability of adopting a more effective cut-off point for risk assessment. In a broad sense, this study will generate evidence-based data to assist other organizations considering the implementation of a falls risk screening tool.

3.6 Conclusion

In summation, if the MFS fall risk screening tool is preferred as part of a hospital's fall prevention program. If possible, a predictive validity analysis should be conducted prior to its full adoption. A reasonable cut-off score needs to be identified according to the setting with a predetermined balance between sensitivity and specificity. This would deliver a more accurate fall risk score and off-load some of the unnecessary burden nurses face on a daily basis. If contemplating a fall prevention program without the use of a screening tool, an individualized care plan needs to be in place with clear follow-up guidelines and interventions. Interdisciplinary staff would require education on all aspects of patient falls. Even though there are limitations, there is an advantage in a large

sample size used in the study as well as delivering practical recommendations aimed at reducing patient falls.

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Chapter 4

4 Multiple Case Study Analysis of Factors Contributing to Falls in an Acute Care Hospital

4.1 Introduction

Falls are a constant risk for patients in hospitals, particularly for older, more vulnerable adults. Occurring at an alarming rate, patient falls have been shown to be as high as 11.0 per 1,000 patient days (Currie, 2008; Oliver, Healey, & Haines, 2010). Falls can lead to serious adverse consequences, such as the inability to return home, and are a major cause of admissions to long-term care facilities (Health Quality Ontario, 2008). Falls are known to cause psychological harm, such as isolation due to the reluctance of patients to participate in activities for fear of falling again, as well as recurrent falls, physical harm, and even death. Along with the burdens that patients and families endure due to a fall injury, hospital costs also increase. Costs can increase by $30,696 per serious injurious fall, and the patient's length of stay (LOS) can be extended by up to 45 days (Zecevic et al., 2012). An increased LOS impacts emergency departments as they struggle to find beds and relieve hospital "waiting time" pressures.

Hospital administrators are constantly looking for ways to improve falls prevention program through the mitigation of both intrinsic and extrinsic risk factors. Scott, Wagar & Elliott (2010) classified risk factors, using the BBSE (biological, behavioural, social, economic, and environmental) model. Contributing factors are discovered after an investigation and refers to the chain or effect of causal factors leading up to the fall

(Reason, 1998). It is important to identify the contributing factors and implement strategies to prevent a recurrent fall (Safer Healthcare Now, 2015).

Although case studies have been used extensively in social science research (Yin, 2003), there are few in-depth hospital fall case studies in the literature. Case studies provide rich, detailed information that can both transport the reader into the events as they happen (Hartley, 2004) and provide a greater understanding of the context and behaviours surrounding the fall. There has been fall case study research in community settings. Mahler, Svensson, and Sarvimaki (2011) conducted a study that used two fall cases of older persons living in the community, with the aim to understand the personal and professional strategies used for fall prevention. Two health care providers and two social workers were interviewed, along with the fallers. Using Yin's (2003) methodology on conducting case study analysis, the researchers gathered similarities and variations between the two cases to understand the situations and to construct themes. The authors extracted the similar themes (absence of mentioning falls, activity/exercise/physical and strength training, and wishes for daily life at home) and the dissimilar themes (nutrition, medications, coping perspectives, social relations, and mood/temper) from the narratives. The themes implied that a multifactorial fall prevention program should be implemented in the community, however the results did not indicate any particular strategy that would have prevented the falls. Gotzmeister, Zecevic, Klinger, and Salmoni (2015) conducted a study in the community examining eight fall cases and found 247 contributing factors, which were grouped into four themes: (a) riskiness of everyday living, (b) supervision limitations, (c) health care system disconnection, and (d) poor fall-risk identification and follow-up. This study made recommendations for the home setting, such as providing

support, being knowledgeable about falls, and recognizing risks. In a hospital setting similar to the present study, Lee, Gibbs, Fahey, and Whiffen (2013) demonstrated a correlation between hospitalization and patient falls due to delirium (acute confusion state). The researchers used a fictional case for their study to illustrate the effect falls can have on the geriatric population. Their case study was a 75-year-old, male patient admitted to the hospital with dyspnea (shortness of breath). On the third day, when he was expected to be discharged, the patient appeared confused and in an agitated state, and he fell. The authors concluded that prevention of delirium during hospitalization can reduce falls.

The effect of aging was the main risk factor in these articles that used case studies as their research strategy. Gotzmeister et al. (2015) sought to understand the lived experience of octogenarians and how care providers can reduce safety risks. Similarly, Mahler et al. (2011) used case studies to gather the narratives from previous fallers and their care providers. They found a need for health care staff to implement strategies in the community, based on agreement between them and the person at risk. It was also suggested that nurses may be in a good position to incorporate strategies based on evidence and patient-centered care. Lee et al. (2013) reiterated these findings in an acute-care hospital setting. Admission to a hospital produces its own set of fall risk factors, including what Lee and colleagues referred to as *reserve capacity* in the elderly. As people age, their health demands diminishes their capacity to protect themselves in the hospital. They can become disorientated and confused due to age and medical conditions. By examining causes, prevention strategies can be developed to minimize these and similar risks.

One way modern hospitals attempt to learn more about falls and their contributing factors is by recording information about each fall. For example, at the hospital where the present research was centered, the hospital's incident reporting system is called the Adverse Events Management System (AEMS). This system's data has been used to capture incidents and their root causes (Canadian Courseware Development Health Systems, 2016) that were present at the time of the fall. However, this approach lacks the depth that a case study analysis can provide. Present but unseen underlying contributing factors are often absent in this type of report. The purpose of the present study was to conduct a secondary analysis of 11 case studies of falls in the same hospital taken from two previous research projects. The research questions the present study intended to answer were the following: (a) What contributing factors can be uncovered from in-depth case studies of hospital falls? and (b) What fall prevention strategies are suggested from the case study analysis to reduce the incidence of falls in acute-care hospitals?

4.2 Methods

4.2.1 Setting

The present study was conducted in an acute care hospital in Ontario, Canada. The falls took place on the hospital's neuroscience and medicine units. The neuroscience unit consisted of both surgical and nonsurgical neurology patients. Common diagnoses included stroke, brain tumor, and spinal surgery. The medicine unit had patients with chronic and acute medical conditions, such as chronic obstructive pulmonary disease, pneumonia, heart failure, and diabetes. Both patient populations had multiple comorbidities.

4.2.2 Existing hospital fall prevention strategies

Fall prevention is a Required Organizational Practice for Accreditation Canada, which requires hospitals to have fall prevention strategies in place (2015). Every patient admitted to the participating hospital was assessed for the risk of falling, using the Morse Fall Scale (MFS) tool. MFS consists of six items known to increase the risk of falling in the hospital: history of falling, secondary diagnosis, ambulatory aid, IV/saline lock, gait/transferring, and mental status (Morse, 1989). Depending on a patient's risk level (0–25 equaled low risk, > 25 equaled high risk), standard or standard plus extra interventions were put in place to decrease the fall risk (Table 4.1).

Table 4.1 Standard and extra fall-prevention interventions (for scores 25 or greater).

Standard Fall-Prevention Interventions for All Patients (0-24)	Extra Interventions Implemented for High-Risk Patients (25 or greater)
Call bell system within reach and operational	Assessed for contributing factors (vision, UTI, urinary frequency, postural BP, delirium)
Adequate lighting	Patient/family and interdisciplinary team informed of fall-risk status
Orientation to unit, room, bathroom	Fall-risk sign posted
Bed at lowest level, brakes on	"Call Don't Fall" yellow armband applied
Secure, nonslip footwear ensured	Assisted with mobilization
Personal items within reach	Education provided to patient/family
Walking aids, commode, and urinal accessible	Evaluation of current medication
Need for frequent toileting assessed	
Pathway clear of obstacles	

Ensured that bed exiting/equipment/items on patient's strongest side	
Evaluation of current medication that may place patient at risk for falls	

Note. The cut-off score between standard and extra interventions was 25. Interventions are put in place for patients when admitted to the hospital

The extra interventions dealt with communication and intrinsic risk factors. Communication strategies were divided into two parts. First, visual cues, such as a fall-risk sign and a fall-risk armband, helped staff immediately identify the high-risk patient on the unit. Second, effective reporting from one staff member to another indicated the patient's present mobility status and was important for consistent transfer of fall-risk information. The goal was to ensure that all team members in the hospital were aware of a patient with an elevated fall risk. Intrinsic factors included assessments for vision problems, urinary tract infection, urinary frequency, postural blood pressure, and delirium. A reevaluation of the patient's medications was also indicated for this risk level.

4.2.3 Data

Findings from two prior studies were used as secondary data for this research project. The two studies produced a total of 11 patient fall case studies which were conducted in the acute care hospital. The case studies had used the Systemic Falls Investigative Method (SFIM) framework (described in following sections) to collect the data. In the first study, Madady (2013) investigated 22 fall case studies, of which six individuals were recovering from a stroke in the neuroscience unit. The case studies identified contributing

factors linked to the stroke disease process and to systemic issues related to supervision and organizational influences. In the second study, Zecevic, Leat, Brennan, Keeling, Hileeto, and Brymer (2015) investigated five fall cases in a medicine unit. First, the researchers assessed the patients for vision problems, then they investigated the patients who fell in order to identify other possible contributing factors. The present research combined the contributing factors from the two studies to further analyze their findings and look for the prominent contributing factors associated with the falls. The secondary data analysis examined the data with new research questions allowing a more in-depth interpretation of the data (Corti, Thompson, & Fink, 2004).

4.2.4 Data collection and within-case analysis in the original studies

The SFIM was used to collect and analyze data in the 11 cases in the two previous studies. Adapted from the Integrated Safety Investigation Methodology used for investigating accidents in the transportation and industrial sectors, Zecevic, Salmoni, Lewko, and Vandervoort (2007) adapted this framework to investigate falls in older adults.

The SFIM guides the investigator through six steps, which are described below.

1. The data were collected from interviews with the “Faller” (central person in the investigation), “Liveware” (other involved individuals), “Software” (documentation), “Hardware” (equipment used), and “Environment” (F-SHEL). The F-SHEL guide is a way to gather data consistently from sources in the organization, including the patient charts, the equipment used, policy documents, and environmental conditions.
2. A sequence of events was developed that outlined the conditions and processes leading up to the fall, with safety-significant events highlighted and investigated in depth for contributing factors.

3. The generic error-modeling system process was used to determine whether the fall was due to intentional or unintentional actions. The data were analyzed on whether the actions and decisions people took were due to a mistake, an error in judgment, or a lapse in memory.
4. The next step of within-case analysis put safety-significant events into context, using the adapted Swiss Cheese Model of Accident Causation (Reason, 1998). Different layers of Swiss cheese represent the varied levels of safety defenses: organizational factors, supervision, preconditions, and unsafe acts. Organizational factors encompass the service providers and policy makers. Formal caregivers are paid health care providers, such as nurses, physicians, and personal support workers (PSWs). Informal caregivers are family, neighbours, and friends. The preconditions level includes the person's predisposed risk factors that are intrinsic to a person's health and physical abilities as well as the patient's extrinsic environment. The unsafe acts level looks at decisions of the people involved in the fall. The holes in the Swiss Cheese Model represent weaknesses in the various system layers; failures in the system occur if the individual holes line up. The goal is to identify the risk and shrink the holes by putting interventions in place.
5. This step identifies the risks and provides feedback that can be used to reduce falls. This is done through the recognition of unsafe conditions.
6. Developing strategies is the final step, offering recommendations to "shrink the holes" in the various layers of contributing factors and to prevent further falls.

The data analyses in the original studies consisted of within-case analyses and across-case analysis for each separate study. For the purpose of this study, only the findings from the within-case analyses were used. Rigor and trustworthiness in the original studies were achieved by the processes of triangulation, peer debriefing, reflexivity, and providing an audit trail (Houghton, Casey, Shaw, & Murphy, 2013).

4.2.5 The 11 fall cases

For the present research, a total of 11 SFIM reports were included. The case reports contained five sections: Fall Information; Information About the Faller; Investigative Report Summary; Summary of the Contributing Factors, Using the Swiss Cheese Model;

and Conclusions. The reports contained photos and a sequence-of-events diagram to provide specific details for each case.

The average age of the fallers was 68 years old (range of 55 to 84). Seven of the fallers had a stroke diagnosis (i.e., a sudden interruption of blood flow to the brain). A stroke can cause multiple symptoms, including cognitive, sensory, and balance deficits, depending on which part of the brain is affected. One faller had a diagnosis of diabetes (i.e., a disease manifested by insufficient insulin being released from the pancreas), which can result in symptoms such as neuropathy and imbalance. One faller had arthroplasty of the right shoulder (i.e., surgery to correct a joint that has decreased mobility and pain). Another faller had the diagnosis of a heart attack, and another was diagnosed with a previous fall.

Although the patients had different health problems, there were two important characteristics they all shared: being unwell and being in an acute care hospital environment. Another similarity was that all the falls occurred in the patient's room or bathroom (BR) area. This is a common location for hospital falls (Hitcho et al., 2004). There was one patient who wanted to get back into bed after sitting up for lunch. He did not want to call the nurse for assistance, so he rose from his chair and fell. One person fell after getting out of bed while still in restraints. Another got out of bed and fell while walking towards the doorway. The rest of the falls involved entering (five cases) or leaving (three cases) the BR area.

4.2.6 Secondary data analysis

The data analysis process used in the present study was an abridged version of Yin's (2009) steps for multiple-case study analysis and an understanding of the Swiss Cheese Model investigative technique (Zecevic et al., 2007). The present research merged the results of the two previous fall studies (Zecevic et al., 2015; Madady 2013), thus representing both a cross-case and cross-study analysis. This latter point is important to note, since the SFIM investigators varied across studies. There were not only natural case-to-case variations in the fall circumstances and reports, but also study-to-study variations to consider (e.g., different hospital units studied, therefore different foci for the investigations). The present research team consisted of three individuals, all with prior experience on fall research. The primary researcher had over 25 years of experience as a registered nurse in the acute-care hospital. The other two researchers did not have ties with the hospital; however, they had been part of the research teams for one or both of the previous studies. Across the two studies, there were 11 cases with the corresponding SFIM investigative reports.

Coincident with the Plan, Design, and Prepare stages of Yin's model, the three researchers met to discuss a general purpose for the study. It was concluded that an amalgamation of the two studies could lead to a deeper understanding of hospital falls and, hopefully, to improved fall-prevention recommendations. One important aspect of the design for the present study was to maintain the four layers of the Swiss Cheese Model as critical across-case organizers. Most importantly, this meant that factors identified during each of the 11 investigations as having contributed to the falls being investigated would be separated into the organizational, supervision, preconditions, and unsafe acts layers. During the information entry phase of the present work, the primary

researcher entered all the contributing factors into an Excel spreadsheet, according to their layers of defense. In total, there were 549 contributing factors (92 within the organizational layer, 65 in the supervision layer, 255 with the preconditions layers, and 137 factors with the unsafe acts layer). A perusal of the factors by the three researchers indicates that the data did not align itself to a formal content analysis for two reasons. First, there were inconsistencies (e.g., level of detail) in how contributing factors were identified. Secondly, frequencies for contributing factors would not be valid, as individual studies had very different numbers of factors connected to similar aspects of the fall. The next step was for the primary researcher to enter into the spreadsheet corresponding to each contributing factor whether there appeared to be a hospital fall prevention strategy in place coincident with each factor. Of particular interest were factors that contributed to the fall and did not appear to have a corresponding fall prevention strategy as part of the existing hospital fall prevention protocol.

As a next step in the secondary analysis, two of the researchers (BW, AS) met to ensure they agreed on an operational definition for each layer. The operational definitions followed those used by Zecevic et al. (2007), but they were tailored specifically for the acute-care hospital setting. Wiegmann and Shappell (2003) used a similar tailoring process for the Swiss Cheese Model to link it more closely to aviation. This step was deemed important to clarify the time flow of factors as latent and active failures. For example, a staffing policy leading to inadequate supervision of a patient during a night shift could be considered an unsafe decision, but it is not considered an active failure, since its negative consequences are not immediately experienced. The operational definitions for the four defense layers of the Swiss Cheese Model are as follows.

Organizational factors layer. Organizational factors represent policies and practices that define how work is done throughout the hospital. They are driven by multiple influences, including government legislation, accreditation standards, and safety guidelines. Organizational factors include decisions related to planning, design, and communications throughout the hospital, and they pertain to all staff, physicians, students, and volunteers.

Supervision layer. Supervision refers to hospital staffing, which includes for example, nurses who provide direct patient care, physiotherapists (PTs) and occupational therapists who provide patient therapy, and nursing leaders who manage the resources in the departmental units. Areas of concern can be linked to factors such as lack of staff to assist patients or staff unfamiliar with patient routines.

Preconditions layer. Preconditions relate to factors intrinsic to the patient or to extrinsic factors in the patient's immediate environment (most often the patient's room/bathroom). Intrinsic factors consider the patient's physical abilities (e.g., muscle strength or balance) and mental capacity (e.g., confusion), and they are most often related to disease processes. Extrinsic factors consider the hospital environment and the equipment needed for medical and personal care.

Unsafe acts layer. Unsafe acts encompass individual errors or violations with effects almost immediately manifested in a fall. Errors can be due to poor decisions and judgment or to lack of insight into possible consequences. Violations can flow from noncompliance or a failure to follow protocol. The patient, nurse, or other health care team members can initiate or become involved in unsafe acts.

The first three layers (organizational factors, supervision, and preconditions) are considered latent conditions, which present opportunities for adverse events to occur but lay dormant until an unsafe act occurs to expose these weaknesses in the fall prevention system. Unsafe acts are active failures that lead rather directly (in time) to a fall.

Once the operational definitions were agreed upon, the next step for the two researchers was to separately read through the lists of contributing factors in the Excel spreadsheet to identify the major categories of contributing factors. No attempt was made to complete a line-by-line coding of factors; rather, the researchers simply created a list of the key categories of factors in each layer. These key categories were derived both by the wording of individual contributing factors (as found in the original case reports) and a familiarity of the case studies themselves and hospital falls. After each researcher developed his or her own list, they met to come to consensus on the most important factor categories identified. Once consensus was reached for the most important groupings (e.g., patients transferring themselves without assistance), any unused contributing factors not fitting into these categories were discussed, then discarded if deemed less important. Some factors could be very specific to a single case and, therefore, of no general cross-case value. The primary researcher also checked the discarded factors to determine whether they were connected to the existing fall prevention strategies. Of particular interest was whether any “discarded” factors could be connected to an easily identifiable, generalizable prevention strategy that could be implemented without undue effort to hospital work practice.

4.3 Results and Discussion

The data consisted of 549 contributing factors associated with 11 adverse fall events; less than one half (208 contributing factors) had a fall prevention strategy in place. For the organizational factors layer, there were 92 contributing factors; for the supervision layer, 65 contributing factors; for the preconditions layer, 255; and in the unsafe acts layer, there were 137 contributing factors, as illustrated in table 4.2.

Table 4.2 Contributing Factors (N = 549)

Levels of Swiss Cheese Defenses	Neurosciences Cases						Medicine Cases					**Total**
	1	2	3	4	5	6	1	2	3	4	5	
Organizational	7	3	3	1	5	5	10	19	12	17	10	92
Supervision	4	7	7	9	4	2	7	7	5	10	3	65
Preconditions	18	15	18	22	24	18	39	33	15	34	19	255
Unsafe Acts	8	9	10	10	12	5	22	20	11	22	8	137
Total	37	34	38	42	45	30	78	79	43	83	40	**549**

Note. Number of contributing factors per case study at each safety defense layer

For the organizational factors layer, categories of contributing factors were identified as policy on staffing levels, practice of moving patients to different rooms, and lack of clear policy concerning restraints and the use of bedrails. For the supervision layer, the categories identified were ineffective communication, staff's lack of awareness of patient needs, and the efficiency-thoroughness trade-off (ETTO) effect. For the preconditions layer, the categories identified were cognitive impairment, impaired mobility, patient medications, and the patient's room and bathroom environment. For the final layer, unsafe acts, the categories identified were patients transferring without assistance and improper use of the call bell. All 11 of the cases illustrated at least one or a combination of these categories. Table 4.3 shows a synopsis of the categories.

Table 4.3 Results of Across-Case Coding Process and Recommendations

Defense Layer	Categories of Contributing Factors	Operational Definition With Examples of Contributing Factors	Falls Prevention Strategy in Place (Yes/No)	Recommendations
Organizational factors	Policy on staffing levels	Refers to nurse-to-patient staffing ratios; examples include accounts that an RN-to-patient ratio of 1:5 is less than what staff perceives to be optimal; another example is the fact that during lunchtime and nursing breaks, staffing levels are reduced by 40–50%	No	Make changes in policies and procedures related to staff-to-patient ratios, particularly in high-risk areas
	Practice of moving patients to different rooms	Refers to patients who are moved from one unit to another or from one room to another on the same unit during the course of their hospital stay; to free up emergency room space, the admitting department transfers patients between available rooms	No	Evaluate practice of multiple patient moves
	Lack of clear policy concerning restraints and the use of bedrails	Refers to the lack of clarity in the restraint policy that leads to inconsistent use of restraints and the inappropriate use of bedrails; an example is when there is	No	Regularly review policies and procedures on alternatives to

		no standard practice on the unit for how often bedrails should be raised to discourage patients from attempting to return to bed independently		restraints; incorporate implications for bedrail use into existing restraints policy
Supervision	Ineffective communication	Refers to a failure of information shared from staff to patient and/or staff to staff; examples include nurses assuming patients would follow given instructions; a physiotherapist (PT) who unsuccessfully attempted to teach a patient to call for assistance when ambulating; and ineffective communication from staff to staff when an arriving nurse was not informed of a patient's anxiety or impulsive behavior	Yes (Inform patient/family and interdisciplinary team of fall-risk status)	Use College of Nurses Therapeutic Communication Standards, SBAR communication tool, and CEM
	Lack of awareness of patient needs	Refers to unfamiliarity with the patient and/or their care needs; examples include a nurse being new to taking care of a patient or another not being aware that the patient had vision problems	No	Conduct safety huddles at the beginning of each shift
	The efficiency-thoroughness trade-off (ETTO)	ETTO occurs when staff attempt to balance efficiency and thoroughness when completing tasks; examples include a nurse being too busy to check on the patient every 15-20 minutes; nurses know that best practice is to reposition a	No	Promote a safety culture in which staff can adjust their work while trying to maintain efficiency

		patient with a pressure ulcer at least every two hours, but they are unable to achieve this due to looking after other patients who also require their attention; more examples include not reapplying restraints before leaving the side of the patient or not being able to dedicate sufficient time to each patient		
Preconditions	Cognitive impairment	Refers to a patient having episodes of confusion while in the hospital; for example, a patient was confused and unable to understand where he was due to having a right caudate putamen stroke, which affected cognition; another example involved patients with cognitive impairment due to an acquired brain injury or having a mild cognitive impairment with short-term memory difficulty	Yes; assess for contributing factors (vision, UTI, urinary frequency, postural BP, delirium)	Practice cognitive care to reduce and manage confusion
	Impaired mobility	Refers to a patient with limited ability to move without staff assistance; for example, a patient with a stroke had difficulty with her balance, one was unstable and had difficulty controlling limb movements, one suffered from Parkinson's disease, and one's visual acuity and depth perception were impaired, making mobility more challenging	Yes (assist with mobilization; ensure walking aids, commode, urinal are accessible)	Integrate exercise with patient care within the first 24 hours of admission to limit deconditioning effects from immobility

	Patient medications	Refers to the medications that are ordered for patients, which contribute to polypharmacy; for example, a patient was taking 11 medications; another was ordered 15 different medications while in the hospital; there were some medications that were contraindicated because they posed a fall risk, examples including being ordered medications such as benzodiazepines and narcotics	Yes (evaluation of current medications)	Alert staff when a high fall risk medication has been ordered and verify that it is the most appropriate medication for the patient (Beers Criteria)
	Patient's room and BR environment	Refers to a patient's immediate environment while in the hospital; examples include clutter from hospital furniture and equipment such as furniture, oxygen tubing, and patient walkers	Yes (pathway clear of obstacles)	Assess P-E fit; conduct environmental scans (part of comfort rounds)
Unsafe acts	Patient transferring without assistance	Refers to patients choosing to not use the call bell or to wait for assistance before transferring; examples include transferring independently from the bed to go to the BR, leaving the BR area to return to bed, and transferring out of a wheelchair to get into bed	No	Conduct comfort rounds and observational care
	Improper use of the call bell	Refers to staff not answering a call bell promptly; can also refer to patients not using it to call for assistance; examples	Yes (call bell system within reach and	Provide clear guidelines for using and answering call

	include when the nurse heard a call bell on her nursing phone but did not respond immediately as well as when a patient ignored a PT's instructions to use the call bell to call for assistance when he was finished	operational)	bells

Notes. SBAR refers to situation, background, assessment, and recommendations. CEM refers to communication enhancement model. P-E fit refers to person-environment fit model. Safety huddles are short, regular meetings among the health care team members for the purpose of discussing patient needs. Cognitive care refers to applying activities shown to reduce confusion and delirium in the hospital. Beers Criteria refers to a regularly updated list of medications that are harmful to seniors. Environmental scans are a systematic way to visually examine the surroundings for safety risk factors. Observational care is providing one-to-one constant observation at required time intervals. Comfort rounds are regular patient checks to anticipate needs and provide care

4.3.1 Organizational factors

Policy on staffing levels

Seven cases indicated staffing levels were a contributing factor on the organizational factors layer. Investigations discovered that the nurse-to-patient ratio can decrease from 1:4 before staff breaks to 1:8 when covering for breaks (Medicine Case 1 in Appendix). There may not be an optimal prescribed ratio, because patient demands can be irregular throughout the day and night. Staffing levels should be determined by the likelihood of patients going for tests and the need for additional staff to help with transfers (Kalisch, Tschannen, & Lee, 2012). Units should tailor their staffing levels according to the needs of the patients and the periods with increased activity. Increasing staff during busy times in areas that report the most falls, such as neurology and medicine units (Watson et al., 2015), could be a fall prevention strategy to support staff as they assist with patient transfers. Dunton, Thompson, and Fink (2004) conducted a study involving four acute care hospitals in which they found there was a correlation between the number of patient falls and the number of nursing staff. Hospital administrators, along with unit leadership, decide on staffing ratios. Their decisions are based on patient classification indicators entered by staff per the patients' plans of care for each shift. This information is entered into a computer database, which helps determine a nurse's workload according to patient needs. A patient who is deemed at high risk for falls would be classified accordingly with high risk extra strategies put into place. Workload measurement analysts, along with administrators, examine the data in order to allocate the resources (staff, in this case) necessary for the care of the patients. Reassessing the staff-to-patient ratios in high risk areas could be an effective strategy to reduce falls.

Practice of moving patients to different rooms

On the organizational factors layer, three of the cases reported that the patient was moved to a different room during his or her stay in the hospital (Medicine Cases 1, 2, 4 in Appendix). Multiple room transfers can occur for several reasons. One reason is to reduce the number of patients in the emergency department. Hospitals can operate above capacity, meaning there are more patients than beds available. Patients may be moved to a temporary unit where there are beds available, then moved again to an appropriate area. In one case, a patient was moved to four different rooms. Another reason for multiple room transfers may be isolation precautions to protect patients from infection transmissions in the hospital. Unfortunately, multiple moves can have negative consequences. Each time a patient is moved to a different environment, his or her risk for confusion increases, which in turn can elevate fall risk. A study by Morgan, Pineles, Shardell, Graham, Mohammadi, Forrest, Reisinger, Schweizer, and Perencevich (2013) found that moving patients to precaution rooms caused patients to feel more isolated, with less interaction with health care workers, less patient monitoring, less visitor contact, and more risk for an adverse event to occur. In two cases, this sentiment was shared as a contributing factor: "Entering the faller's room would require both nurses to dress up in protective equipment, which is time-consuming . . . frequent room changes prevent continuous patient-centered care" (Zecevic et al., 2015). Familiar surroundings are changed, and familiar equipment may also be changed. In one case, the patient had to be re-educated on how to use a walker assigned to him while in hospital, which was identified as a contributing factor of his fall. Investigations also discovered that the hospital spends $200 for each patient room transfer. An improved policy on patient room

changes can cut this cost and improve patient-centered continuity of care and safety. This can be inserted into the fall prevention strategies that already exist.

Lack of clear policy concerning restraints and the use of bedrails

Per the hospital's Use of Restraint policy, restraints are anything that is applied to restrict the patient in any way. It can also mean an object that can limit the patient's ability to move and/or can keep them in a certain area (Hospital Policy, 2016). This policy directs all staff to utilize alternative measures before applying restraints, such as involving family members, maintaining a safe environment, diverting or redirecting attention, engaging in social activity, reducing environmental stimuli, and increasing frequency of observation. Applying physical restraints to patients, such as the Pinel system mentioned in the fall cases, can cause agitation and increased confusion, which can lead to falls. Restraints have been found to cause falls and injuries (Tan, Austin, Shaughnassy, Higgins, McDonald, Mulkerrin, & O'Keefe, 2005). For this reason, hospitals generally adopt a minimum restraint policy. This requires staff to apply restraints that will be the least restrictive. For example, a waist restraint will prevent a patient from getting up, but it will still allow free movement of arms and legs.

Raised bedrails can be considered a form of restraint, since they restrict a person to a specific area. They are often used by nurses to prevent patients from falling and are marketed as a fall-prevention safety feature on beds (Healey, Oliver, Milne, & Connelly, 2008). However, in one case a patient climbed over the bedrails, only to realize she needed help to ambulate. She wanted to get back into her bed, but she could not because the bedrails were raised, so she fell to the floor next to her bed (CNS Case 2 in Appendix). Climbing over bedrails and falling from a greater height can cause greater

injury than falling without bedrails raised (Bowers, Lloyd, Lee, Powell-Cope, & Baptiste, 2008). With all four bedrails up, patients cannot go anywhere but over the rails. Healey, Oliver, Milne, & Connelly (2008) as well as Bowers (2008) recommend not using bedrails, instead implementing alternatives such as low beds and floor mats. Revising the restraint policy to include a maximum number of raised bedrails (e.g., leaving at least one rail down, so there is space for the patients to get up and leave) could be an effective step to insert into an existing fall prevention strategy.

4.3.2 Supervision

Ineffective communication

Good communication in hospitals is vital for safe patient care. In these cases, ineffective communication among staff and between staff and patients were contributing factors. Typically during patient handoff, the outgoing nurse reports to the incoming nurse. However, the lack of a structured approach can cause staff to omit pertinent information. In two cases, PTs assisted patients to their rooms after therapy. The patients got up and fell while waiting for assistance (CNS Cases 3, 4 in Appendix). No verbal report was given to the nurse when the patient was returned to his or her room or to the BR. The SBAR (situation, background, assessment, recommendation) verbal communication tool is an effective form of handing off patient care from one staff to another (Institute for Healthcare Improvement, 2016). The "situation" provides the reason for the report; "background" gives a brief, pertinent history; "assessment" forwards any problems; and "recommendation" allows critical thinking in solving any problems that could occur (e.g., a fall) (Andreoli, Fancott, Velji, Baker, Solway, Aimone, & Tardif, 2010).

Implementation of this communication tool could provide a consistent method of transferring information between staff.

Good communication between staff and patients is also important for optimal safe care. Health changes in patients can affect communication skills, including age-related changes, such as with hearing (patient may require hearing aids, certain pitches may be harder to hear), vision (hearing may be more difficult if the patient is not seeing the person, glasses may be needed), processing information (reaction time to noise, lights, clutter), and memory (involving recent memory or new learning—significant when giving instructions). Neurological, depressive, and physical illnesses as well as medications can influence and impede communication. Adopting a supportive communication model, such as the Communication Enhancement Model (CEM), can counteract these conditions. The CEM can be used to promote safety by modifying communication according to the patient's needs (Ryan, Meredith, MacLean, & Orange, 1998). It focuses on the ability of the patient and includes continuous assessment prior to patient interactions. When giving instructions, such as for calling for assistance, the message may not be understood by the patient. Instructions were given to call for assistance in all cases, but in nine cases the patients got up without assistance. Staff need to be sure instructions are heard and understood by having the patient perform the call bell procedure in front of the nurse.

Lack of awareness of patient needs

In three cases (CNS Cases 2, 3, 5 in Appendix), investigations identified a contributing factor being nurses' unfamiliarity with their patients. Performing safety huddles may be an effective strategy in this instance. With this strategy, team members gather and discuss

pertinent patient information, such as information on whether a patient has had a recent fall. Safety huddles are meant to be short, between 5 and 10 minutes in length, and they should be done on a regular basis, at a regular time and place (Spiva et al., 2014; Quigley et al., 2009). The procedure raises staff awareness about patients on the unit so that care can be prioritized and become more efficient during busy times. The patient's medical condition, mobility status, ulcers, dizziness, and any other disease process concerns are discussed, and pertinent safety issues are highlighted. Staff can then adjust their care per the needs identified in the safety huddles. If elimination is raised as an issue, staff can organize their care to toilet every two hours. Bathroom issues were most involved with falls (seven cases). Safety huddles highlight important information and issues such as this to update staff and help them with their priorities in patient care.

Efficiency-thoroughness trade-off (ETTO)

During periods of increased activity on the units and decreased supervision, staff prioritize their work according to the presumed needs of the patients and the tasks at hand. In a hospital setting, this can be a continuous process, as patients' conditions change and staff supervision levels fluctuate. The ETTO principle may operate, representing a trade-off between efficiency and thoroughness (Hollnagel, 2009). The ETTO principle describes the common response of people to adjust to meet their work needs. Hollnagel, Wears, and Braithwaite (2015) suggest a balance between patient safety and hospital productivity. In one case study (CNS Case 4 in Appendix), it was stated, "[the] RN is very busy caring for five other patients and can't assist faller immediately" (Madady, 2013). On a busy unit, staff can find it difficult to perform their routine duties plus those that can prevent a patient from falling. Expectations of thoroughness and

efficiency can put staff in a position in which they must choose one over the other. Hollnagel et al. (2015) proposed the Safety-I model, which equates safety failures with adverse events in organizations such as hospitals. They recommended a safety culture to emphasize “work-as-done” rather than “work-as-imagined.” This means that the clinical work performed by staff is valued and constraints are not imposed on day-to-day workloads. Clinical work must be flexible to adjust to the changing demands.

4.3.3 Preconditions

Cognitive impairment

Being a patient in a hospital can lead to disorientation and acute confusion, which are risk factors associated with falls. There were eight cases in which cognition was recognized as a contributing factor. These conditions relate to the patient’s disposition and environment. Patients coming into a hospital may not have had any previous confusion episodes or falls. However, being unwell (predisposing factors) and being in a hospital environment (precipitating factors) can lead to increased risk for confusion and falls (Inouye, 2000). Although the authors did not look at acute care settings, in a systematic review citing 27 studies, Muir, Gopaul, and Montero-Odasso (2012) found that cognitive impairment was associated with falls. Inouye (2000) proposed interventions such as providing reality orienting and therapeutic activities to reduce cognitive impairment in the hospital. Examples of therapeutic activities include engaging the patient in discussions about current events and allowing the patient to reminisce. Asking the patient basic questions can help keep the patient oriented and mentally alert while in the hospital. This could reduce poor judgment and impulsive behaviors, such as risk taking.

Impaired mobility

Each studied case portrayed the patient as having impaired mobility, defined as a limitation in independent physical movement, which can be associated with falls (Slaughter, Estabrooks, Jones, & Wagg, 2011). Patients had problems with mobility, such as an unsteady gait, being deconditioned, and being unable to regain balance. An example was the patient who had finished brushing her teeth at the sink. She stood up, lost her balance, and fell over the walker. Up to 65 percent of older adults can lose mobility while in the hospital (Gill, Gahbauer, Han, & Allore, 2011; Covinsky, Pierluissi, & Johnston, 2003). There could be multiple reasons for impaired mobility in the hospital setting. Medications such as antidepressants, narcotics, and sedatives are known to cause motor impairment, dizziness, and weakness. All the cases dealt with at least one of these drugs. Pain and discomfort can affect mobility. Pain from ulcers can limit the patient's ability to move freely, as with the patient who had an ulcer and tried to go back to bed. Decreased muscle strength from deconditioning can also cause impaired mobility (Gillis & MacDonald, 2005). There are strategies to improve mobility while in the hospital, such as assessing a patient's mobility status during each shift and integrating mobility exercises into the care plan. Active and passive ROM (range of motion) exercises can be applied if the patient is unable to get up, and regular ambulating routines can prevent deconditioning and help maintain balance. The Mobilization of Vulnerable Elders in Ontario (MOVE ON) program was developed to increase patients' mobility and improve outcomes. They accomplish this by assessing patients' mobility status within 24 hours of admission to hospital and monitoring progression and frequency of mobilization. Patients who can ambulate should be encouraged and assisted to ambulate three times per day,

with the distance progressively increasing, this improves mobility and other health care benefits (Slaughter et al., 2011).

Patient medications

The majority of cases (9 out of 11) mentioned medications as a contributing factor of investigated falls. Known medications that can contribute to falling include antipsychotics, hypnotics, vasodilators, narcotics, and antidepressants (Montero-Odasso, Levinson, Gore, Tremblay, & Bergman, 2007; Oliver, 2007; Rubenstein, 2006). In these cases, medications such as lorazepam, hydromorphone, furosemide, and ramipril were ordered for the patients and were identified as contributing factors of their falls. Each patient was taking at least five different medications, which signified *polypharmacy*, a term used to describe multiple medications taken together. Polypharmacy is a "geriatric syndrome" that can increase the adverse effects of the medications, due to pharmacokinetics and aging (Pretorius, Gataric, Steven, Swedlund, & Miller, 2013). The effects can contribute to drug-related problems, such as dizziness, weakness, low blood pressure, and falls. In a study conducted by Rubenstein (2006), it was found that medications are an identifiable risk factor and that falls can be prevented. Pharmacists can play a role in preventing falls by issuing a pharmacy alert when a fall risk medication is ordered. Beers Criteria (2016) lists medications that increase safety risks for seniors. The list is updated regularly to assist pharmacists and other health care providers. By using the electronic medication administration page, pharmacists can alert nurses of the medications that increase fall risk. Certain precautions can then be implemented, such as performing "lying and standing" orthostatic blood pressures (patients remain supine to take a blood pressure, then standing for at least one minute before measuring a standing

blood pressure). Patients with a significant orthostatic blood pressure drop should be instructed to sit at the side of the bed for two minutes before transferring, and with reconsideration of the time of day certain medications are administered. Nurses can adjust for higher risk if prompted with the alert while administering the medications, and they can review safety measures in the moment with the patients who are receiving high-risk medications.

Patient's room and bathroom environment

The patient environment with medical equipment and hospital furniture plays a role in patient falls. Walkers and furniture were involved in three different case studies (CNS Case 4, Medicine Cases 1, 5 in Appendix). As patients become more medically complex, the hospital environment needs to adjust to help them adapt to their limitations. Iwarsson (2009) identified how falls can be reduced based on the person-environment fit model, which states that patients adapt to change depending on each person's abilities, their environment, and the demands it places on them. Of concern in the acute care setting is that patients can be inundated with medical equipment. In one case, a patient used a walker that belonged to a friend and was not meant for him. This was a contributing factor on the unsafe act layer which led to his fall event. In another case, a patient rose from sitting on her walker and fell over it. Another problem occurred when patients were transferred to different programs that required different physiotherapy equipment. Unfamiliar equipment is a risk before the patient gets used to it. More patient teaching around ambulatory equipment may be warranted. Environmental scans can also be implemented to identify environmental safety hazards, such as an oxygen tube on which the patient can trip or a chair blocking the entrance to the bathroom. This procedure

involves a generic checklist that designated staff (e.g. nurses, PSWs) can complete as they look around the area, ensuring risks are identified and safety measures are implemented to protect the patient from tripping and falling. Reviewing the checklist requires staff to perform a 'walk-around' in the patient's surroundings, looking for anything that might be a safety risk and removing it. Environmental scans are usually completed every hour, and any staff member can conduct them.

4.3.4 Unsafe acts

Patients transferring without assistance

Even though patients were instructed to call for assistance before transferring alone, some disregarded instructions, got up without assistance and fell. At times, patients may not use the call bell to ask for assistance getting up because they are confused. Five cases involved this type of fall. Comfort rounds and bed/chair exit alarms can be implemented to help reduce falls in this situation. A comfort round is a strategy in which nurses and/or Personal Support Workers (PSW) attend to their patients at least once every hour. While it is not always possible to increase patient observation, comfort rounds enable staff to anticipate the patient's needs, which could reduce his or her need to get up unsupervised. Goldsmith (2015) completed a project that incorporated this process into a safety program. It was described as purposeful patient rounding, denoting rounds with specific intentions. Using the "six Ps" (pain, personal care, position, pumps, possessions, and promise), they would assess pain; assist to the bathroom, if necessary; reposition the patient, if necessary; check pumps for trip hazards and programming errors; ensure personal belongings were nearby to prevent overreaching and losing balance; and let the patient know approximately when the nurse would return. As part of comfort rounds,

staff would also conduct an environmental scan around the patient's immediate surroundings. This procedure provides a consistent and intentional approach to patient safety.

Improper use of the call bell system

Tzeng and Yin (2009) found in their study that the call bell system had three components: to answer when it was activated, to address the patient's request, and to respond appropriately. The authors found that it was frustrating to patients when these three components were not completed. They also found that nurses saw the call bell system as noisy and as interruptions to their work. However, the call bell system is an integral part of communication in hospitals, as it allows information to be relayed between patients and staff when they were not together. This is essential to let staff know that the patient requires assistance and to let the patient know when staff will respond. This form of communication relies on adequate staff training and staffing levels, proper patient instruction and appropriate use so that patients may be reassured that help will come and will not attempt to stand unassisted. In the case studies there were instances in which the patient did not use the call bell when needing assistance and there were instances in which patients rang the call bell in futile attempts to get assistance. In one case, the patient rang the call bell 19 times before getting up unassisted and falling (Medicine Case 3 in Appendix). A consistent call bell system should have guidelines to determine the person responsible for answering call bells and the purpose for using call bells, creating two-way systems across the hospital to alert staff and to reassure patients that they will get help and they do not have to get up alone.

4.3.5 Summary

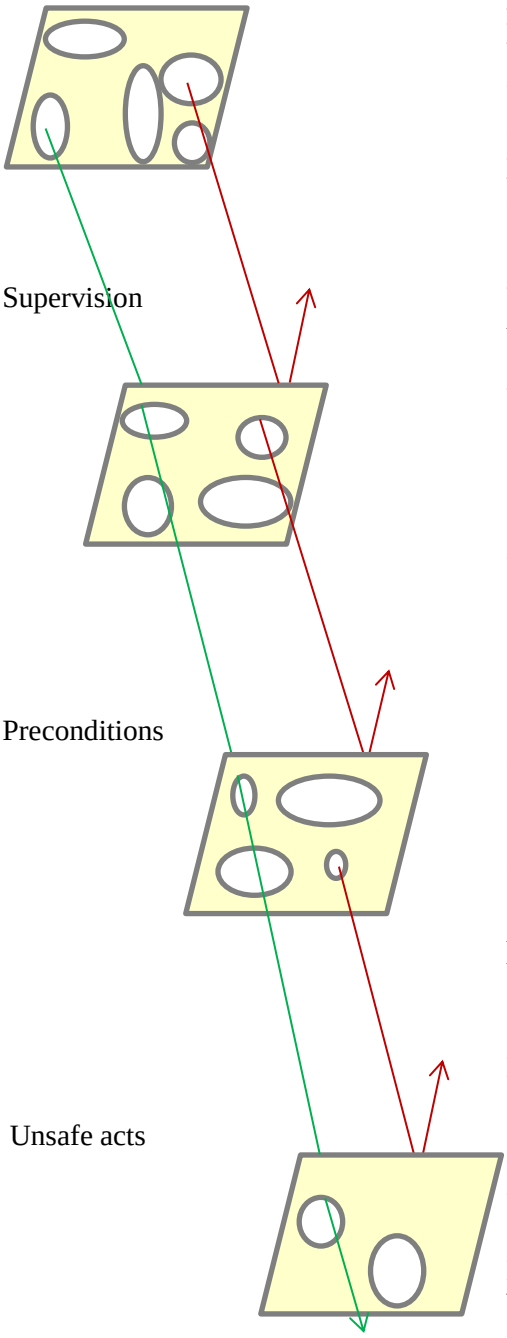
This study examined data from two previous studies that helped explain the contributing factors associated with falls in an acute care hospital. Through in-depth investigations and a system-wide approach using the SFIM framework, contributing factors emerged at each defense layer. Trends and patterns from those studies helped form categories that enabled systematic recommendations to surface. Reason (1998) constructed defense layers to illustrate how adverse events can be minimized by adhering to safety practices in each layer. In the first three layers (organizational factors, supervision, and preconditions), "latent" conditions exist, which can result in an adverse event. In the fourth layer (unsafe acts), "active" failures can occur, also resulting in an adverse event. All the cases had latent conditions attached to them. From the organizational factors layer to the preconditions layer, patients were susceptible to hazardous conditions during their hospital stay, which may have been thwarted if the latent conditions were averted along the Swiss Cheese Model pathway. An example of this is the case in which a chair was left behind the door leading to the bathroom, keeping the door from opening fully. Other patients and staff walked around the chair until the patient tried to take his walker through the narrowed door opening to use the bathroom. By not addressing the contributing factor and averting the hazard, the latent risk turned into an active one, which ultimately led to a fall.

Recommendations were based on strategies along the pathway of each defense layer and category. For example, on the organizational factors layer, there are criteria regarding the number of staff employed in the units. The nurse-to-patient ratio is based on patient workload measurements along with leadership input. These workload measurement indicators can be reassessed to include the times when the nurse-to-patient ratio was low due to staff leaving the units for breaks or during times of high activity. Going through

this defense layer to the supervision layer, the ETTO principle can come into effect. With fixed resources and limited time, staff can lose sight of safety as they try to manage their tasks. A safety culture needs to be built to promote the ability to adjust to conditions while still paying attention to detail. Going through supervision to the preconditions defense layer, patients who become confused are twice as likely to fall as those who do not. Every effort needs to be made to decrease the patient's risk for confusion while in the hospital and eliminate precipitating factors such as restraint application and/or polypharmacy. Therapeutic activities provided by a recreational or behavioural therapist can help keep the patient mentally aware and less confused. Going through the preconditions layer to the unsafe acts defense layer, patients transfer without assistance. At this point, the pathways through the four defense layers line up for a fall to ensue. Utilizing alternatives to restraints, such as bed exit alarms, comfort rounds, and one-to-one observational care, can prevent the unsafe act. This is illustrated in Figure 4.1.

Figure 4.1 Recommended Interventions

Categories	Swiss Cheese Model	Recommendations
Staffing level	Organizational factors	Changes in policies and procedures, i.e., staff-to-patient ratio in high-risk areas
Room moves		
Restraints		Regular review of policies and procedures, e.g., limiting patient moves and utilizing alternatives to restraints
Ineffective communication	Supervision	Use SBAR communication tool
Lack of awareness of patients' needs		Use CEM
ETTO		Conduct safety huddles
		Promote safety culture
Cognitive impairment	Preconditions	Integrate activities as part of cognitive care
Decreased mobility		Integrate exercise with patient care
Patient medications		
Patients' room and BR environments		Assess P-E fit of patients and their surroundings
		Implement alerts according to Beers Criteria
Patients transferring themselves without assistance from staff	Unsafe acts	Conduct environmental scans
		Place on observational care
Improper use of the call bell system		Develop guidelines for call bell use



Note: As defenses are breached, arrows move from one defense layer to another and a fall occurs, but they can be deflected when the holes get smaller due to interventions. The more risks there are (holes in the Swiss Cheese analogy), the more chance there is for an adverse event to occur.

It is important to recognize that the different layers, or categories, may have some "holes" that cannot be fixed. For some patients, there will be no way to prevent all the holes from closing. In such a case, a tailored practice must be set in place to meet the needs of the individual patient and unit environments. Hospital safety institutions, such as Accreditation Canada, offer generic fall prevention standards to follow, but in some instances, individual departments do not fit the generic mode. For example, in some departments a screening tool may not be required, because it can be concluded for that department that all or most patients are at the highest risk for falls (e.g., the elderly and those with osteoporosis pose a risk for falling). All interventions should be in place, regardless of the score. The Neurosciences and Medicine Program units were used in this study. These units generally see the majority of patient falls (Watson et al., 2015; Bouldin et al., 2013). Recommendations include implementing individual care plans with fall safety devices, such as low beds, hip protectors and fall mats.

4.4 Limitations

Secondary data was used for this study. Although reusing qualitative data can be a source for rich and "deep" information, arguments may be made against the use of this design. Preselected case studies did not allow the present researcher to have the same knowledge and context that the original researcher had with the participants. Unfortunately, this also meant that there was no opportunity to immerse oneself in the field and witness firsthand the context as well as the verbal and nonverbal behavior of the participants, which are valuable elements of a study. Another limitation is the results cannot be generalized. Findings showed common situations in which falls occurred, such as going to and returning from the bathroom without assistance. Procedures can be set in place to address

toileting needs, but further studies are required in other hospitals to validate the results and apply them to other organizations.

4.5 Future Recommendations

This study demonstrated how hospitals can benefit from the case study approach. The analysis illustrates the use of the SFIM framework to conduct a thorough investigation on the reasons why patients fall in the hospital and identifies a number of key issues for further research. One recommendation could be to continue this form of study, using hospital case studies, and to continue to outline contributing factors for falls in acute care hospitals. Another recommendation could be to implement strategies proposed and evaluate their effectiveness. For example, high-risk areas, such as the neurology and medicine units, should be provided with additional resources during busier blocks of time. Patient transfers should be limited to reduce problems such as confusion and staff unfamiliarity with the patients. Strategies such as comfort rounds can be implemented to check on patients more frequently, anticipate their needs, and scan the immediate surroundings for safety hazards. The effectiveness of call bell use is another issue for researchers to pursue. Clear guidelines on call bells' use and respondents are necessary. This would be accomplished with staff education, implementation of the strategy, and follow-up audits. Lastly, gather patient views and perspectives through interviews on fall safety and hospitalization. This insight can raise staff awareness on why some falls occur. The ETTO principle requires further study in the hospital setting to ensure staff achieve a balance between efficiency and patient safety. Emphasizing patient safety in policy development and staff teaching can promote this approach.

4.6 Conclusion

The purpose of this study was to examine hospital fall cases and to learn the contributing factors for patient falls in an acute-care hospital. This was a unique approach, since no prior hospital fall data had been presented in this way. The research questions of what contributing factors can be uncovered by using in-depth hospital case studies and what fall prevention strategies can be suggested were answered by this study methodology. By using the case studies, which incorporated the SFIM framework, this study was able to probe deep into the data and hospital practices, revealing that existing fall prevention strategies are not effective and additional strategies are needed to prevent falls in the hospital setting. Hospital policies, increased unit activities, disease processes, the environment and patients transferring without assistance dominated the reasons for increased risk. By concentrating on the underlying issues associated with patient falls, changes can be made to close the gaps on the four different defense layers in which the safety failures seep through, thus producing a more effective fall prevention program.

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Chapter 5

5 General Discussion

5.1 Discussion

Fall prevention is a genuine concern for hospitals, patients, families, and society. Falls lead to physical, psychological, and financial hardships, which can increase hospital lengths of stay, institutionalization, and deaths. Previous research on falls addressed fall prevention; however, with an aging population and an increase in fall rates (Safer Healthcare Now, 2015), further studies have been needed. The fall prevention literature points to multifactorial strategies of assessing risk, the environment, and education to reduce falls (Gu, Balcaen, Ni, Ampe, & Goffin, 2016). In the hospital, risk assessment tools are developed to measure the patient's fall risk while in the hospital. However, some literature suggests removing the tools and relying on staff assessments and individual care plans to assess risk (Healey, Munro, Cockram, Adams, & Heseltine, 2004). The second component of a multifactorial fall prevention program includes assessing and modifying the environment. Being a patient in the hospital can cause acute confusion, decreased mobility, and loss of function. Adjusting the patient's surroundings can help the patient adapt as well as help the hospital avoid these conditions and provide a safe environment. This adjustment includes removing hazards, providing assistive devices, and communicating the potential risk to all care providers.

The studies conducted over 4 years analyzed patient falls and prevention strategies in an acute-care hospital. The setting was a multisite teaching hospital with over one million visits and approximately 50,000 admissions per year. The purpose of the research was to

examine falls, identify contributing factors, and recommend strategies to reduce fall occurrences. The research questions included:

1. What variables were associated with falls and injurious falls over five years?
2. What were some of the problems associated with using a central incident reporting system?
3. Was the MFS appropriate to use to identify patients at risk for falling?
4. What contributing factors can be uncovered from in-depth case studies of hospital falls?
5. What fall prevention strategies are suggested from the case study analysis to reduce the incidence of falls in acute-care hospitals?

The first study provided an overview of factors associated with falls using an Adverse Events Management System (AEMS) database. The system is used by staff to report incidents and identify factors present at the time of the fall. The primary focus of this study was to identify the variables associated with falls and injurious falls.

The study found most falls occurred between 10:00 a.m. and 12:00 p.m. Further investigation found there was high activity on the units during this time frame as well as fewer staff present to supervise patients. It was also found that most falls occurred during a patient transfer from one surface to another; for example, from a bed to a chair or from a chair to a standing position in the bathroom. As part of initial nursing assessments, patients are graded on their need for assistance when transferring. They can be designated a “one-person,” “two-person,” or “mechanical-lift” transfer; however, patient mobility will change during a hospital stay. Therefore, continuous reassessment is necessary. This reassessment needs to be completed at the time of each transfer and should consist of assessing communication (e.g., Is the patient able to follow simple commands?), ability (e.g., Can the patient move extremities freely, and is the patient not drowsy due to medications?), resistance (e.g., Is the patient cooperative or agitated?), and the

environment (e.g., Is the right equipment available and obstacles removed?). These questions should be addressed prior to all patient transfers.

The area most involved with falls was the patient's room. The analysis of AEMS also indicated that the inpatient medicine and neuroscience units had the highest rates of falls. This concurs with other hospital studies (Hitcho et al., 2004). These areas admit patients with neurological deficits and comorbidities, and the majority of these patients have a high risk for falls. These units also admit older patients with multiple health issues. It would not be uncommon for mobility to be an issue in these areas, as patients with strokes and other neurodegenerative diseases are treated. Geriatric syndromes in these units include polypharmacy, incontinence and confusion, which contribute to falls. The results of the first study revealed information hospital staff and administrators can use to develop policies, add resources and implement new strategies to address the contributing factors of falls.

Another focus of the study was to identify problems with the AEMS and note any inconsistencies with reporting falls. This study took a broader view to examine the fall event and highlight areas for improvement. Before the AEMS, hospital incidents were reported on written forms. A computerized system allowed the hospital to expedite the process and made it more efficient to recover data and trending information. While this is helpful, it is clear more needs to be done if falls are to be reduced. According to the AEMS data, there was not a significant improvement in the falls rate from 2009 to 2014 (since the AEMS came into effect), bringing to light the need for continued research in this area as well as staff education on fall prevention.

The second study took a closer look into the fall prevention program by examining a fall risk assessment screening tool currently used in the hospital. This was a predictive validity study used to assess the sensitivity, specificity, and predictive values of the adapted Morse Fall Scale (MFS) (Morse, Morse, & Tylko, 1989) on patients admitted to the medicine units. A second part of the study examined the views of the nurses using the MFS tool. The consensus of responders was that the MFS was ineffective in reducing falls; the nurses all answered "yes" to the question of whether the MFS could be improved to meet the needs of patients on the medicine units.

The MFS is a validated screening tool that uses a six-item scale to assess fall risk in acute care hospitals. At the fall risk score of 25, the hospital staff would implement strategies geared toward high-risk patients. The predictability study found a cut-off point of 25 was not appropriate. Morse, who created the MFS, recommended 25 as a reasonable cut-off point in hospitals, but she recognized that each area needed to conduct a predictive validity study of the tool to assess the appropriate risk level for each particular setting (Morse, 2009). There are other assessment tools for use in hospitals, such as the STRATIFY and the Hendrich II. Study II demonstrated it might be necessary to replace the screening tool with another risk assessment instrument, change the cut-off point or remove the tool completely, because it found the MFS had poor predictive validity when using the suggested cut-off point of 25 (Watson, Salmoni, & Zecevic, 2016). To give staff accurate information, a screening tool should provide a high predictive value in the setting in which it will be used (Oliver, 2007). The best MFS performance in this study was with a cut-off greater than 55, but the specificity value remained low. One recommendation is to reconsider whether a risk assessment tool is necessary. A more logical approach may be to replace the tool with individualized care plans (Ganz, Bao,

Shekelle, & Rubenstein, 2007). Accreditation Canada (2015) and Safer Healthcare Now (2015) state fall prevention strategies should include an initial risk assessment. This would include all of the items captured by the MFS and other intrinsic and extrinsic factors integrated with hospitalization. Items not covered by the MFS can increase fall risks. Therefore, an individualized care plan could assess each patient and replace a general screening tool.

In the third study, an analysis of contributing factors of 11 fall case studies that used the Systemic Falls Investigative Method (SFIM) process was conducted (Madady, 2013; Zecevic, Leat, Brennan, Keeling, Hileeto & Brymer 2015). While research associated with falls is extensive, little research has adopted multiple case studies, which can reveal more of the story surrounding the fall, the environment and the patient's condition. The research questions of the third study looked at the contributing factors from case studies analysis and what additional strategies could be put in place to reduce the incidence of falls. The contributing factors were divided into the defense layers, per the Swiss Cheese Model (Reason, 1998). By recognizing the major categories of organizational factors, supervision, preconditions, and unsafe acts layers, hospital administrators can devise programs that can be implemented to guard against the risks and "holes" in the Swiss cheese analogy. The holes can then shrink or close and deflect possible hazards (Reason, 1998). Main categories from each defense layer were highlighted, and recommendations to address them were offered. The categories that emerged were as follows:

1. Organizational factors (policy on staffing levels, practice of moving patients to different rooms, lack of clear policy around restraints, and the use of bedrails)
2. Supervision (ineffective communication, lack of awareness of patient needs, the efficiency-thoroughness trade-off effect)
3. Preconditions (cognitive impairment, impaired mobility, patient medications, patient's room and BR environment)

4. Unsafe acts (patients transferring without assistance, improper use of the call bell)

Along with the other categories, cognition and mobility played a significant role in the fall cases. A major goal for hospitals is to prevent patient confusion and immobility, conditions which led to falls in the cases studied. Older adults with cognitive problems are twice as likely to fall as someone without cognitive problems (Taylor, Delbaere, Close, & Lord, 2012). Contributing factors showed that the patients experienced confusion in most of the case studies. Many factors associated with hospitalization can cause confusion, including multiple room changes, certain medications, and disease processes. Using strategies to reduce these conditions can ultimately reduce falls in which confusion is a contributing factor. Mobility was another prevalent contributing factor. A vast amount of literature speaks to falls and immobility (Ostir et al., 2013; Gill, Gahbauer, Han, & Allore, 2011; Covinsky et al., 2003). Major hospital programs, such as Mobilization of Vulnerable Elders in Ontario (Slaughter, Estabrooks, Jones, & Wagg, 2011), are being developed to reflect the need to keep patients mobile while in the hospital. Other contributing factors can be deterred by unit changes such as conducting comfort rounds, performing environmental scans and applying enhanced communication principles to anticipate patient needs. Although it may be difficult to change a patient's disease trajectory, strategies can be integrated into patient care to counteract risk factors.

Post-fall reviews can be initiated to prevent recurrent falls. Currently, the AEMS process has a follow-up assessment completed by leadership and staff on the units where a fall occurs. However, there is no consistent post-fall documentation in the clinical area where new strategies could emerge to reduce falls. Montero-Odasso et al. (2007) piloted a post fall flow sheet in a long-term care facility. The document was filled out by physicians, nurses, and other interdisciplinary team members after a fall. Each interdisciplinary team

member reassessed the patient and produced revised strategies to prevent a recurrent fall. The researchers found the fall rate was reduced with the introduction of the form. The SFIM framework provided an in-depth analysis of adverse events that occurred in the hospital.

A process for in-depth case study analysis can be initiated by a Risk Management department as an adjunct to the AEMS. When there is a significant incident involving the inpatient population, an investigation could be conducted by the Risk Management team, using a case study framework to understand the hospital's characteristics and improve the safety of patients expecting safe treatment in the hospital. Different investigations can be analyzed to identify what led to the falls, from a systematic hospital viewpoint. The results could provide a thorough review of the general and personal reasons patients fell. Establishing a procedure using a case study analysis, such as the SFIM framework, can remove the uncertainty of why and how falls occur. Contributing factors such as cognitive impairment and immobility can lead to ideas on how to improve these factors through patient care. The recommendations outlined in the three studies can be adopted as regular practice in hospitals to reduce patient falls.

5.1 Future Research

The three studies used in this dissertation explored patient falls in an acute care hospital. Although there is a present focus on patient safety, there is no indication that this safety risk will decline as the population ages and relies on hospital care. If risk factors are to be reduced, more studies will be needed to identify patients most at risk for falls and to examine the link between falls and the hospital environment. Previous studies have shown the strategies used in the hospital to address risk assessment, environment and

education as it relates to the patient's condition. Perhaps a different, more thoughtful approach is needed, with set goals and an evaluation process in place.

One goal of this alternate approach could be to continue to examine risk assessment. A study could compare the use of a risk assessment tool versus the use of an individualized care plan. The research questions would ask whether there was a reduction of falls with one method over the other. Since programs vary in patient needs, a secondary measure could be to identify which area requires which method of assessment.

Another goal could be a study of the hospital environment and whether introducing safety devices/equipment not yet used in the hospital would be effective in reducing falls and/or fall injuries. Baker et al. (2016) implemented a 6-PACK program to reduce fall injuries in hospitals. The program implemented fall risk signage, bathroom supervision, walking aids within reach, routine toileting, low-low beds, and bed/chair alarms. Although there was not a significant difference in falls with this intervention, it is important to build on strategies already used. Fall mats are another safety device that can be added to prevent injuries. A future study could evaluate their usefulness in an acute care hospital setting. Since other medical equipment is present around the patient's bedside, a subacute unit where there is the least amount of medical equipment (e.g., poles for IV therapy) should be used for this study. Call bells are another piece of equipment that could be studied. A study could examine how often call bells are used, their effectiveness and whether there is a reduction of falls when used. A secondary measure would be to eliminate call bell use in one unit and conduct hourly patient rounds to evaluate if this is a more effective method of fall reduction.

Lastly, there can be a pretest-posttest study to review staff's knowledge and learning needs concerning falls as they pertain to the patient's risk, environment and condition. A survey can be given to nurses and PSWs on the medicine and neurology units to assess their learning needs for fall prevention (including cognition, mobility, and communication as topics). According to the needs assessment, an education and training program would be developed and delivered to those staff. There would be a 3-month posttest and a 9-month follow-up survey to assess if the learning had made a difference in fall prevention strategies delivered and the program's sustainability. Fall rate data from the AEMS system would provide the number of falls before this intervention and after.

Using Outcome Research to study the interventions can provide a framework to evaluate the usefulness of the additional interventions.

5.3 Conclusion

The studies in this thesis demonstrated a unique and thorough approach for examining falls in acute care hospitals. A review of the AEMS falls data provided a broad view of the problem. Fall prevention strategies were examined, and the risk assessment tool was shown to be inadequate. Falls continue to occur in acute care hospitals, even with a fall prevention program. Therefore, there is a need for continuous evaluation of falls data, improved staff education and a province wide database registry for future research on incident reporting. Data from registries can provide valuable information on falls and show whether fall prevention strategies already in place are effective.

Fall prevention strategies must meet the needs of individual units. For example, a predictive validity test should be conducted prior to using a fall risk assessment tool. If a

fall does occur, especially one causing injuries, a thorough, systematic investigation outlining the contributing factors can show the latent conditions, such as cognition and mobility problems. Integrating activities to enhance cognition and mobility into routine patient care can offset the contributing factors associated with falls, the common thread that seems to seep through defensive barriers.

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Appendix A

Appendix A: Morse Fall Scale

MARK THE SCORE IN THE APPROPRIATE COLUMN FOR THE RISK FACTORS THAT APPLY.									
DATE (YYYY/MM/DD):									
TIME:									
PATIENT UNCONSCIOUS ☐ **YES (Low Risk)** ☐ **NO (Complete MFS)**									
MORSE FALL SCALE (MFS) RISK FACTOR (see reverse for scoring)									
HISTORY OF FALLING (immediate or within 3 months)	**YES 25**								
	NO 0								
SECONDARY DIAGNOSIS	**YES 15**								
	NO 0								
AMBULATORY AID Furniture	**30**								
Crutches / Cane / Walker / Wheelchair / Needs Assistance	**15**								
None / Bedrest	**0**								
IV / SALINE LOCK	**YES 20**								
	NO 0								
GAIT/Transferring Impaired	**20**								
Weak	**10**								
Normal / Bedrest / Immobile	**0**								
MENTAL STATUS Overestimates / Forgets limitations	**15**								
Oriented to own ability	**0**								
TOTAL FALL RISK SCORE									
INDICATE FALL RISK LEVEL: **LOW (0-24)** **MODERATE-HIGH (24 or higher)**									
STANDARD SAFETY INTERVENTIONS All Risk Levels (☐)									
Call bell system within reach and operational									
Adequate lighting									
Orientation to unit, room, bathroom									
Bed at lowest level, brakes on									
Ensure secure, non-slip footwear									
Personal items within reach									
Walking aids, commode, urinal accessible									
Assess need for frequent toileting									
Pathway clear of obstacles									
Ensure bed exiting/equipment/items on patient's strongest side									
Provision of fall prevention brochure to patient/family, education provided									
Evaluation of current medication that may place patient at risk for falls									
MODERATE-HIGH RISK ASSESSMENT (☐) **(Document problem areas on Progress Notes*)**									
Assess for contributing factors (see reverse) (vision, UTI, urinary frequency, postural BP, delirium)									
MODERATE-HIGH RISK INTERVENTIONS (☐) **(Document PRIORITY interventions on Patient Care Profile)**									
Inform patient/family and interdisciplinary team of fall risk status									
Fall Risk sign posted									
"Call Don't Fall" Yellow armband applied									
Activate bed/chair exit alarm									
Assist with mobilization									
Non-slip footwear in use									
Provision of fall prevention brochure to patient/family, education provided									
Evaluation of current medication									
NURSE'S INITIALS									

CONSIDERATIONS:

- Consider placement in room near nursing station or in an area of high visibility
- Consider assistance from family members
- Consider observation care with leadership approval
- Consider referrals as specific risk factors are identified to reduce risk for falls or repeat falls
- Consider need for medication review by team
- Communicate risk for fall status at shift report and upon patient transfer to other unit (RNAO, 2007, p9)
- The use of bedrails to prevent falls is not recommended (RNAO, 2011)
- Never underestimate the power of clinical judgment

***Based on Morse, J.M, Morse, R.M, & Tylko, S.J. (1989); Morse (2009)**

Appendix B

Appendix B: Eleven case summaries

Case Study	Summaries	Contributing Factors
CNS Case 1	The faller, a 55 year old stroke survivor, fell on the floor on Monday, April 30, 2012 at 0520. When the night shift registered nurse (RN) woke the faller up to check for incontinence, the faller expressed the need to go to the washroom. The RN released the restraints, put on the faller's shoes and assisted her to stand. The RN then realized that the faller was unsteady on her feet and that she needed more assistance to walk the faller to the washroom. The RN assisted the faller to sit back down on the bed, waited a few minutes to be sure that the room entrance to call for assistance from another nurse at the front desk. When the RN turned towards the faller, she saw that the faller had stood up on her own. Because the faller could not stand on her own, she slowly slid down from the edge of the bed to the floor. The second nurse entered the room, and the faller was assisted to the bed by two RNs and assessed for injures. The faller did not sustain any injuries. She was then taken to the washroom.	*Organizational factors*: Night RN is from NRU No organizational policy exists to inform staff who is responsible for answering the call bell A new call bell system was purchased one year ago but not yet installed due to lack of technical support *Supervision*: RN does not put restraints back on faller before leaving her side Faller needs assistance from at least one person for all transfers Call bell is not answered right away *Precondition*: Faller is completely disoriented because it is early in the morning Faller needs assistance with all ADL Faller has difficulty with her balance

		Faller is impulsive when left unattended *Unsafe Act*: Faller tries to stand up on her own. RN goes to the door to call for assistance. RN wakes the faller up to check for incontinence.
CNS Case 2	The faller, a 55 year old female stroke survivor, fell to the ground on May 1, 2012 at 1345. After several hours of lying in bed, the faller felt the urge to urinate and decided to use the washroom by herself, despite being instructed by her nurse to call for help. She sat herself up in bed by using the bedrails and then slowly climbed over the bedrails. She then stood by her bedside, only to realize that she was unable to walk to the washroom due to poor balance, coordination, and strength. Thus, she decided to climb back into bed but was unable to do so. Instead she chose to slowly lower herself to the ground where she lay for approximately 10-15 minutes. The cleaning staff noticed her lying on the floor and notified her nurse. The faller was then assisted back into bed by two nurses.	*Organizational factor:* Family is encouraged by hospital staff to supervise patients or hire sitters if they are concerned for patient's safety. Current RN to patient ratio (1:5) is less than what nurses perceive as optimal ratio of 1:3. There is discrepancy between bedrail manufacturer's view of role of bedrails as form of restraint and current practice in the unit. *Supervision:* At the time of the fall RN is too busy to check on faller every 15-20 minutes. Low RN to patient ratio (1:5) prevents the RN from dedicating

		sufficient time to each patient. Staff is unaware that faller is attempting to go to the washroom by herself. *Precondition:* Faller is cognitively impaired and disoriented. Faller needs assistance with every activity of daily living. Faller has poor balance control and coordination problems while walking. *Unsafe Act:* Faller decides to go to washroom by herself. Faller realizes that she is unable to go to washroom by herself. Restraints are discontinued after discussion between the healthcare team and family.
CNS Case 3	The faller, a 71 year old stroke survivor, fell to the ground on May 10, at 1220. The day of the fall the faller had an occupational therapy (OT) session at 1000 in order to complete the Montreal Cognitive Assessment (MoCA). He also participated in a physiotherapy (PT) session in the hallway of the unit at 1115. After the session the physiotherapist sat him up in his wheelchair 50 cm away from his bed with lap	*Organizational factor:* According to BPG for pressure ulcer care, patients should be repositioned in wheelchair every 2 hours. During lunch time, staff

tray on and call bell close by. The faller rested for 45 minutes on his wheelchair. He ate at noon while sitting in his wheelchair and then decided that he would rather lie in bed. He did not use the call bell to call for help and managed to take the wheelchair lap tray off by himself. As he tried to reach the mattress on his bed, the faller's left arm gave out causing him to lose balance and fall backward to the ground.

levels are reduced by 40-50%.

Standard practice at the unit does not specify if bedrails should be raised to discourage patients from attempting to go back to bed independently.

Supervision:

Faller's RN is new to taking care of faller, today is her first time with him.

Faller's RN believed that faller did not need chair Posey.

According to BPG for pressure ulcer care, patients should be repositioned in wheelchair every 2 hours.

Precondition:

Prolonged sitting aggravates ulcer wound on faller's coccyx.

Faller has mild cognitive impairment and difficulty with short term memory and processing speed.

Faller is on 11 prescription medications.

Faller has difficulty

		communicating due to aphasia and cognitive impairment. Most times faller does not adhere to staff instructions *Unsafe Act:* Faller decides to go to bed independently. Faller over-reaches Faller loses control of his balance.
CNS Case 4	The faller, a 66 year old stroke survivor, fell in an acute care hospital room on Thursday, May 17, 2012 at approximately 1555. After an afternoon physiotherapy session, the faller was assisted to the washroom in his hospital room by the physiotherapist (PT). The faller was able to walk with his walker but required assistance and supervision by at least one other person. The faller left his walker just outside the washroom door and, before leaving him, the PT reminded the faller to call his RN using the call bell in the washroom when he was ready to leave. The faller used the call bell to call for help, but after 5 minutes of waiting, became impatient and decided to go to his bed independently. He stepped out of the washroom and grabbed onto his walker. As he started walking his foot hit the walker and he tripped over the walker. He lost balance and fell forward to the ground.	*Organizational factor:* Fall does not have a formal support network. *Supervision:* Faller requires supervision when using the toilet. RN is assisting another patient. RN is very busy caring for 5 other patients and can't assist faller immediately. *Precondition:* Faller has difficulty communicating due to aphasia. Faller is unstable and has difficulty controlling limb movements.

		Faller suffered a right caudate putamen stroke. *Unsafe Act:* Faller starts inconsistently using a walker given to him by a friend. PT instructs faller to use call bell to call for assistance when he is done. Faller decides to leave washroom without help.
CNS Case 5	The faller, a 53 year old stroke survivor fell on Thursday, May 31, 2012 at approximately 0632. Prior to this fall, the faller experienced two other falls while at acute care hospital. The previous falls were the result of the faller's attempts to transfer to the washroom independently during the middle of the night, on May 29th and 30th. During the night of May 31st, the faller was feeling very restless, confused and agitated. He was unable to sleep and tossed and turned for the majority of the night. The RN placed wrist restraints on the faller to prevent him from pulling out tubes or wires. At 0200 the faller decided to get out of bed by himself without calling for help. Although the bedrails were up and the faller's wrists were restrained, he was able to sit himself up and put his right leg underneath the bottom bedrail. The RN walked in for a scheduled check and, when she noticed the faller attempting to once again get out of bed, she repositioned him and placed a Pinel system waist restraint with the "beavertail" attachment on him and removed the wrist restraints. The faller was still unable to sleep and lay in bed awake from approximately 0210-0630. At 0630 the hospital fire alarm went off, and because the faller was trained as a first responder/firefighter,	*Organizational factor:* Restraints were the only falls prevention strategy implemented for this frequent faller at high risk. Unit staff rarely use a gap protector and diagonal restraints due to the additional time needed for their set-up and installation. According to hospital policy, staff are required to obtain consent from SDM before the application of restraints. *Supervision:* Staff is unaware of faller's actions. Faller's wife was not consulted prior to

	he naturally felt the urge to respond to the alarm. The faller pulled and twisted the restraint straps and somehow repositioned himself so that his head was at the foot of the bed. Next, the faller squeezed himself in between the bedrails, through the space between the top and bottom bedrails, while he was still restrained, and fell off the side of the bed. Two RNs heard the commotion and the faller yelling for help and rushed to his room. The RNs found the faller hanging at the side of the bed, face up, with the "beavertail" restraint still around his waist.	application of restraints to the faller. During shift change verbal reporting, RN #3 was not informed of faller's anxiety, impulsive behavior and previous occupation. *Precondition:* Faller is disoriented to time and place. Faller is hemiplegic on left side. Faller is preconditioned to respond to an emergency alarm. *Unsafe Act:* Faller tries to get out of bed independently. RN #3 places the Pinel system waist restraint with beavertail attachment on faller. The hospital fire alarm goes off.
CNS Case 6	The faller, an 84-year-old gentleman, fell in an acute care hospital room on Wednesday, June 20, 2012 at 0328. The faller was admitted to the emergency room on June 5, 2012 where he was diagnosed with a left middle cerebral artery (MCA) stroke, which left him with significant aphasia and right-sided weakness. During the 15 days in the hospital he remained calm and stable and had never attempted to ambulate on his own. On June 20, 2012 the faller had a gastrojejunostomy (GJ) feeding tube inserted	*Organizational factor:* A bracelet worn by high falls risk patients to remind them 'not to fall' is ineffective. Discussion between RNs, physicians and other staff regarding patient safety due to falls is inadequate.

because he was unable to swallow appropriately. The night of the fall (June 20), the faller was positioned in bed and checked on every 90 minutes by his nurse. He felt restless and agitated and was unable to sleep. At approximately 0325 the faller decided to get out of bed for unknown reasons. He pulled out his feeding tube and then walked five meters to the doorway of his hospital room, and stood briefly at the doorframe. He then lost balance and slid against the doorframe and fell to the ground.

Faller is assessed as high risk for falls but an individualized falls prevention strategy is not put in place.

Supervision:

RN to patient ratio during the night is 1:7.

Due to aphasia and GJ tube inserted earlier in the day, the faller requires frequent supervision.

Precondition:

Faller is confused and unable to understand where he is.

Faller is unable to communicate his discomfort due to aphasia.

Faller suffers from depression.

Faller suffers from Parkinson's disease.

Unsafe Act:

Faller's nurse checks up on faller every 90 mins.

Faller gets out of his bed independently.

Faller walks 5 meters towards the hospital room door.

Medicine Case 1	The faller, a 57 year-old alcoholic and pontine stroke survivor, fell in hospital on the patient room floor on his buttocks on Thursday, July 3, 2014 at 2330. The faller had drank 6-8 cups of tea over the course of the day and had to urinate before going to sleep. He got up from the bed independently and began to walk around the corner to the bathroom using his two-wheeled walker. The main door to the patient room was open at 90 degrees which left only a two foot clearance between the edge of the door and the bathroom countertop. When the faller tried to fit his walker between this gap, it did not fit, so he reached forward to this four-patients hospital room. The faller grabbed the chair with his left hand and tried to pull the chair behind him. As and grabbed the door with his left hand. He pulled the door towards him and began to push his walker forward with his right hand. The walker's front left wheel then got caught on the back right leg of a chair that had presumably been left behind the door by a visitor to this four-patients hospital room. The faller grabbed the chair with his left hand and tried to pull the chair behind him. As he pulled the chair, he lost his balance and began falling backwards. The faller leaned back thinking that the free-moving door behind him was a wall. The door then moved and the faller fell onto his buttocks as he pushed his walker forward.	*Organizational factor:* Measures of vision are not included in patient assessment upon hospital admission. During nursing breaks of the day shift, the nurse to patient ratio is 1:8. Frequent room changes prevent continuous patient-centered care. *Supervision:* Nursing supervision diminishes when patients move from room to room. Nursing staff is unaware that the faller has no 3D perception. Nursing staff is unaware that the chair behind the room door blocks walking path to the toilet. *Precondition:* Faller has unsteady gait. Faller is confused and forgetful. Faller drinks 6-8 cups of tea per day. *Unsafe Act:* Faller ignores the

		instructions given by the PT to call for assistance. Faller falls while trying to transfer from bed to chair on his own. Faller ignores instructions given by nurse and PT to call for assistance when going to the bathroom.
Medicine Case 2	The faller, a 70 year-old Kurdish and Arabic speaking diabetic, fell on the floor in this hospital room on Thursday, August 21, 2014 at 1330. The faller had eaten a large lunch at 1130. His blood glucose level, which had already been very high (24.8 mmol/L) in the morning, rose to 29.1 mmol/L at 1200. The insulin, both planned and sliding scale, did not bring down the faller's blood glucose level, which had steadily risen over the 14 hours leading up to the fall. The faller used his 4-wheeled Rollator walker to ambulate to the bathroom to brush his teeth. While sitting on the seat of the walker in front of the bathroom sink, he could not get the lid of his toothpaste off so he called out for a nurse. The faller's primary nurse entered the faller's bathroom, opened the toothpaste for him, and exited the room to complete work on the electronic medication dispense computer which was located just outside the faller's room. After the faller finished brushing his teeth, he decided to leave his walker by the sink and walk back to his bed unassisted. As he was walking, the faller tripped over curled toes on his left foot and lost his balance. The faller then fell sideways and landed on his left side.	*Organizational factor:* Admitting department frequently transfers patients to any available bed on a unit to free up space in the ED. Hospital's falls prevention assessment policy combines scores for moderate and high risk on Morse Scale. Occasionally nurses are too busy with other duties and forget to complete adverse event reports. *Supervision:* Faller's son does not visit the faller regularly. Attempts by nurse and PT to educated faller to call for assistance when ambulating are futile. Staff relies on faller's son to translate and fill-in food orders for the

		faller each week. *Precondition:* Faller is unable to answer assessment questions due to language barrier. Faller's visual acuity and depth perception are impaired. Faller's standing balance is unsteady. *Unsafe Act:* Faller climbs over right lower side rail of bed to use the bedside commode. Faller is moved to another room on the same unit [Room #3]. Faller decides to walk back to his bed unassisted.
Medicine Case 3	The faller, an 80 year-old man recovering from a recent reverse shoulder arthroplasty surgery, fell to the ground on his left side on Thursday, August 28, 2014 at 2231. The faller experienced constipation since he was admitted on Tuesday August 26, 2014. On the day of the fall he was given Lactulose by his nurse at 1406 to help improve his bowel movements. Twenty minutes later, the nurse completed a fall-risk assessment on the faller and put in place the hospital's Standard Falls Prevention strategy for moderate to high risk fallers, since the faller's Morse Scale score was 65/115. Four hours after receiving the Lactulose, the faller had an entirely liquid bowel movement. At 2207, he had to make another	*Organizational factor:* Falls prevention interventions are the same for moderate and high fall risk patients. Only primary nurse's phone is programmed to receive call bell calls. Staff Assist Button that alerts other staff members when primary nurse is busy, is available only at

bowel movement so he used his bedside call button to call the night nurse. The night nurse assisted the faller to the bathroom and instructed the faller to call her using the call button beside the toilet when he was done. After finishing his bowel movement, the faller used the call button to call the night nurse, who was assisting another patient in another room. As he waited on the toilet, the faller became impatient and pressed the call button an additional 19 times in six minutes. The faller then got up from the toilet alone and then lost his balance and began to fall forward. In an attempt to re-gain his balance, the faller held onto the door handle with his left hand. He then released his left hand from the handle and landed to the floor on his left side.

bedside, not in the bathrooms.

Supervision:

Faller receives no feedback on whether his nurse received his call or not, as he waits on the toilet.

Patient supervision is diminished during breaks at night, when RN to patient ratio is 1:12.

Faller is instructed by nurse and PT to always have one person assist him when moving anywhere.

Precondition:

Faller feels unsteady on his feet because he cannot swing his right arm.

Lactulose is a rapid laxative causing urgency once bowel movement starts.

Urgency and rushing increase the risk of falling.

Unsafe Act:

PT gives the faller a hemi-walker to use with his left (non-dominant) arm.

Nurse gives faller

		Lactulose to improve his bowel movement. As he waits on the toilet for the nurse to arrive, faller presses call button an additional 19 times in six minutes.
Medicine Case 4	The faller, an 82 year-old frail, impulsive, non-cooperative and depressed man, fell on the floor on his buttocks and hit his head on September 7, 2014 at 0925. The faller pulled out his Foley catheter on September 5, 2014 at 2000. His doctor re-inserted the catheter on September 6, 2014. The morning after his catheter was reinserted, the faller felt a need to urinate. He sat up on the edge of his bed, then quickly stood up from the bed and took several steps towards the bathroom without his walker or assistance. As he walked, he lost his balance, fell on his buttocks, and hit his head on the floor.	*Organizational factor:* It seems that an informal unit culture is that adverse event reports for non-consequential falls can be omitted if staff is too busy. Assistive devices (i.e., walkers) are not transferred between units on different floors in the same hospital. When bed alarm cable is disconnected, the alarm will still go off locally, but is not recorded in the bed alarm history log. *Supervision:* Faller fails to call nurse for assistance when attempting to get out of bed at night. Nursing supervision diminishes when patients move from room to room. Secondary nurse is attending to one of her primary patients in another room.

		Precondition: Faller is impulsive. Faller is legally blind. Faller's trunk and legs are deconditioned. *Unsafe Act:* Faller gets up from bedside commode on his own (unassisted). Faller refuses to practice climbing stairs with PT. Faller gets up from bed very fast.
Medicine Case 5	The faller, a 75 year-old heart attack survivor, fell in hospital on her buttocks on a patient room floor on Tuesday, October 28, 2014 at 0700. The faller had gotten up from her hospital bed independently and ambulated, using her four-wheeled Rollator walker, around the corner to the bathroom sink. She sat on the walker's built-in seat while brushing her teeth The outgoing night nurse and incoming day nurse were standing at the room entrance exchanging reports at shift change. They were aware that the faller was at the bathroom sink brushing her teeth. When she was done, the faller stood up from the walker seat, stumbled backwards, and tripped over the walker's back wheels. She lost her balance and fell over the walker which impacted her left armpit. The faller then fell to the floor landing on her buttocks.	*Organizational factor:* Falls risk assessment using the Morse Scale was not completed either on Thursday (October 23), as regularly scheduled, nor after the room change. Entering the faller's room would require both nurses to dress up in protective equipment, which is time consuming. Nursing staff shift change report has no standardized start or end time. *Supervision:* Nursing supervision

diminishes when patients are moved frequently between rooms.

Supervision of patients during shift change is minimal.

Day nurse (#1) is unaware of events that happened between 01:00 and 03:00 the previous night.

Precondition:

Faller's fall risk is unknown.

Faller is on 11 prescription medications.

Faller experiences a burning sensation in her legs secondary to diabetes.

Wall oxygen supply tubing line is clear and difficult to see for a patient with limited peripheral vision.

Unsafe Act:

The faller gets up from the bed unassisted.

While standing at the door, day nurse (#1) sees the faller walking unassisted with her walker from the bed into the bathroom.

	Day nurse (#1) decides to start her regular morning routine by assessing another patient's vital signs and then assist the faller.

Note: Excerpts taken from the SFIM Investigative Reports.
CNS refers to clinical neurosciences
BP refers to Blood Pressure.
O_2 refers to oxygen, MCI refers to mild cognitive impairment

Appendix C

Appendix C: Investigative Cases

The following six case studies were obtained as de-identified secondary data from the study "Improving safety and preventing falls in stroke survivors through the continuum of care", funded by the Ontario Stroke System Research Program 2010-12, PI Aleksandra Zecevic, PhD (Western University).

Case ID: 1200112

The Fall

The faller, a 55 year old stroke survivor, fell on the floor on Monday, April 30, 2012 at 05:20. When the night shift registered nurse (RN) woke the faller up to check for incontinence, the faller expressed the need to go to the washroom. The RN released the restraints, put on the faller's shoes and assisted her to stand. The RN then realized that the faller was unsteady on her feet and that she needed more assistance to walk the faller to the washroom. The RN assisted the faller to sit back down on the bed, waited a few minutes to be sure that the faller could sit independently without losing balance, and instructed her to remain seated. She went to the room entrance to call for assistance from another nurse at the front desk. When the RN turned towards the faller, she saw that the faller had stood up on her own. Because the faller could not stand on her own, she slowly slid down from the edge of the bed to the floor. The second nurse entered the room, and the faller was assisted to the bed by two RNs and assessed for injures. The faller did not sustain any injuries. She was then taken to the washroom.

The Faller

This 55 year old stroke survivor had previously sustained a subarachnoid hemorrhage in 1984 and had her right middle cerebral artery aneurysm clipped. She had a re-bleed with subarachnoid hemorrhage in 1986 and another re-bleed in 1988 due to an arteriovenous malformation that was partially resected surgically. She also had surgery for a Chiari I abnormality in the 1990s and the insertion of a ventriculo-peritoneal shunt. Faller was admitted to the intensive care unit (ICU) on January 13, 2012 with a large left temporal hematoma with extension into the ventricular system. Between February 18, 2012 and April 22, 2012, she underwent eight operative procedures for external ventricular drainage, clipping posterior cerebral artery and removal of ventriculo-peritoneal shunt, ventriculo-peritoneal shunt revision, and replacement of shunt due to infection. She was transferred from the ICU to the neurosurgery unit for further treatment and recovery on April 22, 2012. Faller was receiving physiotherapy and occupational therapy after her surgeries. She showed some improvement in her physical abilities, however, there was a decline in her cognitive abilities. She remained confused, disoriented to time and place, and showed impulsive behavior. Her progression during her stay in the neurosurgery unit was slow but steady. She showed improvements in transferring independently from lying to sitting positions but still required assistance from one to two persons when walking.

Her balance during standing and walking fluctuated due to her reduced cognitive abilities and impulsive behavior. The faller was able to follow commands but did not remember instructions. After her last surgery, she was diagnosed with aphasia. On April 25, 2012, she was put on restraints to prevent her from falling as well as pulling out tube feeds. The extensive number of procedures she underwent resulted in reduced cognitive capacity poor short-term memory, impulsive behavior, and a reduced ability to effectively communicate with staff and family. It was noted by the healthcare team that the faller "had no ability seemingly to lay down new memories." Given the severity of her illness, the multiple complications, and issues encountered related to her large subarachnoid and intraventricular hemorrhage, the faller remained disoriented for the duration of her stay in acute care as well as the rehabilitation hospital.

The faller wore incontinence briefs and was often unable to control the passing of urine. However, she still notified staff during their regular checks if she felt the urge to urinate and preferred to be taken to the washroom. The faller was identified as high risk for falls using the Morse Fall Scale. This information was written on the nursing Kardex (a quick summary of patient's care needs used by nurses). She had a "high risk for falls" wristband placed on her wrist as well as a sign posted above her bed. Prior to the investigated fall, she had three other falls while in the acute care hospital. During her first fall on April 24, 2012, the faller tried to climb over the bedrails. She later sustained a bruised knee and shoulder when she fell out of bed after restraints were taken off on April 26, 2012. She fell for a third time when she slipped out of bed again on April 26, 2012. These three previous falls were not investigated because the family initially refused to provide consent to participate in the study.

Environment

At the time of the fall the faller was in a two-person room where the second bed was unoccupied. The room was well-lit and the faller's bed was closest to the window. The washroom was 6 meters away from the bed and she was always assisted to the washroom by nurse(s) and sometimes her husband.

Family

The faller's husband and sister-in-law visited the faller on a daily basis at varying times. Faller's husband was very supportive and patient with his wife's recovery. The evening before the fall (April 29 at 19:30) the faller's husband, along with the nurse, assisted the faller to the washroom. The faller's family was upset and frustrated with the number of falls the faller had during her hospital stay, and although they refused consent to participate in the study at an earlier time, they later changed their minds and agreed to participated in this study in hopes of finding a solution.

Restraints

Due to ongoing confusion, impulsive behavior and previous falls, the faller was placed on restraints after being assessed as high risk for falls. Restraints were also used because the

faller often forgot where she was and would try to escape. As per hospital policy, consent from the faller's husband was obtained and wrist restraints were placed while the faller was in bed. The bedrails were also used to prevent the faller from getting out of bed. Restraints were usually removed while the faller's family was visiting because they would supervise her and remind her if she attempted to get out of bed. On the day of the fall, wrist restraints were used while the faller slept. However, when the nurse assisted the faller out of bed to use the washroom, she removed the restraints and did not put them back on when leaving the faller to call for help.

The Nurse and the Nursing Resource Unit

The night RN was from the Nursing Resource Unit (NRU) and was unaware of the patient's fluctuating level of balance while walking. While assisting the faller to the washroom with the help of faller's husband earlier that evening, the night RN judged that assistance from one person would have been sufficient. Faller's medical records also indicated that she required assistance from only one person for that day. According to the night RN, "she was more steady in the evening so I thought I could do it on my own, but she was unsteady in the morning, probably because she just woke up. "The NRU was a dynamic staffing strategy recently developed at this acute care hospital. The NRU team was made up of full-time and part-time nurses who were assigned to a variety of clinical areas in response to staffing needs. Staff were booked for full shifts and were assigned a certain number of patients. NRU nurses were assigned to multiple units, referred to as clusters, based on their interest, expertise and learning needs. The clusters, based on specialty and common competencies and skill sets, were: medical/surgical, critical care, women's health, pediatrics, and psychiatry. Nurses in the NRU were provided with a comprehensive orientation and competency development program. Nurses could be cross-trained into multiple clusters based on interest and career goals.

The night nurse had been working in the NRU at the acute care hospital for 1.5 years. During this time she worked with different units in the hospital based on staffing needs. She previously had four years' experience working with stroke patients in a rehabilitation hospital. She had taken care of the faller once before, three weeks prior. However, during her prior shift with the faller she did not walk her anywhere because faller was not yet stable enough to stand. During her shift on April 30, 2012, the night of the fall, the night RN was taking care of 5 other patients, which she found to be manageable. The night RN mentioned that she usually started to feel fatigued around 03:00 when she worked night shifts. RNs in the unit were required to check on their patients every 2 hours. They always checked on the patient (to make sure they were still breathing). According to nursing leaders, "because there are some patients who are quite confused and Sundown (Sundown syndrome is a term that describes the onset of confusion and agitation that generally affects people with dementia or cognitive impairment and usually strikes around sunset) at night – If it takes these patients longer to finally fall asleep, the RN might skip one check or space it out every 3 hours. They will still check in on these patients but they may let them sleep a bit longer before waking them. This is a difficult

one because you don't want to leave someone in a wet incontinence brief however, sleep is a huge part of the brain's recovery process".

Call Bells

Call bells used in the unit were the Dukane StaffCallPro Nurse Call System (Dukane was acquired by General Electric in 2006). When a patient pushed a call bell button, a central telephone located at the main clerk's station rang and flashed the room number. A light above the room and one above the hallway entrance also lit up. The call bell phone at the main desk was sometimes answered by the clerks or by the nurses without consistency. If the phone was answered by a clerk, she was required to tell the appropriate nurse or any available nurse to assist the patient. This created additional work for the unit clerks. Patients who were disoriented and confused often used the call bell inappropriately. The call bell telephone at the front desk was often ignored and rang for long periods of time, sometimes up to 3-4 minutes. There were no clear instructions as to who was responsible for answering the call bells. Nurses and clerks had expressed dislike and dissatisfaction with the call bell system. When the night RN realized that she needed assistance walking the faller to the washroom, she chose to "pop her head out of the room to call for help" instead of using the call bell located on the faller's bed. The night RN stated "either way I would've had to take a few steps away from her [faller]." The night RN stated that she "knew that other nurses were sitting at the desk so it would be quicker than using the call bell, because sometimes the call bell isn't answered right away." She also said that she would use the call bell in emergency situations where she could not leave the patient.

Case ID: 1200212

The Fall

The faller, a 55 year old female stroke survivor, fell to the ground on May1, 2012 at 13:45. After several hours of lying in bed, the faller felt the urge to urinate and decided to use the washroom by herself, despite being instructed by her nurse to call for help. She sat herself up in bed by using the bedrails and then slowly climbed over the bedrails. She then stood by her bedside, only to realize that she was unable to walk to the washroom due to poor balance, coordination and strength. Thus, she decided to climb back into bed but was unable to do so. Instead she chose to slowly lower herself to the ground where she lay for approximately 10-15 minutes. The cleaning staff noticed her lying on the floor and notified her nurse. The faller was then assisted back into bed by two nurses. She was assessed for injuries but none were found. The room was only occupied by the faller and there were no witnesses at the time of the fall.

The Faller

Prior to her stroke the faller was a healthy, well-functioning, middle-aged woman. The faller was admitted to the emergency room (ER) on January 16, 2012 with a post-coital headache. In the ER she suddenly lost consciousness and became unresponsive and was subsequently intubated and seen by the neurosurgery team. A CT scan was performed

and showed intraventricular blood with hydrocephalus as well as a large clot in the posterior fossa going into the 4th ventricle. The patient was then taken to the operating room and a craniectomy of the posterior fossa was performed for evacuation of the clot. The neurosurgery team also found the arteriovenous malformation (AVM), which they removed. She was transferred to the Critical Care Trauma Centre postoperatively because she remained intubated, sedated and paralyzed. Her progress between February and March was slow. The faller was fairly stable postoperatively, however, due to extensive tongue swelling, the team was reluctant to extubate her. On February 1, 2012 a tracheostomy was performed. Faller's neural recovery while at the acute care hospital was slow. She made some progress but hen plateaued. On February 4, 2012 the faller was transferred to another acute care hospital within the city for closer observation by the neurosurgery team. On February 5, 2012 the faller had a lumbar procedure done to assess for suspected infections due to her decreasing level of consciousness. On February 14, 2012 a cerebral angiogram was performed to confirm a residual AVM and on March 22, 2012 this residual AVM as removed. All these events and surgeries resulted in reduced cognitive capacity and reduced ability to communicate with staff and family.

The faller's speech function was an issue throughout her stay. She appeared to have developed cerebellar mutism, a unique postoperative syndrome typically arising 1 to 2 days after removal of a midline posterior fossa tumor; it consists of diminished speech progressing to mutism, emotional lability, hypotonia and ataxia. The faller was able to mouth a few words but her voice appeared to be quite weak and her spontaneous speech output was poor. Her speech appeared to be "gargled" due to excessive saliva accumulating in her mouth. She used thumbs up to communicate. Although she received speech therapy, she made very little progress in her verbal abilities and issues with tongue swelling prevented her from speaking.

Other issues encountered during her hospital stay included: dysphagia; hydrocephalus, which seemed to resolve itself; urinary tract infections due to catherization; chest/tracheostomp infection; depression (started antidepressants on April 18, 2012); and an earlier fall (February 21 @ 05:00) which resulted in a head injury. The nature of this initial fall was very similar to the one being investigated presently (i.e., Faller attempted to climb out of bed independently). The patient remained fairly weak in all extremities, she responded to simple commands and she was not able to produce full sentences.

The faller wore incontinence briefs and was often unable to control the passing of urine. However, she preferred to use the washroom and during regular checks would notify nursing staff if she felt the urge to urinate. Instructions for her transfers indicated that she should be assisted by a minimum of one person and usually two people, depending on the size of the person doing the transfer. The faller was 178 cm tall and weighed 84 kg. The faller was unable to walk independently.

During her stay in the intensive care unit from January 19, 2012 to February 2, 2012, the faller was started of tube feeds, which she received for 18 hours per day from 16:00-10:00. At the time of the fall, the faller was attached to tube feeds. This schedule

continued until May 2, 2012 when it was changed to 12 hours nocturnal regimen in preparation for her discharge to a rehabilitation hospital.

Environment

At the time of the fall the faller was in a two-patient room where the second bed was unoccupied. The room was well-lit and the faller's bed was closest to the window. The washroom was 6 meters away from the bed and she was always assisted to the washroom by nurse(s) or her husband. The immediate physical environment in the room was in good repair.

Faller's Husband and Family

The faller's husband was a self-employed gentleman who was very supportive and highly involved with his wife's recovery. He visited her every day from 15:00 – 20:00 and often supervised her and took her for outings around the hospital. The faller also had two daughters who attended university and often visited their mother in the evenings. According to hospital policy, if a patient requires constant supervision, the family is invited to either hire sitters or stay with the patient if they are concerned with the patient injuring themselves.

Restraints

After her first fall on February 21, 2012, and several attempts to pull out the feeding tubes due to confusion and impulsivity, the medical team found the use of physical restraints necessary. As per hospital policy, her husband's consent was obtained and wrist restraints were placed while the patient was in bed. The bedrails were also used to prevent the patient from getting out of bed. However, the patient soon learned how to climb over or squeeze between the bedrails to get out of bed. When the patient was sitting in a chair by her bed, a lap tray was used to act as a restraint because it prevents patients from getting up. On the day of the fall, staff observed and reassessed her using the restraint policy algorithm and decided that restraints were no longer needed. According to the hospital policy administration document entitled Use of Restraint: restraint use must be reassessed by the Health Care Team and Patient/Family/Substitute Decision Maker at a minimum every 24 hours and the rationale for continued use must be documented." In this situation, the hospital protocol was followed.

Call Bell

The patient was repeatedly instructed by her healthcare team to use the call bell and, although she gave the impression that she understood the instructions (by using thumbs up), she never used the call bell to call for assistance. The call bell remote control was placed in her bed and was easily accessible.

The Bed and Bedrails

The hospital beds in this unit are the Upgradeable Advance Series manufactured by Hill-Rom (http://www.hill-rom.com.canada/index.asp). These beds feature tuck-away side rails at the head and foot ends. The bed measures at 231 cm from headboard to footboard (length) and 105 cm from side rail to side rail (width). The height of the bed measures a maximum of 115 cm (high position) to a minimum of 80 cm (low position). The manufacturers suggest that, when a patient is unattended, the bed should be left in the low position in order to reduce the possibility of patient falls and resultant injuries. According to the manual for the Advance Series beds manufactured by Hill-Rom (available on their website): "Side rails are intended to be a reminder, not a patient restraining device." According to Hill-Rom representatives, the side rails are meant to be a reminder for the staff. Nevertheless, according to the hospital restraint policy bedrails act as a form of environmental restraint, meaning that they are "intended to prevent a patient's movement from one location to another."

Hill-Rom, along with the nurse educators at the unit, provides staff with semi-annual information/training sessions on the use of the beds. Nurses receive basic training on the proper use of hospital beds during their four year clinical nursing education but learn about the beds mostly through their clinical experiences. At the time of the fall, the bed was in a semi-raised position, the head of the bed was at 40 degrees, and all side rails were up.

Staffing

No specific document exist that states how many stroke patients or other type of patient a nurse may care for at one time. However, based on the patient intensity measurement system Acuity Plus, which is a measurement of appropriate workload used in nursing practice, the average number of staff needed to care for a typical inpatient is determined. Based on daily clinical judgments of the leadership in the unit, a decision may be made to increase or decrease the number of staff based on current needs. Interviews with nursing staff indicated that, from a nursing perspective, the optimal ratio for stroke patients was 1 nurse for every 3 patients, although this ratio would vary based on the complexity of each patient. At the time of the fall, the ratio was 1 nurse for 5 patients.

Case ID: 1200312

The Fall

The faller, a 71 year old stroke survivor, fell to the ground on May 10, 2012 at 12:20. The day of the fall the faller had an occupational therapy (OT) session at 10:00 in order to complete the Montreal Cognitive Assessment (MoCA). He also participated in a physiotherapy (PT) session in the hallway of the unit at 11:15. After the session the physiotherapist sat him up in his wheelchair 50 cm away from his bed with lap tray on and call bell close by. The faller rested for 45 minutes on his wheelchair. He ate at noon while sitting in his wheelchair and then decided that he would rather lie in bed. He did not use the call bell to call for help and managed to take the wheelchair lap tray off by himself. As he tried to reach the mattress on his bed, the faller's left arm gave out causing

him to lose balance and fall backward to the ground. He was able to slow his fall by holding onto the side of the bed and, as a result, landed without injury with his head resting underneath the bed. A nurse walking by noticed the faller lying on the ground and called for help. Three nurses rushed to the faller's aid and assisted him to his bed. The faller was assessed for injuries by one of the nurses and no injuries were reported.

The Faller

This 71 year old stroke survivor's past medical history included Type II diabetes, dyslipidemia, hypertension, atrial fibrillation, obstructive sleep apnea (for which he was not being treated), osteoarthritis, cellulitis in his right leg, and prostate cancer. He had a radical prostatectomy in 2005 as well as a previous left hip replacement in 2011. The faller was active and was still working as a stock broker before his stroke. In the morning of March 12, 2012, while on his way to a funeral service, the faller experienced a sudden, very sharp and painful headache. He was brought to the emergency room by family where he was diagnosed with subarachnoid hemorrhage (SAH) and subsequently transferred to the neurosurgery unit. On March 14, 2012 the faller underwent a cerebral angiogram to evaluate the blocked blood vessels and embolization. On March 20, 2012 a pressure ulcer was noted on faller's coccyx. Faller's recovery after the surgery was slow but steady. He was not able to walk and transfer independently. His transfer status indicated he required assistance from 1-2 person(s), depending on the size and ability of the person providing assistance, and the need of a two-wheeled walker for walking during his hospital stay. The faller was oriented to his name, place but not date and year. As a consequence of his SAH, the faller suffered cognitive impairment, memory loss, and confusion. He also lost weight and had general muscle weakness and fatigue, which was exacerbated by his obstructive sleep apnea. He was taking 11 different medications.

Environment

The faller occupied a two-patient room. On the day of the fall the room was only occupied by the faller and there were no witnesses. At the time of the fall (12:20) the room was well lit by overhead light and a large window facing the beds. The faller was sitting in his wheelchair which rested in between the two beds. The curtains which separate the two beds were not drawn and the faller was close enough to the unoccupied bed to reach it while sitting in his wheelchair. He used the unoccupied bed to lay down his lap tray when he decided to transfer to his bed on his own. The lap tray was used as a form of restraint to discourage patients from getting out of their wheelchairs unsupervised. The faller was not wearing a chair Posey (a form of seatbelt for the wheelchair). The top right bedrail was up while the bottom right bedrail was down and all left bedrails were up. Because the bottom bedrails were down, the faller thought he could get into bed by himself without difficulty. He over-reached from his wheelchair to the mattress and lost balance.

Wound Care Management and Pressure Ulcer

On March 20, 2012 the faller developed a coccyx ulcer. The healthcare team in the neurosurgery unit cared for his pressure ulcer, which seemed to get worse over time. On May 7, 2012 the Skin Wound Ostomy Team (SWOT) was consulted and they completed an initial assessment. The ulcer was diagnosed as an unstageable pressure ulcer and SWOT prescribed a special pillow for the faller's wheelchair, which was used to help offload pressure on the tissue under the coccyx.

Nurse and Lunch Break Coverage Practices

On the day of the fall, the faller was a new patient for the day RN on duty. Although she had seen the faller before and assisted a colleague in caring for the faller, she had not yet been assigned as this primary nurse. At the time of the fall the nurse had gone for lunch break and a covering RN was in charge of looking after the faller. The RN did not inform the faller that she was going for lunch. During lunchtime, the unit staffing levels are reduced by 40-50 %. Half of the RNs go for lunch while the other half care for their own patients as well as 4-5 additional patients.

Case ID: 1200412

The Fall

The faller, a 66 year old stroke survivor, fell in an acute care hospital room on Thursday, May 17, 2012 at approximately 15:55. After an afternoon physiotherapy session, the faller was assisted to the washroom in his hospital room by the physiotherapist (PT). The faller was able to walk with his walker but required assistance and supervision by at least one other person. The faller left his walker just outside the washroom when he was ready to leave. The faller used the call bell to call for help, but after 5 minutes of waiting, became impatient and decided to go to his bed independently. He stepped out of the washroom and grabbed onto his walker. As he started walking, his foot hit the walker and he tripped over the walker. He lost balance and fell forward to the ground. The RN walked into his room and noticed the faller on the floor. She rushed to the room doorway and called for assistance from other nurses nearby. Two other RNs arrived and helped the faller into his bed. Faller was assessed for injuries and no injuries were found.

The Faller

This 66 year old gentleman experienced his first stroke in 2008. At the time he lived alone and had not seen a doctor in many years. He did not seek medical treatment for this stroke and self-diagnosed himself. After this event, the faller's health started to decline. He was experiencing 2-3 falls per week, and in 2010 he noticed the onset of slurring of words. He began to use a walker, which was given to him by a friend, inconsistently because he was becoming increasingly weak due to significant muscle wasting. His diet at this time consisted mainly of chocolate bars. The faller was a chain smoker and heavy drinker. His mobility around the apartment began to decline to the point of spending the majority of his days sitting in an armchair watching television. Due to his decreased mobility the faller used empty jars to urinate in and these jars rested around his armchair

within arm's reach. On May 13, 2012, the faller felt very weak and uncoordinated in his movements, and he fell three times. The first fall occurred when he lost his balance and landed on the armchair. He was unable to pick himself up and his landlord had to help him back up. The second time he missed his chair and landed in a seated position on the floor. He sat there for several hours before his landlord saw him and helped him back up. During the third fall the faller fell to the ground while trying to reach the telephone, he was unable to pick himself up and lay there for seven hours before his landlord came by to check up on him again. His landlord called an ambulance and the faller was taken to the emergency room. The faller was diagnosed with right caudate putamen stroke. On May 14, 2012, the faller was transferred to the neurology unit where he stayed until May 30, 2012 at which time he was discharged to a stroke rehabilitation hospital. During his stay at the acute care hospital the faller's recovery progressed slowly due to his lack of motivation to participate in therapies. The faller had pronounced speech impairments and communicated with great difficulty. His speech was slurred and difficult to understand. The faller was also inappropriate in his speech, often times cursing and using vulgar language that easily offended others. Although he did not physically harass members of the health care team, his inappropriate language made him an unpleasant patient. The faller had been suffering from depression for many years and it was believed that his depression was linked to personal and family issues.

Family

The faller was divorced and estranged from his children. He did not have any friends or family other than his landlord who periodically checked up on him and occasionally assisted with groceries. The basement apartment in which he lived was owned by the landlord, who lived upstairs. After his second stroke in May 2012, the faller's daughter started to visit her father and became more involved with his care. After his discharge from the rehabilitation hospital the faller's daughter visited faller once or twice a week to assist with groceries.

Environment

At the time of the fall the faller was walking from the washroom of his hospital room to his bed. The room was occupied by the faller and one other patient. The curtains around the faller's bed were drawn to separate the faller's space from his roommate's. The washroom was shared by the faller and his roommate. He roommate was not in the room at the time of the fall. The faller's bed was closest to the washroom, approximately 6 meters away. The room was lit by overhead lighting and a large window closest to the faller's roommate's bed. The room environment was kept in good condition.

Walker

The faller initially used a four-wheeled walker at home. This walker was given to him by a friend but it is unclear from where it was acquired from. He did not use this walker frequently as it was large and difficult to maneuver around his home. When he arrived at the stroke unit at the acute care hospital, the faller was assessed and given a generic

walker by the OT. This walker did not have wheels and belonged to the hospital. The faller received this walker 3 days before his fall and was still adjusting to it.

CCAC

The Community Care Access Centre (CCAC) was not involved with the faller's care before his second stroke. Because he never visited a hospital or doctor, no one was made aware of the faller's declining health and living conditions. His landlord acted as his only informal support and was only able to provide the faller with minimal assistance.

Right Caudate Putamen Stroke

According to a study published in the Journal of Neuroscience, a stroke in the right caudate putamen can affect many types of motor skills including: controlling motor leaning, motor performance and tasks, motor preparation and specifying amplitudes of movement and movement sequences. This form of stroke can also affect reinforcement and implicit learning. Reinforcement learning is necessary for interacting with the environment and catering actions to maximize the outcome. Implicit learning is a passive process where people are exposed to information and acquire knowledge through exposure. Stroke affecting the putamen has also been shown to impair performance of rule-based tasks (Sapir, Kaplan, He & Corbetta, 2007). The faller suffered a right caudate putamen stroke and consequently suffered from motor deficits similar to the ones described above.

Case ID: 1200512

The faller, a 53 year-old stroke survivor fell on Thursday, May 31, 2012 at approximately 06:32. Prior to this fall, the faller experienced two other falls while at acute care hospital. The previous falls were the result of the faller's attempts to transfer to the washroom independently during the middle of the night, on May 29th and 30th. During the night of May 31st, the faller was feeling very restless, confused and agitated. He was unable to sleep and tossed and turned for the majority of the night. The RN placed wrist restraints on the faller to prevent him from pulling out tubes or wires. At 02:00 the faller decided to get out of bed by himself without calling for help. Although the bedrails were up and the faller's wrists were restrained, he was able to sit himself up and put his right leg underneath the bottom bedrail. The RN walked in for a scheduled check and, when she noticed the faller attempting to once again get out of bed, she repositioned him and placed a Pinel system waist restraint with the "beavertail" attachment on him and removed the wrist restraints. The faller was still unable to sleep and lay in bed awake from approximately 02:10-06:30. At 06:30 the hospital fire alarm went off, and because the faller was trained as a first responder/firefighter, he naturally felt the urge to respond to the alarm. The faller pulled and twisted the restraint straps and somehow repositioned himself to that his head was at the foot of the bed. Next, the faller squeezed himself in between the bedrails, through the space between the top and bottom bedrails, while he was still restrained, and fell off the side of the bed. Two RNs heard the commotion and the faller yelling for help and rushed to his room. The RNs found the faller hanging at

side of the bed, face up, with the "beavertail" restraint still around his waist. The RNs struggled to free the faller but were unable to do so because the weight of the faller pulled down on the restraints and caused the magnetic lock to jam. Six other RNs in the unit rushed into room. Together they were able to snap open the waist restraint by cutting it with scissors and gently lower the faller to the ground. The faller was lifted back into bed and assessed for injuries but no major injuries were found. The faller sustained a minor abrasion on his right hip.

Faller

The faller was a 53 year old right-handed gentleman who had a sudden onset of hemiplegia on May 19, 2012. The faller was in the shower when he noticed that his left hand and later his left leg stopped working. He was taken to the emergency room of a local hospital in a smaller town and later transferred to the regional acute care hospital for further evaluation. The faller was diagnosed with an intraparenchymal hemorrhage in his premotor gyrus with edema surrounding it. The faller was previously diagnosed with multiple sclerosis in 2008 and suffered from degenerative disc disease and carpal tunnel syndrome. During his stay in the acute care hospital, the faller was alert and oriented during the day, but confused and restless at night. He had an eye deviation to the right with inability to look to the left. He had a left facial weakness and dense left hemiplegia and significant left sided neglect.

Family

The faller's wife was a registered nurse and worked both in their small hometown hospital as well as in the regional acute care hospital. She was very supportive and visited her husband every day after work. The faller also had extended family in the city, who visited often.

The faller's wife expressed dissatisfaction with the use of restraints on her husband. According to the hospital restraint policy: "A patient may be restrained or confined or a monitoring device (as a restraint) or a safety and protective device used ONLY if the use of restraint or confining or monitoring is authorized by a plan of treatment to which the patient or substitute decider has consented. "However, the faller's wife stated that she was not consented for the use of the Pinel waist restraint on her husband the evening of the fall. Hospital staff stated that attempts were made to contact the faller's wife, but they were unable to reach her in the middle of the night when there was an increased risk to his safety due to agitation, impulsivity and restlessness. According to hospital policy, in emergency situations the consent of the patient or substitute decision maker is not needed to restrain a patient, however, it is unclear if the night of the fall was deemed an emergency scenario.

Restraints

The faller was not restrained after his first fall because, before the first fall, the faller's wife did not give consent for the use of restraints. The faller was restrained after his

second fall because this was assessed to be an emergency situation. She later expressed that she was not content with the use of restraints and would rather monitor the faller herself or ask a relative to monitor him. She was made aware of the need for restraints after the night of the third fall when hospital staff informed her of the fall and the use of restraints. She was upset and said that she was not made aware of the need to restrain her husband using the waist restraint and that no one discussed the use of restraints with her. Hospital staff stated that, because it was an emergency situation and because they were unable to reach her by telephone (it was late at night), they restrained the faller without her consent. The night of the third fall, investigated here, an RN placed the faller in the Pinel Beavertail Restraint. The Pinel restraint system is a lock and key belt that is used for the positioning of restless or combative patients. The system consists of cloth-covered straps that latch together by means of a magnetic key. The waist strap is the biggest and most widely used portion of this restraint system. Other parts include shoulder, thigh, wrist, ankle and head straps. Only the waist strap was used on the faller. The restraint system comes with lengthy instructions on proper use. The manufacturer of the Pinel restraint system does not recommend the use of this system when parted bedrails are used, unless a solid gap protector is inserted to prevent patients from slipping through the gap. "Using bed rails with the Pinel Waist Belt is redundant; however for reasons of perceived security some staff will place the rails in the up position. If these are split rails (of sufficient spread between rails to tempt a patient's escape), it is recommended that the Gap Cover be used to close this gap. It is an inexpensive means of blocking this gap and prevent a patient from trying to slide between the rails" (Pinel restraining and de-restraining instruction booklet, page 24).

Nursing

The faller had not previously been in the care of the night nurse who was taking care of him the night of the fall. She was unfamiliar with his impulsive behavior, and previous occupation as a first responder, because this information was not clearly discussed during RN verbal reporting during shift change, the night of the fall.

Case ID: 1200612

The fall

The faller, a 34-year-old gentleman, fell in an acute care hospital room on Wednesday June 20, 2012 at 03:28. The faller was admitted to the emergency room on June 5, 2012 where he was diagnosed with a left middle cerebral artery (MCA) stroke, which left him with significant aphasia and right sided weakness. During the 15 days in the hospital he remained calm and stable, and had never attempted to ambulate on his own. On June 20, 2012 the faller had a gastrojejunostomy (GJ) feeding tube inserted because he was unable to swallow appropriately. The night of the fall (June 20), the faller was positioned in bed and checked on every 90 minutes by his nurse. He felt restless and agitated and was unable to sleep. At approximately 03:25 the faller decided to get out of bed for unknown reasons. He pulled out his feeding tube and then walked five meters to the doorway of his hospital room, and stood briefly at the doorframe. He then lost balance and slid against

the doorframe and fell to the ground. Two RNs, who were standing at the end of the hall near the nursing station of the unit, saw the faller lying on the ground of his room and rushed over to assist him. They helped him back to his bed and assessed him for injuries. No injuries were found.

The Faller

This 84-year-old stroke survivor was widowed 4 months prior to his stroke, and he now lived alone. On June 5, 2012 he suffered a left MCA stroke, which was thought to be cardioembolic. He suffered from atrial fibrillation, hypertension, type 2 diabetes, chronic anemia, Parkinson's disease, Cholicystitis and alcoholism, as well as a remote history of smoking. He had significant difficulty communicating, especially word-finding, but was able to say 'yes' and 'no'. Medical staff found it very difficult to get answers from him during assessments due to his limited communication abilities. He had no control over swallowing and a GJ tube was therefore inserted on June 20, 2012. The GJ tube was originally scheduled to be inserted on June 19, 2012 but, due to faller's very low heart rate, the procedure was reschedule. The faller suffered from very low heart rate (bradycardia) but refused a pacemaker. Because the faller was confused, it was not known if he had the cognitive capacity to make the decision for himself. His bradycardia posed continued risk to his safety. He was confused and according to the physician, most probably suffered from neuropathy due to diabetes and alcoholism. Neuropathy causes a decrease in proprioception and sensation in the feet, making walking difficult and unsafe. The physician stated that in retrospect, due to confusion and possible neuropathy, this patient should not have been allowed out of bed at all, especially since he was assessed at high risk for falls upon admission. During his hospital stay he was given a walker and was ambulating only under supervision during physiotherapy sessions.

Medications

The faller was taking 11 prescription medications including medication for Parkinson's disease (Levodopa-carbidopa). These medications are known to cause orthostatic hypotension, a drop in blood pressure due to the change in body position from laying to standing. This may have led to a transient loss of consciousness and, subsequently, the loss of balance.

Falls Prevention

Upon admission, patients who are assessed as high risk for falls are given a small bracelet that identifies them as at risk for falls. This bracelet is meant to be a visual cue for both hospital staff and the patient, to remind them not to fall. However, the capacity to understand what this means is low in stroke patients suffering from cognitive impairment. Although the faller was assessed as high risk for falls, no specific strategy was put in place to prevent him from falling. Because the faller had not previously exhibited impulsive behavior, increased safety measures were not put in place to prevent him from falling in the event he did attempt to transfer or ambulate independently. Although the faller was given a walker and instructed on the use of the walker, his mental capacity to

understand, learn or remember these instructions was very low. Standard practice in the unit was to continuously repeat instructions to confused or cognitively impaired patients.

Monitoring of patients

Patients who suffer from confusion, neuropathies and especially aphasia, who are unable to verbally communicate their needs require more frequent, if not continuous, monitoring. The faller was confused and unable to understand and navigate the hospital environment. Due to his severe aphasia and confusion, the faller was incapable of communicating the reasons behind his decision to get out of bed. According to one of the attending physicians and the two RNs on duty the night of the fall, the faller could have been experiencing pain and discomfort due to a number of health conditions, including a newly inserted GJ feeding tube, bradycardia, peptic ulcers, cholecystitis, alcohol withdrawal, and Parkinson's disease. He was also suffering from diabetic neuropathy and had little sensation in his feet, which cause problems with balance. Due to polypharmacy and the side-effects of a stroke, the faller required frequent monitoring by nursing staff. The volatile combination of medications, confusion, decreased proprioception and an inability to communicate was not counterbalanced with good communication within the healthcare team so that the faller would have adequate supervision and monitoring for nonverbal communication and cues.

Unit Staffing at Night Time

During the night shift there was one nurse taking care of seven patients. The RN was unable to supervise the faller more frequently than every 90 minutes due to a heavy workload and time constraints. According to a physician, "confused patients need to be watched more carefully. He is out of acute injury and it is a busy ward, they need to hire nurses to take care of people who are acutely ill because the sickest patients are the ones they're going to be focusing on. We do not have enough nurses. We need more nurses. The cardiac observation monitoring is very expensive but we need more nurses!"

Communication with Patients Suffering from Aphasia

Common characteristics displayed by a person who has aphasia may include decreased attention, decreased memory, inability to recall specific words, poor auditory comprehension, lack of ability to use words or gestures to make needs known, and high levels of frustration. Nurses in the stroke unit are specially trained to care for stroke patients, including those suffering from aphasia. When communicating with aphasic patients, clinicians must talk simply and naturally and encourage the patient to respond in whatever way he/she can as well as encourage gestures and talking with hands. Nurses are instructed to tactfully change the subject when the patient is frustrated in trying to explain something and keep any instructions and explanations simple. Staff is encouraged to ask direct questions requiring a simple "yes" or "no" rather than those requiring complex answers. Staff is not to confuse the patient with too much idle chatter or too many people/distractions in the room (http://www.aphasia.or/naa_materials/communicating_with_people_who_have_aphasia.h

tml). In the case of the faller, staff relied on “yes” and “no” responses from him and used visual aids, such as body diagrams to indicate location of pain and calendars to orient him to date. The faller’s needs (stomach pain, frustration, and agitation) were not recognized by staff.

The following five case studies were obtained as de-identified secondary data from the study "Vision and Falls in Hospitals - Pilot Project", funded by the Western University, Faculty of Health Sciences, Faculty Research Development Fund Collaborative/Planning Grant 2013, Co-PIs: Aleksandra Zecevic, PhD (Western University) and Susan Leat, PhD (Waterloo University).

Case ID: 1300114

The Fall

The faller, a 57-year-old alcoholic and pontine stroke survivor, fell in hospital on the patient room floor on his buttocks on Thursday, July 3, 2014 at 23:30. The faller had drank 6-8 cups of tea over the course of the day and had to urinate before going to sleep. He got up from the bed independently and began to walk around the corner to the bathroom using his two-wheeled walker. The main door to the patient room was open at 90 degrees which left only a two foot clearance between the edge of the door and the bathroom countertop. When the faller tried to tilt his walker between this gap, it did not tilt, so he reached forward and grabbed the door with his left hand. He pulled the door towards him and began to push his walker forward with his right hand. The walker's front left wheel then got caught on the back right leg of a chair that had presumably been left behind the door by a visitor to this four-patients hospital room. The faller grabbed the chair with his left hand and tried to pull the chair behind him. As he pulled the chair, he lost his balance and began falling backwards. The faller leaned back thinking that the free-moving door behind him was a wall. The door then moved and the faller fell onto his buttocks as he pushed his walker forward. The walker fell and made a loud noise which drew the attention of the faller's primary nurse down the hall. Two nurses rushed to the faller's room and found the faller kneeling upright beside his walker. The two nurses assisted the faller back to his bed, did a full head-to-toe assessment, and found no new injuries.

The Faller

This faller has an extensive history of alcohol abuse dating back to his early 20's. He has a family history of alcohol abuse, as his father, sister and brother have all died from alcohol-related circumstances. In the past, he drank an average of 4-5 drinks per day, but he has increased his average to 7-8 drinks per day following a separation from his wife a year and a half ago. He was fired from his job a year ago because of substance use and his driving license was suspended over concerns of neurological symptoms and alcohol use.

The faller also has a history of falling backwards. At the beginning of March 2014, he had fallen backwards hit his head and had a black eye. Two weeks later, the faller had been trying to quit drinking, but experienced alcohol withdrawal and drank on March 29. A day later, on March 30, he fell backwards and hit the back of his head on the parking lot asphalt in front of a local pharmacy. A witness saw the faller on the ground with seizure-like symptoms lasting about a minute, followed by a period of confusion. On May 23, 2014, the faller fell backwards again in a parking lot after a night of drinking at a pub. He had a loonie-size hematoma to the back of his head, as well as abrasions to his left foot and ankle. On June 14, 2014, the faller traveled to a resort in Mexico with a friend. The next day, on June 15, 2014, the faller fell backwards and hit his head on the ground. He was brought to a hospital in Mexico where his head wound was stitched up and he was released. After returning to the resort, his friend noticed the faller displaying strange behavior and confusion. Next day, the faller was taken back to the hospital by ambulance where he was treated for agitation, alcohol withdrawal, and suspected hepatic encephalopathy. He was released the same day. After a week in Mexico, the faller was still confused and disoriented and was airlifted to the hospital in Canada on June 22, 2014.

While at the hospital in Canada, the medical team treated the faller for alcohol withdrawal. On June 30, 2014, the faller underwent an MRI that revealed a recent pontine perforator infarction and severe chronic cerebellar atrophy. The pontine stroke affected the faller's brainstem, which affected his sitting and standing balance; while the chronic cerebellar atrophy, likely due to his chronic alcohol abuse, affected his balance, coordination and gait. In addition, the faller's physiotherapist team noted that the faller tended to lean back when ambulating, so he was assigned a two-wheeled walker and instructed to call for assistance when moving anywhere. He was confused and unable to remember instructions, which prevented compliance with nursing directives to use call bell at all times.

Occasionally, the faller was overconfident in his ability to transfer independently or ambulate without assistance. The faller's medical conditions, history of falling, history of injuries due to falls, the use of a mobility aid and unsteady gait indicated that he was at a very high-risk for falls. The faller had no fluid intake restrictions so he drank a lot of caffeinated tea throughout the day and had to make frequent trips to the bathroom to urinate. This also contributed to his trouble sleeping at night.

The faller's vision with both eyes together was slightly better than 20/20. However, when assessed individually, the left eye was worse than 20/20 and the right eye was 20/20. The faller had no problem seeing contrast and his peripheral vision was good, but he did not have any depth perception, meaning that 3D vision was absent and objects appeared flat to him. He reported that his vision declined since the fall in Mexico.

Assistive Devices

The walkers on loan to patients at the hospital were purchased by and belonged to a floor-based hospital units using each on its budget. When a patient was transferred to another

floor, the walker they were originally using remained on that floor and a new walker was loaned to them when they arrived in their new room. This practice prevented equipment from going missing between floors, reducing the need to find money in the unit budget to purchase new assistive devices. For this faller, the two wheeled walker on loan had a steel frame, two 3-inch wheels at the front two pegs, and two rubber stubs on the back two pegs. The faller felt unstable when turning sharp corners with this two wheel walker, and when using only one hand as the walker tilted on its edge.

Hospital Environment

The hospital corridors tended to be cluttered with computerized medication dispensing units, IV poles, clean linen carts, food delivery carts and other miscellaneous equipment depending on the time of day. On the day of the fall, the faller was in a four-patient ward room were other complex care patients kept him awake at night. Each patient had a bed, a chair, an IV pole and a bedside table. When guests visited, they had to bring extra chairs from hallway or conference room into the patient room, which added more clutter to the already tight space inside the patient room. When the faller got out of bed to go to the bathroom, he had to navigate his walker around a number of these obstacles near his bed before entering the bathroom. The bathroom counter was long and its sharp corners were approximately two feet away from the open patient room door, which was usually open to assist the night nursing staff see and hear their patients in an effective manner. The door to the patient room had the potential to open 180°, but two dirty linen baskets, placed along the bathroom wall, prevented the door from opening past 90-100°. The door in this open position partially blocked entry into the bathroom because the bathroom counter top was jutting out from the wall, and the faller's walker could not fit through. After the faller moved the door towards himself, he caught his walker on a conference room chair that a visitor had presumably placed behind the door on their way out. This was the second obstacle the faller had to move from his path to the toilet.

Falls Prevention

The Standard Falls Prevention strategy is implemented for all hospital patients with a moderate to high risk of falling according to a patient's score on the Morse scale (score greater than 24 or of 115 is considered moderate to high risk for falls). The bedroom and bathroom lights were both on, the faller was wearing non-slip socks, he was using his walker to ambulate, a call button was placed beside his bed which he was instructed to use this whenever he ambulated, a hand held urinal was placed at his bedside, a red "High Risk for Falls" sign was placed above his bed, and he was wearing a yellow "Call Don't Fall" bracelet on his wrist. The faller's first hospital fall occurred on June 30, 2014 when he tried to transfer from the bed to a nearby chair alone. The standard fall prevention strategies remained unchanged after his first fall and were insufficient to prevent his second fall. In the past year, 10 a.m. was the most frequent time for patient falls on this unit. This is recognized by staff as a very busy time of the day when new orders from physicians come in, and half of nursing staff is on scheduled break. At this time nurse to patient ratio is 1to 8 substantially reducing patient supervision.

Incident Reporting

The first fall on June 30, 2014 was noted in the faller's medical chart but was not recorded in the computerized adverse event reporting system. It seems that an informal unit culture is that adverse events reports for non-consequential falls can be omitted if staff is too busy.

Admissions and Room Transfers

Admissions Department frequently transfers patients from room to room to free up space in the Emergency Room (ER). Patients from the ER are initially moved to any available bed on a unit and then transferred again when an appropriate bed on the unit becomes available. The hospital was consistently operating over consensus at 103% of bed use. This meant that extra beds had to be added to larger rooms for patients who were close to being discharged .This faller was transferred three times before the fall on July 3, 2014. The frequent room changes required patient adjustment to a new environment and new nursing staff, potentially influencing continuity of care, familiarity between the patient and the nursing staff, and patient supervision. Additionally, each room change resulted in approximately $200 of additional cost for room cleaning and staff time for transfer preparation and patient re-assessments.

Case ID: 1300214

The Fall

The faller, a 70-year-old Kurdish and Arabic speaking diabetic fell on the floor in his hospital room on Thursday, August 21, 2014 at 13:30. The faller had eaten a large lunch at 11:30. His blood glucose level, which had already been very high (24.8 mmol/L) in the morning, rose to 29.1 mmol/L at 12:00. The insulin, both planned and sliding scale, did not bring down the faller's blood glucose level, which had steadily risen over the 14 hours leading up to the fall. The faller used his 4-wheeled Rollator walker to ambulate to the bathroom to brush his teeth. While sitting on the seat of the walker in front of the bathroom sink, he could not get the lid of his toothpaste off so he called out for a nurse. The faller's primary nurse entered the faller's bathroom, opened the toothpaste for him, and exited the room to complete work on the electronic medication dispense computer which was located just outside the faller's room. After the faller finished brushing his teeth, he decided to leave his walker by the sink and walk back to his bed unassisted. As he was walking, the faller tripped over curled toes on his left foot and lost his balance. The faller then fell sideways and landed on his left side. The primary nurse heard the "thud" of the faller landing and entered the faller's room to find him lying on the floor on his left thigh and right knee. The nurse and another staff member then assisted the faller to his bed. The nurse performed a head-to-toe physical assessment on the faller and found no injuries.

The Faller

The faller was diagnosed with insulin-dependent type two diabetes mellitus in 1994. On July 17, 2014, the faller felt sick and was vomiting in his home multiple times. The faller, who lives alone, called a friend and told him to call him back at 12 midnight and if he did not pick up the phone, that something may have happened to him. The faller did not pick up the phone when the friend called at midnight, so the friend went to the faller's house and called 9-1-1. An ambulance took the faller to a large regional hospital where he was admitted with diabetic ketoacidosis, a lung infection, and sepsis which later developed into an acute kidney injury. He was placed on dialysis from July 28, 2014 until August 18, 2014.

The faller developed neuropathy two years prior to this case and since then, has experienced numbness in his legs. He felt nothing below his knees. He had two ulcers on his left foot; one on the inside/front aspect and one on the outside/middle aspect. His toes were curled on both feet, which his son notes was partially attributed to a time when he tripped over a rug at home and broke the metatarsal of his big left toe. When the faller walked, he tended to drop and drag his left foot. With fatigue, the faller lifted his left knee higher to compensate for dragging his foot and toes.

The faller's blood glucose level was elevated to14.8 mmol/L at lunch on August 20, 2014. Twelve units of scheduled novorapid insulin and four units of sliding scale novorapid (adjusted as per current blood glucose level) insulin were given to the faller and his blood glucose level dropped to 8.5 mmol/L at 17:00 on that day. However, the faller's blood glucose level rose to 19.3 mmol/L at 22:00, then rose again to 24.8 mmol/L at 08:00 on August 21, 2014. The spike in the evening was likely due to high carbohydrate snacks that the faller ate in the evening. The faller was given eight units of scheduled novorapid insulin and eight units of sliding scale novorapid insulin at 08:00 on August 21, 2014. His blood glucose level then rose to 29.1 mmol/L at 12:00 and the nurse gave him twelve units of scheduled novorapid insulin and eight units of sliding scale novorapid. At 13:45, the faller's blood glucose levels were critical and six additional units of novorapid insulin were given. At such a high blood glucose level, the faller's vision would have been blurred and he would feel lightheaded, dizzy, and fatigued.

The faller's vision with both eyes together was worse than 20/20. When assessed individually, his vision was no better, with his right eye (20/70) being slightly worse than his left eye (20/50). The faller's vision was poor enough that he was unable to drive. He had bifocals, which he wore for reading and sometimes while walking but he said his vision was still poor with them on. His contrast sensitivity and peripheral vision were good. He had some depth perception but not full, meaning objects appeared flatter than they would for someone with perfect depth perception.

The faller consistently scored as a moderate-high risk for falls on the Morse Scale (>24). Since admission to the hospital, his Morse score went from 75/115 on July 28, 2014 to 30/115 on August 28, 2014. On the day of the fall, the faller's Morse Scale score was 55/115. The hospital falls prevention policy considered all patients with Morse score greater than 24/115 at moderate to high risk for falls. The faller was prescribed a walker a

year ago, which he used at home. However, the faller frequently attempted to practice his independence by ambulating without the assistance of a walker. He thought that if he relied on himself to ambulate, that this would help reactivate feelings in his legs and feet. When the faller stood up from sitting, he got dizzy and this dizziness persisted while walking in a straight line. Physiotherapy progress notes revealed that the faller was also weak and deconditioned. He appeared to understand instructions given by his son, the nursing staff, and physiotherapist but in attempts to maintain independence, he ignored their instructions and ambulated without his walker. He had a history of falling and had no strategy for maintaining his balance.

Assistive Devices On-Loan in Hospital

The walkers on loan to patients at the hospital were purchased by and belonged to each individual hospital were purchased by and belonged to each individual hospital unit using the unit's budget. When a patient was transferred to another floor, the walker they were using remained on the previous floor and a new walker was loaned to them when they arrived in their new room. This prevented equipment from going missing between floors, and reduced the need for the unit to find money in the budget to purchase new or repair existing assistive devices. This faller, first had a two wheeled walker on loan that was replaced with the four wheeled Rollator walker. This walker had a steel frame with a seat in the middle and red balls on the brake handles, which the faller found helpful. When transferred for the fifth time, after the investigated fall, the faller was loaned a different walker that he did not like or feel comfortable using.

Falls Prevention

The Standard Falls Prevention strategy was implemented for all hospital patients with a moderate to high risk of falling according to a patient's score on the Morse Scale (score greater than 24/115 was moderate-high risk for falls). The faller's Morse Scale score was recorded every week and was between 55 and 75. The bathroom lights were on, the faller was wearing non-slip socks, he was using his walker to get to the bathroom, a red "High Risk for Falls" sign was placed above his bed, and he was wearing a yellow "Call Don't Fall" bracelet on his wrist. He was repeatedly instructed to use a call button when he needed to ambulate but he ignored this instruction. These fall prevention strategies remained unchanged after this fall (July 29, 2014) and were ineffective in preventing his second fall.

Admissions and Room Transfers

The Admissions Department frequently transferred patients from room to room to free up space in the Emergency Department (ED). Patients from the ED were initially moved up to any available bed on the unit and then transferred again when an appropriate bed on the unit became available. The hospital was constantly operating over consensus at 103% of bed use. This meant that extra beds had to be added to larger rooms for patients who are close to being discharged. This faller was transferred four times before the fall on August 21, 2014 and the fifth time was on the day of this fall. The frequent room changes

required patient adjustment to a new environment and new nursing staff, which potentially influenced continuity of care, familiarity between nursing staff, and patient supervision. Additionally, each room change resulted in approximately $200 of additional costs for room cleaning and staff time for transfer preparation and patient re-assessments.

Nutrition

Upon admission to the hospital, diet plans were tailored to the specific needs of the patient by the physician. This plan was then sent to the food services where menus were implemented in accordance with the physician's diet order. Every day at breakfast, the patient chose their food for the next day with several choices per category (appetizer, entrée, dessert, beverage, and condiments). A diabetic health plan limited the amount of carbohydrates because they had the most effect on the blood glucose level. The meal plans ranged on a continuum from flexible, where the patient could choose any food option, to structured, where the food choices were set. The faller was on a flexible diabetic meal plan with limited potassium at the time of the fall on August 21, 2014. Since he was confused, his son helped fill-in his daily menu choices a week in advance. The scheduled insulin dosages were then planned in advance, based on these food choices. The nursing staff reported that the faller repeatedly stashed snacks, such as shortbread cookies, in his bedside drawer to eat later, which compromised the effects of scheduled insulin.

Language/Communication

Language barrier was repeatedly noted in the progress notes of the faller's medical chart and in the interviews with the faller's medical team. The faller spoke and understood Kurdish and Arabic and his English was very limited. The nursing staff repeated instructions to call for assistance when ambulating multiple times each day. When nursing staff at this hospital did not speak the mother tongue of their patients, their first option was to use family members to help translate and relay information. For this case, the faller's son was involved but he also worked a full-time job, had a large family and at times was difficult to contact. This made communication with the faller difficult for most of the faller's medical team. The next option for the staff was to use pre-set language cards with key English phrases already translated to other common languages for the patient to read. Lastly, the unit clerk desk had contact information for off-site interpreter services. A copy of a document obtained by the research team was outdated and contained some phone numbers that were no longer in service. Additionally, a 24/7 USA-based professional translation service was also available. However, it was cost-prohibitive, a $3.95/minute of telephone consultation, and used only for emergency medical consultations with physicians. All of this contributed to the communication difficulties experienced both by the faller and his nursing staff.

Case ID: 1300314

The Fall

The faller, an 80-year-old man recovering from a recent reverse shoulder arthroplasty surgery, fell to the ground on his left side on Thursday, August 28, 2014 at 22: 31. The faller experienced constipation since he was admitted on Tuesday August 26, 2014. On the day of the fall he was given Lactulose by his nurse at 14:06 to help improve his bowel movements. Twenty minutes later, the nurse completed a fall-risk assessment on the faller and put in place the hospital's Standard Falls Prevention strategy for moderate to high risk fallers, since the faller's Morse Scale score was 66/115. Four hours after receiving the Lactulose, the faller had an entirely liquid bowel movement. At 22:07, he had to make another bowel movement so he used his bedside call button to call the night nurse. The night nurse assisted the faller to the bathroom and instructed the faller to call her using the call button beside the toilet when he was done. After finishing his bowel movement, the faller used the call button to call the night nurse, who was assisting another patient in another room. As he waited on the toilet, the faller became impatient and pressed the call button an additional 19 times in six minutes. The faller then got up from the toilet alone and pushed the door to the toilet area open (to the right) using his left arm, since his right arm was in a sling. The faller then lost his balance and began to fall forward. In an attempt to regain his balance, the faller held onto the door handle with his left hand. He then released his left hand from the handle and landed to the floor on his left side. The night nurse entered the faller's bathroom to find him lying on the floor facing away from the sink. She assisted the faller to his feet and walked him back to his bed. The night nurse then did a full head-to-toe assessment on the faller and found no injuries.

The Faller

The faller had a history of heart problems including stable angina, hypertension atrial fibrillation and bradycardia, a condition which led to a pacemaker being surgically implanted in 2003. On July 14, 2014, the faller had reverse shoulder arthroplasty surgery on his right shoulder and was given a sling to prevent movement in the right shoulder while it healed. He was also given a cane to use with his left arm while recovering after the surgery. On July 18, 2014 the faller felt short of breath in his home and went to the Emergency Department of a hospital in his hometown where he was diagnosed with bilateral subsegmental pulmonary emboli. He was released from the hospital two days later on July 20, 2014 and prescribed Rivaroxaban, an anticoagulant medication to help prevent blood clotting.

While at home, the faller felt unstable walking with the sling because he was unable to swing his right arm. He fell while walking in his home three times between August 19 and 25th, 2014. Since the shoulder surgery, the faller felt weak in both his trunk and his legs. He was unable to exercise and had no physiotherapy post-shoulder surgery which led to his deconditioned and general weak state. He also felt dizzy whenever he stood up from a seated position. X-ray results from August 26, 2014, revealed arthritic changes in the metacarpophalangeal joints of his right hand as well as chondrocalcinosis in both hands, which caused the faller pain and stiffness. The faller had kyphosis and stood in a slightly hunched position. The faller went for a follow-up appointment with the shoulder

surgeon on August 26, 2014 where he again complained of shortness of breath. The surgeon referred him to a local Urgent Care Centre, where he was told to go to the large regional hospital on the same day.

The faller's visual acuity with both eyes together was slightly worse than 20/20. When assessed individually, his vision was the same in both the right and left eye (20/30). The faller's contrast sensitivity and peripheral vision were great. The faller has no depth perception, meaning 3D vision was absent and objects appear flat to him.

On the day of the fall, the faller's Morse scale score was 65/115, indicating moderate to high risk for falls (all scores greater than 24/115). He was prescribed a hemi-walker to use with a minimum of one person assistance when he ambulated at the hospital. He was an impatient man who did not like to wait for assistance. The faller was right- handed but since his right arm was in a sling, he had to use the hemi-walker with his left hand. He had a history of falling and had no strategy for maintaining his balance.

Assistive Devices

For this faller, the hemi-walker on loan from the hospital had a steel frame with four peg legs and rubber bottoms which provided a wide based of support. It also had two height levels of handgrips. It was designed to only be used with one hand while ambulating. The faller also had a sling on his right arm to prevent his shoulder from moving.

Night staffing

The faller's primary nurse at the time of the fall began her twelve hour shift at 19:00 on August 28, 2014. The primary nurse started working on this unit just three weeks prior to the date of the fall and this was her first shift with the faller as one of her patients. Although the unit physicians advocated for much improved nurse-to-patient ratios of 1:1 or 1:2, the Patient-Care Needs Assessment (PCNA) tool was used by management to establish nursing-to-patient ratios. The PCNA study determined that a1:6 ratio was a manageable workload during night shift, so the faller's primary nurse cared for a total of six patients on the nights of the fall. On night shifts, the nursing staff took a team approach and helped each other as needed. This approach was supported and encouraged by unit management. Staff breaks were decided and scheduled amongst the nursing staff and there were no formal rules or regulations about break times.

Call Bell

The call button system at the hospital involved mostly one-way communication. A call button could be activated in three ways. 1. from the patient's bed, 2. using a separate hand-held bedside button, or 3. from a call button beside the toilet in the bathroom. A patient's primary and secondary nurses would ideally have their cellphones programmed by unit clerks or team lead nurses, to receive these calls. After a call button was activated, the primary nurse was notified with the specific room and bed number on her cellphone. If the primary nurse failed to acknowledge this notification by pressing a button on the

cellphone within two minutes, the secondary nurse would receive the same notification on his/her cellphone. Two-way communication was possible only if the patient called for assistance from their hospital bed. In that case, the nursing station would also be notified and from the station they could talk to the patient via speakers and a microphone built into the patient bed. Two-way communication was not possible for the hand-held bedside call button, or the toilet call button. For this particular case, the faller used the call button located beside the toilet so two-way communication was not possible. The faller had no way of knowing whether the nurse was her way or if she even received his call for help. The cellphone for the faller's secondary nurse was not programmed to receive the primary nurse's patient calls. This means that even after two minutes, only the primary nurse knew that the faller needed assistance and she was pre-occupied assisting a patient in another room.

Falls Prevention

The Standard Falls Prevention strategy was implemented for any hospital patient with a moderate to high risk of falling according to a patient's score on the Morse Scale (24 or more was moderate to high risk for falls). For this faller, it was implemented on August 28, 2014 at 14:26, immediately following a fall-risk assessment (Morse Scale score was 51/115), and eight hours before the fall. The bedroom and bathroom lights were both on, the faller was wearing non-slip socks, he was using his hemi-walker to ambulate, a red "High Risk for Falls" sign was placed above his bed, and he was wearing a yellow "Call Don't Fall" bracelet on his wrist. None of these strategies were sufficient to prevent the investigated fall.

Case ID: 1300414

The Fall

The faller, an 82-year-old frail, impulsive, non-cooperative and depressed man, fell on the floor on his buttocks and hit his head on September 7, 2014 at 09:25. The faller pulled out his Foley catheter on September 5, 2014 at 20:00. This doctor re-inserted the catheter on September 6, 2014. The morning after his catheter was re-inserted, the faller felt a need to urinate. He sat up on the edge of his bed, then quickly stood up from the bed and took several steps towards the bathroom without his walker or assistance. As he walked, he lost his balance, fell on his buttocks and hit his head on the floor. Two nurses rushed into the faller's room and helped the faller back to bed. His primary nurse did a full head-to-toe assessment and found no injuries.

The Faller

The 82-year-old faller was a long-term smoker. He smoked 20 cigarettes a day for the past 74 years. He had a history of chronic obstructive pulmonary disease (COPD) and was on 3 litres of oxygen at home before admission to the hospital. He was also very impulsive, non-cooperative, and did not follow the hospital rules. On August 16, 2014, he was caught smoking a cigarette in his hospital bedroom with his oxygen tubes and tank

still attached and on Nursing staff took his lighter and cigarette away and explained the risks of possibly blowing up. The faller denied smoking inside the hospital.

The faller was incontinent and had a Foley catheter in place before admission to the hospital. While at the hospital, the impulsive faller removed the catheter on countless occasions. On September 5, 2014, the faller ambulated independently to the bathroom to empty his own catheter bag. The faller was caught by a nurse who reminded him to always call for assistance when ambulating or emptying his catheter bag because nursing staff needed to monitor his fluid balance. For this reason, the faller's fluid balance was not accurately tracked and noted.

Unknown to his medical team, the faller's visual acuity was bad enough that he could have been considered legally blind. When assessed individually, his right eye was 20/219 and his left eye was 20/95. With both eyes together his vision was slightly better at 20/87. This means that a person with normal vision would see the same thing at a distance of 87 feet what the faller sees at a distance of 20 feet. The faller had low contrast sensitivity but his peripheral vision was good. He did not have any depth perception, meaning 3D vision was absent and objects appeared flat to him. Vision tests are not a standard practice in patient assessments upon hospitalization.

The faller suffered from chronic constipation and was taking three constipation-relief medications (Bisacodyl, polyethylene glycol 3350 and sodium biphosphate-sodium phosphate) while at the hospital. He was also depressed and often mentioned to nursing staff and his medical team that, "this quality of life is not worth living." To help treat his depressed mood, the faller was prescribed Citalopram, which is an antidepressant medication that has been known to increase the risk of falling in elderly people. In addition, he was taking a total of 15 prescription medications.

The faller was originally admitted to the hospital because he had a fall at home when his leg gave out. He did not lose consciousness or experience any leg pain prior to the fall. He was unable to cope at home and his daughter and grandson, who he was living with, were unable to take proper care of him. The faller was frail, weak, and only weighed 110 pounds.

The faller was assessed by a Community Care Access Centre (CCAC) case manager for Transitional Care Unit (TCU) availability on August 28, 2014 and although he was eligible, there were no beds available. On September 3, 2014, the faller's doctor declared him an Alternative Level of Care patient until he was mobilizing well enough to go home. He first refused to practice stairs with the physiotherapist on August 25, 2014 and then again on September 4, 2014. He also refused to practice ambulating and preferred to stay in his bed.

The faller consistently scored as a moderate to high risk for falls on the Morse Scale (score greater than 24 out of max 115). Since admission to the hospital, his Morse Scale scores changed from 85 on August 16, 2014 to 100 from September 2-9, 2014, then to 80 on September 11, 2014. On the day of the fall, the faller's Morse Scale score was100. He

appeared to understand instructions given by the nursing staff and physiotherapist to always call for assistance and use the walker when ambulating, but he frequently ignored their instructions and ambulated alone without his walker. He was also very quick to get up from the bed and although the nursing staff heard the bed alarm go off, they found it difficult to get to his room before he left the bed. He had a history of falling and had no strategy for maintain his balance.

Assistive Devices

The walkers on loan to patients at the hospital were purchased by and belong to each individual hospital unit using the unit's budget. When a patient was transferred to another floor, the walker they were using remained on that floor and a new walker was loaned to them when they arrived in their new room. This prevented equipment from going missing between floors, which would have forced the unit to find money in the budget to purchase new assistive devices. Equipment changes were not recorded in a central database and notes were only made in the faller's medical chart. Physiotherapy staff were often unaware of patient room and floor transfers and had to problem solve equipment changes when they saw the patient on the new floor. For this faller, the four wheeled Rollator walker on loan had a steel frame with a seat in the middle of the walker. An oxygen tank was also attached to the walker.

Admissions and Room Transfers

The Admissions Department frequently transferred patients from room to room to free up space in the Emergency Department (ED). Patients from the ED were initially moved to any available bed on a unit and then transferred again when an appropriate bed on the unit became available. The hospital was consistently operating over consensus at 103% of bed use. This meant that extra beds had to be added to larger rooms for patients who were close to being discharged. This faller transferred rooms two times before the fall on September 7, 2014. He was transferred again in September 9th, two days after the investigated fall. The frequent room changes required patient adjustment to a new environment and new nursing staff, potentially influencing continuity of care, familiarity between the patient and the nursing staff and patient supervision. Additionally, each room change resulted in approximately $200 of additional costs for room cleaning and staff time for transfer preparation and patient re-assessments.

Bed Alarm

The bed alarm was turned on by the faller's primary nurse on the faller's first night at the hospital. Bed alarms were used on this unit when patients were impulsive, forgetful, or non-compliant with hospital rules. The bed alarms were built into the mattress of the hospital beds and had three different settings: 1. Alarm with any shift in person's weight, 2. Alarm when person sat up, or 3. Alarm when person left bed completely. The faller's bed alarm was set to the second setting where the alarm was activated when he sat up in bed. The bed alarm history was tracked in an electronic database. However, this function was disabled because a cord, connected to the bed alarm, was not plugged into the wall.

On September 5, 2014, the faller had attempted to get out of bed alone and although notes in the faller's paper chart said the bed alarm was on, there was no history of such activity in the electronic database. The bed alarm was on at the time of the fall on September 7, 2014 but there was no documented history of the alarm being triggered in the automatic history log. When the bed alarm cord was not plugged into the wall, the bed alarm still functioned locally, but its activity was not recorded in the database. The bed alarm cord was transferred with the hospital bed when a patient transferred between rooms. Occasionally, nursing staff forgot to plug the bed alarm cord into the wall of the new room. This was the most likely explanation for the lack of documented bed alarm history in this investigation.

Nursing Workload and Scheduled Breaks

The faller's primary nurse went on her scheduled break at 09:10 on September 7, 2014 and left her four patients under the responsibility of the secondary nurse, who then had eight patients to care for. Before going on break, the primary nurse gave the secondary nurse a quick report on her patients, how they mobilized, their health status and told her that the faller's bed alarm was on. While the primary nurse was on break, the secondary nurse's primary responsibility was still to her four patients but she was on stand-by for the primary nurse's patients. When the faller's bed alarm went off at 09:24, the secondary nurse heard it, but was occupied assisting one of her own patients in another room.

In the past year, 10:00 was the most frequent time for patient falls on this unit. This was recognized by staff as a very busy time of the day when new orders from physicians come in, and half of the nursing staff are on their scheduled breaks. At this time, nurse to patient ratio was 1 to 8 which substantially reduced patient supervision. The standard fall prevention strategies remained unchanged after his first fall and were insufficient to prevent his second fall.

Incident Reporting

The faller's first and second hospital falls on August 16, 2014 and September 3, 2014 respectively, was noted only in his medical chart but was not recorded in the computerized adverse event reporting system. Doctors and nursing staff unfamiliar with the faller had no knowledge of these falls unless they carefully reviewed every note in the patient's medical chart. It seemed that an informal unit culture was that adverse events reports for non-consequential falls could be omitted if staff was too busy.

Falls Prevention

The Standard Falls Prevention strategy was implemented for all hospital patients with a moderate to high risk of falling according to a patient's score on the Morse Scale (score greater than 24 out of 115 was considered moderate to high risk for falls). The bedroom and bathroom lights were both on, the faller was wearing non-slip socks, he was using his walker to ambulate, a call button was placed beside his bed which he was instructed to use whenever he ambulated, a handheld urinal was placed at his bedside, a red "High

Risk for Falls" sign was placed above his bed, and he was wearing a yellow "Call Don't Fall" bracelet on his wrist. The faller's first hospital fall occurred on August 16, 2014 when he tried to transfer from a bedside commode to his bed alone. The fall prevention strategies remained unchanged after this fall. The faller's second hospital fall occurred on September 3, 2014 when he was found by nursing staff sitting on the floor beside the chair of his roommate. The fall prevention strategies remained unchanged again after this fall and were ineffective in preventing his third hospital fall on September 7, 2014.

The hospital's policy was to involve the unit coordinator, unit manager and a Clinical Risk Consultant in a mandatory review of an adverse event only if the event resulted in a Level 4 consequence (i.e., serious injury). Other opportunities for organizational learning (such as falls with minimal or moderate consequences) were minimally utilized.

Cases ID: 1300514

The faller, a 75-year-old heart attack survivor, fell in hospital on her buttocks on a patient room floor on Tuesday, October 28, 2014 at 07:00. The faller had gotten up from her hospital bed independently and ambulated, using her four-wheeled Rollator walker, around the corner to the bathroom sink. She sat on the walker's built-in seat while brushing her teeth. The outgoing night nurse and incoming day nurse were standing at the room entrance exchanging reports at shift change. They were aware that the faller was at the bathroom sink brushing her teeth. When she was done, the faller stood up from the walker seat, stumbled backwards, and tripped over the walker's back wheels. She lost her balance and fell over the walker which impacted her left armpit. This faller then fell to the floor landing on her buttocks. Two nurses and a nurse trainee rushed to the faller's room and found the faller on the floor between the bathroom entrance and the room's short hallway. The faller's primary nurse performed a head-to-toe assessment of the faller and notified her medical team of the fall.

The Faller

The faller had a home-care nurse who visited her at home prior to hospital admission. On October 22, 2014, the at-home nurse noticed the faller had an increased shortness of breath since 09:00 that day and it was getting worse on exertion. The at-home nurse then called 9-1-1 and the faller was brought to the hospital via ambulance.

The faller had a history of cardiovascular heart problems and had suffered a heart attack in August, 2014. When she was admitted to the hospital for the heart attack, she was also diagnosed with congestive heart failure. She had also been diagnosed with atrial fibrillation and was being treated with Apixaban. She had high blood pressure (hypertension) and was also diagnosed with dyslipidemia. The faller also had type 2 diabetes mellitus and was managing it through her diet. She was diagnosed with gastroesophageal reflux disease (GERD) in 1994 and was also living with asthma and osteoarthritis. From the onset of this hospital admission the faller was put on oxygen.

Before and during her stay at the hospital beginning on October 22, 2014, the faller had experienced extreme intractable itching, but doctors were unable to identify any potential irritants. She had bilateral leg swelling, erythema, and a burning sensation for three weeks prior to this hospital admission. There were no wounds, bites or trauma but she was very distressed and itched her body profusely. She was treated with hydrocortisone cream at the hospital which was applied multiple times per day by nursing staff.

At her initial physiotherapy assessment, the faller was able to stand unsupported. She also had good, independent balance when sitting, had no co-ordination problems, and independently went from a sitting to a standing position. She independently transferred from her hospital bed to the bedside chair. She was using a long 25 foot oxygen line which allowed her to ambulate around the corner to the bathroom with the oxygen line attached. When using the four-wheeled Rollator walker assigned to her at the hospital, she was able to ambulate to the hall without any assistance. She was generally weak and took small steps with a very short stride and a slight limp.

At 00:30 on October 27, 2014, the faller complained of shortness of breath and was coughing. She denied the use of a puffer because she felt that it did nothing. She was still very itchy over the course of the day and no medication helped to relieve this itchiness. At 10:45, the faller felt nauseous and vomited. She was given Gravol through her IV in the afternoon and this helped relieve the vomiting over the course of the day. At 19:20 on October 27, 2014, the faller was still short of breath. At 00:45 on October 28, 2014, the faller's SPO_2 level dropped from 88% to 85% and her heart rate was high at 105-110 beats per minute. The faller had a chest x-ray at 01:18 which revealed atelectasis in her lower left lung and shortly after that, a Respiratory Therapist adjusted the oxygen level which brought the faller's heart rate back down and her SPO_2 level back to normal range between 88-91%. After this, the faller was still very itchy all night and slept poorly.

The faller's vision with both eyes together was slightly worse than 20/20 and measured 20/33. However, when assessed individually, each eye measured 20/55. The faller had no problem seeing contrast. She did not have any depth perception, meaning that 3D vision was absent and objects appeared flat to her. Her peripheral vision was also limited and she could not see beyond her central vision.

Assistive Devices

The walker on loan to patients at the hospital were purchased by and belonged to each floor-based hospital unit using each unit's budget. When a patient was transferred to another floor, the walker they were originally using remained on that floor and a new walker was loaned to them when they arrived in their new room. This practice prevented equipment from going missing between floors, reducing the need to find money in the unit budget to purchase new assistive devices. For this faller, the four-wheeled Rollator walker on loan had a steel frame with a seat in the middle of the walker. She had six days of experience using this walker before the fall.

Falls Prevention

Fall risk assessments, using the Morse Scale, were routinely completed by nursing staff every Thursday and after patients were transferred to new rooms. This faller was admitted to the hospital ED on Wednesday October 22, 2014 and moved up to a room on a hospital unit that same day. There was no documentation of any fall risk assessment done at that time. The faller was then transferred to another room within the same unit two days later on Friday October 24, 2014. There was no documentation of any fall risk assessment done at this time, nor on the Thursday prior to the room transfer. The faller's fall risk status was therefore unknown and it was unknown whether the hospital's Standard Falls Prevention strategy was implemented for the faller. At the time of the fall, the bedroom and bathroom light were both on, the faller was wearing non-slip sandals, and she was using her walker to ambulate.

Admissions and Room Transfers

The Admissions Department frequently transfers patients from room to room to free up space in the Emergency Department (ED). Patients from the ED are initially moved to any available bed on a unit and then transferred again when an appropriate bed on the unit becomes available. The hospital was consistently operating over consensus at 103% of bed use. This meant that extra beds had to be added to larger rooms for patients who were close to being discharged. This faller was transferred twice before the fall on October 28, 2014. The frequent room changes required patient adjustment to the new environment and new nursing staff, potentially influencing continuity of care, familiarity between the patient and the nursing staff and patient supervision. Additionally, each room change resulted in approximately $200 of additional costs for room cleaning and staff time for transfer preparation and patient reassessments.

Staff Shift Change

The hospital's nursing staff operated on twelve hour shifts from 07:00 to 19:00 and from 19:00 to 07:00. At shift changes, the nursing staff exchanged patient reports, often at each patient's bedside or room entrance, to ensure the incoming nurse had all relevant information to properly care for his/her patients. The depth of these shift change reports varied from nurse to nurse. Some nurses only exchanged necessary information while others exchanged thorough accounts of everything that happened for each patient on their shift. The nursing staff were not required to check-in early for their shift in order to complete the report exchanges. When a nurse arrived precisely on time, the nurse waiting to be relieved had to stay later in order to complete the report exchange. When a nurse had to stay later to do this, they were paid for their time.

While the reports were being exchanged, patient supervision was at a minimum as all nursing staff were preoccupied. However, if a bed alarm or call bell was heard, they would respond immediately and the report exchange would be postponed.

For this case, the faller was in a private room due to droplet restrictions and since putting on protective equipment was time consuming, the two nurses did the report exchange at the faller's doorway. The day nurse was not informed of many activities that occurred

during the night. While receiving a report at shift change, the day nurse saw the faller ambulate to the bathroom sink to brush her teeth and was confident that the faller would be okay while she started her daily routine in another patient's room.

Oxygen Equipment

To relieve the shortness of breath, the faller was given a 25 foot clear oxygen line that extended out from the wall near her hospital bed. Two prongs were inserted in her nostrils. The medical team preferred to use this method of oxygen prescription because there was a constant supply of oxygen. Mobile oxygen tanks had no alarms when oxygen levels were low and they had to be constantly monitored. Oxygen tanks were only used if patients had to leave their hospital room to ambulate down the hall where the oxygen line did not reach. Wall oxygen supply tubing line was clear and difficult to see. It presented a tripping hazard for a patient with limited peripheral vision. When the faller got up from her hospital bed to go to the bathroom, she had to ensure that she did not trip over the oxygen line, which tended to coil, and that the line did not get caught on anything along the way.

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