MEASURING THE EFFECTIVENESS OF A FLEXIBLE MULTIDISCIPLINARY HOURLY ROUND FALL PREVENTION PROGRAM

A Thesis
Presented
to the Faculty of
California State University, Chico

In Partial Fulfillment
of the Requirements for the Degree
Master of Science
in
Nursing

by
© Siri K. Johnson 2014
Fall 2014
MEASURING THE EFFECTIVENESS OF A FLEXIBLE MULTIDISCIPLINARY HOURLY ROUND FALL PREVENTION PROGRAM

A Thesis

by

Siri K. Johnson

Fall 2014

APPROVED BY THE DEAN OF GRADUATE STUDIES
AND VICE PROVOST FOR RESEARCH:

Eun K. Park, Ph.D.

APPROVED BY THE GRADUATE ADVISORY COMMITTEE:

Irene S. Morgan, Ph.D.        Irene S. Morgan, Ph.D., Chair
Graduate Coordinator

Janelle Gardner, Ph.D.
PUBLICATION RIGHTS

No portion of this thesis may be reprinted or reproduced in any manner unacceptable to the usual copyright restrictions without the written permission of the author.
ACKNOWLEDGMENTS

My deepest and most sincere appreciation goes to my Thesis Committee Chair, Professor Morgan. She is a model of enthusiasm and passion in nursing education that convinced me to observe broader, imagine brighter, and reach farther to make a difference. My gratitude for her unwavering support throughout this project is endless.

I would additionally like to express my gratitude to my Thesis Committee member Professor Gardner for the many hours spent reading, editing, and sleeping with my paper in your lap, the Trauma Unit manager, nurse researcher, and nurses who assisted me with this project in the hospital setting, my children, Jolie, Sebastian, and J for all of their patience, and all of my extended family for their understanding. Each and every one of you took time out of your busy lives to make room for this project, and as a village raises a child, together we are making a difference. Thank you.
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Publication Rights</th>
<th>iii</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acknowledgments</td>
<td>iv</td>
</tr>
<tr>
<td>Abstract</td>
<td>vii</td>
</tr>
</tbody>
</table>

## CHAPTER

### I. Background

- Problem Statement                                                                 | 6      |
- Significance and Relevance                                                        | 7      |
- Purpose                                                                          | 8      |
- Research Questions                                                               | 9      |
- Theoretical Framework                                                            | 9      |
- Definition of Terms                                                              | 10     |
- Qualifications                                                                   | 11     |
- Summary and Transition                                                            | 11     |

### II. Literature Review

- Systematic Reviews and Meta-Analysis                                             | 15     |
- Fall Prevention Programs                                                          | 18     |
- LEAF Program Elements in Literature                                              | 26     |
- Discussion and Transition                                                        | 32     |

### III. Research Study

- Methodology                                                                      | 36     |
- Sample                                                                           | 37     |
- Ethical Considerations                                                           | 38     |
- Data Collection                                                                  | 40     |
- Reliability and Validity                                                         | 41     |
- Data Analysis                                                                    | 42     |
- Transitional Statement                                                           | 43     |
## Chapter IV. Results
- Falls .......................................................... 45
- Survey ....................................................... 46

## Chapter V. Discussion
- Falls .......................................................... 51
- Survey ....................................................... 51
- Implications .............................................. 56
- Limitations ............................................... 62
- Recommendations ................................. 63
- Summary ................................................ 64

## References ................................................... 66

## Appendices
- Preparation of Study .................................. 77
- Study Material .......................................... 80
- Result Charts .......................................... 84
ABSTRACT

MEASURING THE EFFECTIVENESS OF A FLEXIBLE MULTIDISCIPLINARY HOURLY ROUND FALL PREVENTION PROGRAM

by

© Siri K. Johnson 2014

Master of Science in Nursing

California State University, Chico

Fall 2014

Fall occurrence rates remain high in hospital settings throughout the United States. Hospitals often use fall prevention programs to decrease the risk of inpatient falls and impact patient outcomes; knowing which combination of evidence based fall prevention strategies are best to implement can be challenging. Objective: ‘Measuring the Effectiveness of a Flexible Multidisciplinary Hourly Round Fall Prevention Program’ examined the effectiveness and feasibility of the Flexible Multidisciplinary Hourly Round Fall Prevention Program (LEAF Program) in the trauma setting. Methods: The number of falls six months post intervention were compared with the number of falls in the six months prior to the implementation of the program and descriptive correlational data were gathered using a computerized survey to determine difficulties and challenges experienced by the nursing staff with this fall prevention program. Results: 25 falls
occurred during the six months preceding implementation of the LEAF Program \((n=6, \mu=4.17, \sigma=2.48)\) with a total of 6,450 patient days and a six month fall rate of 3.876. A total of 22 falls occurred during the six months after the implementation of the LEAF Program \((n=6, \mu=3.67, \sigma=0.82)\) with a total of 6,468 patient days and a fall rate of 3.40 \((t=0.5906, df=5, 95\% \text{ CI})\). The result was a two-tailed p-value of 0.5805, a difference not considered statistically significant. Nurse concerns included participation, time, charting, and education. Conclusion: The LEAF program is a feasible fall prevention program in the trauma setting with the potential for improvement by addressing nurse concerns and the need for additional research (root cause analysis of falls, population specifics, patient specific fall data).
CHAPTER I

BACKGROUND

Fall occurrence rates remain high in hospital settings throughout the United States. The national average rate of falls and related injuries during a hospital stay is 0.564 per 1,000 discharges (U. S. Department of Health and Human Services [HHS], 2012). This rate is higher than any other hospital acquired condition national average rate: objects left in the body after surgery (0.026), air embolism (0.003), mismatched blood type (0.001), severe pressure ulcers (0.135), central line infection (0.367), urinary catheter infection (0.316), and signs of uncontrolled blood sugar (0.050) (HHS, 2012). Fall rates are a nursing sensitive indicator (Tzeng, Hu, & Yin, 2011). Hospitals with high fall rates fail to meet quality and safety goals that are required to become accredited, are no longer reimbursed for fall related injuries via the Centers for Medicare and Medicaid Services (CMS), and have increased costs associated with fall related morbidity and mortality (CMS, 2012; Siracuse et al., 2012; The Joint Commission, 2012). Cost increases include an estimated $13,316 additional operational expense associated with a serious fall-related injury (Wong et al., 2011). The 30-day mortality rate for fallers is 6%, thirty-day readmissions are 14%, and functional activity is decreased 19% (Siracuse et al., 2012). Between 30% and 50% of in-facility falls result in injuries that are then associated with an increased length of stay and higher rates of discharge into long-term care facilities. Falls that do not result in injury may still trigger a fear of falling and
subsequent anxiety, leading to increased overprotection and prolonged rehabilitation (Miake-Lye, Hempel, Ganz, & Shekelle, 2013). Financial and length of stay impacts of falls may be significantly higher than reported (Vu, Day, & Finch, 2014), and fall related injuries in hospitals could reach more than 1 million per year, most of which are viewed as preventable (Oliver, Healey, & Haines, 2010).

Hospitals often use fall prevention programs to decrease the risk of inpatient falls and impact patient outcomes (Van Gaal et al., 2011; Wexler et al., 2011). In a meta-analysis involving 19 high quality studies, Miake-Lye et al. (2013) indicated that multicomponent programs to prevent falls among inpatients can reduce relative risk for falls by as much as 30%. A large variety of hospital fall prevention programs use multiple components, some of which are very comprehensive. For example, the National Center for Patient Safety worked directly with the Department of Veterans Affairs (VA) to create a comprehensive and systematic program that incorporated and adapted to patient placement, condition, risks, and staff educational needs. The VA’s fall prevention program used standardized and patient specific interventions, resources, alerts, cultural adaptations, training, and recent publications to determine the most appropriate fall prevention strategies to be used to provide a well-rounded program (U.S. Department of Veterans Affairs, 2009). Additional examples of comprehensive programs using multiple components include the ‘Matter of Balance’ and ‘Stepping On’ fall prevention programs which emphasize strength training and behavior modification to prevent falls (Administration on Aging, 2012).

Typically, less comprehensive programs focus on population specific interventions and safety culture change using multiple fall prevention components.
Cooper University Hospital and Neurological Institute chose nine health conditions to be addressed for fall prevention with six specific treatment options (Cooper University Hospital, 2012), while the Mt. Ascutney Hospital and Health Center’s fall prevention program consisted of nine common fall prevention interventions (Mt. Ascutney Hospital and Health Center, n.d.). These hospitals focused on a culture of safety rather than the integration of specific evidence based interventions, a trait recently determined to be extremely important. Pearson and Coburn (2011) performed a literature search of effective fall prevention program strategies in critical access hospitals and found that the most effective fall prevention interventions were interdisciplinary. Although they found that incorporating evidence based interventions that addressed certain physiologic changes, environmental changes, education, valid risk assessment tools, root cause analysis, sitters, patient care plans, and flex staffing programs were most effective in fall prevention, they concluded that no single evidence based intervention tended to make or break a fall prevention program. Rather, they found that cultural change and increased awareness of fall prevention were key to increased patient safety.

While the implementation of evidence based fall prevention strategies foster a culture of safety in the nursing environment (Pearson & Coburn, 2011), knowing which combination of evidence based fall prevention strategies are best to implement can be challenging, and the process of implementation in a specialized environment is not always successful. Throughout literature, failures of fall prevention programs are demonstrated despite the decreased likelihood of publication of studies with negative results (Fujian, Hooper, & Yoon, 2013). In a meta-analysis of high quality fall prevention studies, Miake-Lye et al. (2013) found that 11 of 21 studies produced statistically
insignificant change. Hempel et al. (2013) performed a systematic review of 59 fall prevention programs and determined that even though only a fraction of the studies reported enough data to be able to compare fall rates and determine effectiveness of the fall prevention program, using pooled estimates they found no statistically significant intervention effect.

Yates and Tart (2012) assessed a revised hospital fall prevention program in which revisions simplified fall risk evaluation classifications, required mandatory staff education classes, and implemented new fall prevention interventions (non-slip stockings, educational brochures, and a pharmaceutical report evaluation). Psychiatric falls decreased by 32% while medical falls increased 112% between the original program implemented and the revision to the fall prevention program, making the revisions less than effective for the medical population. Yates and Tart determined that a contributing factor to the medical population findings was policy intervention noncompliance by staff. Although these examples are specific to environments, available resources, practical goals, evidence and fall prevention strategies available, and populations served, a recent meta-sensitivity analysis of fall intervention programs within the last ten years indicates that fall reduction programs are only 9% effective in overall reduction of fall rates, 10% with multifactorial interventions, 9% in community settings, and 12% in settings where there was both primary intervention and subsequent follow-up (Choi & Hector, 2012). Clearly, implementing an effective fall prevention program is a difficult undertaking.

The LEAF (Let’s Eliminate All Falls) Program initiated in the Trauma Unit focused on several aspects of evidence based practice and integrated these into the nursing care environment. For example, a multidisciplinary teamwork strategy was
integrated into a process of hourly rounds and safety checks. Fall prevention education for nurses, patients, and families was achieved by integrating a seven-week educational program for the nurses with additional educational resources and support for patients and their families. Nursing assessment skills and appropriate use of the Morse Fall Risk Scale were reviewed and practiced, and fall risk identification and documentation methods were refined. The refined protocol focused on clients with a Morse Fall Risk Scale score above 75, were age 75 or older, or who a history of previous falls. Interventions began with standard safety hospital-wide policy and procedure interventions such as lighting, three side rails, non-skid footwear, hazard free environment, voiding and mobility assistance, and medication instruction. These were enhanced with unit and patient specific strategies that included keeping high risk patients close to the nursing station and using bed alarms, roll belts, gap protectors, Evolution beds, Posey beds, and hourly safety rounds as appropriate. Finally, the program was made to be flexible, giving the unit the ability to learn from each quarter’s trends in falls and adapt fall prevention methods to address these observed trends.

This paper examined the effectiveness of the Flexible Multidisciplinary Hourly Round Fall Prevention Program (the LEAF Program) on the number of falls six months post intervention as compared with the number of falls in the six months prior to the fall prevention intervention. The number of falls was assessed on a Trauma Unit at a University Level 1 Medical Center in Northern California. Descriptive correlational data were gathered using a computerized survey to determine difficulties and challenges experienced by the nursing staff during implementation of this fall prevention program. Results from this analysis contributed evidence to the growing body of knowledge
describing the most effective combinations of fall prevention interventions in a hospital trauma-based fall prevention program.

Problem Statement

The problem under study for this paper was a lack of evidence that the recently implemented Flexible Multidisciplinary Hourly Round Fall Prevention Program was effective in reducing falls in the Trauma population. The Trauma Nursing Unit in a Northern California University Level 1 Medical Center generated the ‘LEAF Program’ (Let’s Eliminate All Falls), a flexible multidisciplinary hourly round fall prevention program that implemented a specific combination of evidence based fall prevention strategies with the intention to reduce falls within the trauma population, a specialized patient case load. The unit clientele often included patients with multiple physical traumas, traumatic brain injuries, psychiatric disorders, gang related gunshot and stab wounds, and elderly fall injuries. Many of these patients were at risk for a fall during their hospital stay. The issue of not knowing the effectiveness of the program made it a challenge when supporting the program, planning and designing improvements, and promoting it. A second problem under study was a lack of evidence of the feasibility of the program for nursing. Not having an understanding of the program from a nursing point of view limited the ability to understand the issues with it and make appropriate improvements as needed.

The translation of fall prevention evidence into practice remains a concern as evidence continues to evolve, continually needing critical evaluation for applicability in specific settings (Haines & Waldron, 2011). Implementing a successful unit specific fall
prevention program has become a complicated endeavor, and there is continuous need for evaluating the applicability of fall prevention programs in specific settings. Despite challenges, hospitals and nursing units need to increase their willingness to integrate fall prevention programs into their practice in order to advance fall prevention strategies, promote the use of evidence-based strategies, and continue to decrease falls in the acute care setting.

**Significance and Relevance**

Improving and refining the evidence for fall prevention strategies and programs adds to the body of knowledge and improves practice, outcomes, and the respectability and professionalism of nursing. Nurses are on the front line for fall prevention as they work at the bedside, recognize risks, and inform multidisciplinary team members (Gillespie et al., 2012). However, fall interventions that require advanced knowledge, communication, and extra activities are typically implemented less often by nurses than simplified interventions (van Harten-Krouwel, Schuurmans, Emmelot-Vonk, & Pel-Littel, 2011). Research contributes to the nursing knowledge base and improves nursing awareness, implementation, and outcomes by implementing the more advanced interventions, decreasing falls, sequela, related legal litigation, and overall healthcare costs, all while meeting rigorous quality and safety goals. These contribute to and advance the development and merit of a profession.

This study has the potential to fill a gap related to best nursing practices in a fall prevention program implemented in the trauma setting. Researchers have determined common barriers to implementing successful fall prevention programs (Tzeng, 2011), while others have developed strategies for implementing a successful fall prevention
program (Black, Brauer, Bell, Economidis, & Haines, 2011). The specific combination of fall prevention methods identified in the LEAF Program can support or refute previously identified requirements of a fall prevention program. No studies were identified that evaluated the effectiveness and nurse challenges of a flexible multidisciplinary hourly round fall prevention program within the trauma environment in the acute care setting. This study has the potential to fill that gap.

Purpose

The purpose of this study was to 1) determine the effectiveness of the LEAF Program implemented in a Trauma Unit at a Northern California Level One Trauma Center through measurement of Trauma Unit falls pre and post implementation of the LEAF Program, and 2) seek feedback from Trauma Unit nurses to determine challenges experienced with the LEAF Program. The LEAF Program was a fall prevention program implemented on a telemetry medical-surgical trauma unit. The quantitative pre-implementation and post-implementation fall rates per 1,000 patient days were analyzed using the paired t-test to determine the statistical difference of the number of falls before and after the implementation of the LEAF program (Burns & Grove, 2009). Qualitative descriptive data of the implementation process were gathered using a computerized survey to identify challenges of program implementation. Correlational analyses were used to examine relationships between variables. Together, these data will add to the body of knowledge that determines effective fall prevention combinations of evidence based interventions in the trauma population.
Research Questions

- What was the effect of implementation of the LEAF Program on the number of falls six months post intervention as compared with the number of falls in the six months prior to the fall prevention intervention?
- What was the nursing response to challenges of the LEAF Program?

Theoretical Framework

Evaluation of the effectiveness of the LEAF Program was guided by the Interacting Systems Framework and Theory of Goal Attainment by Imogene King (1981). The idea of dynamic interacting systems provided an approach to studying the social systems (society), interpersonal systems (groups), and personal systems (individuals) as a whole within different environments. This framework was used to explain how human connections and relations within these environments interact, and how the nature of these interactions led to the achievement of goals (1981). King believed that the framework presented a process for developing concepts within the physical, psychological, and social environments of nursing (King, 1971). This framework appropriately guided research on the effectiveness of the LEAF Program, which engaged complex human behaviors within each of these systems and promoted quality of care within the acute care setting. The interactions between the individual (LEAF Program participant, nurse), groups (coworkers, multidisciplinary team members), and systems (hospital safety environment) were identified and used to explain goal attainment (a decrease in the fall rate) or a lack thereof.
King (1981) derived the Theory of Goal Attainment from her Interacting Systems Framework. This theory focused on interpersonal systems and interactions required for transactions to occur. King described the interactions that must occur between the nurse and client to achieve a goal, including: a) nurse assessment of client concerns, problem, or health disparity, b) nurse and client perceptions of interference, and c) sharing of information with family (King, 1995). In each instance, the nurse and patient had perceptions, made judgments, and took action based on their interactions. They then reacted and interacted based on these perceptions, judgments, and actions, which led to a transaction, created a feedback system, and returned them to the beginning of the transaction cycle (King, 1981). This model of transactions was used to explain nurse-client interactions that led to the achievement of goals (1981). Major concepts of King’s Theory of Goal Attainment included health, nursing, and self as they related to goal attainment and King’s philosophy of nursing, health, and environment. This theory guided research on the effectiveness of the LEAF Program by identifying concepts of a transaction used in the LEAF Program, including interactions between nurse, multidisciplinary team members, and high fall-risk fall patients, the perceptions of safety interference, and the processes used to address these issues within the acute care setting.

Definition of Terms

For the purpose of this study, definitions match those used within the facility of study. Definitions of terms that had the potential to impact the outcomes of the study include:
• Fall: a sudden, uncontrolled, unintentional, downward displacement of the body to the ground or other object, excluding falls resulting from violent blows or other purposeful actions.

• Morse Fall Risk Scale: a rapid and simple method of assessing a patients’ fall risk, consisting of six variables in the electronic medical record.

• LEAF Program: ‘Let’s Eliminate All Falls’, a flexible multidisciplinary hourly round fall prevention program.

• 75/75 Rule: the patient was over 75 years of age, had a Morse Fall Risk Scale of over 75, or had a history of falls.

• Multidisciplinary Hourly Round Fall Prevention Program: an hourly rounding program which required nurses and trained members of the multidisciplinary team to work together to prevent falls in high fall risk patients.

Qualifications

The author has ten years’ experience as a trauma nurse in the Trauma Nursing Unit in a Northern California Level 1 University Medical Center. She is a Trauma Unit Clinical Nurse Educator, a member of the Leadership Council, recent vice-president and current member of the Unit Based Professional Governance Council, an active member of unit teambuilding and quality improvement projects, and was the primary author of the LEAF Program.

Summary and Transition

Fall occurrence rates are high in hospital settings throughout the United States (HHS, 2012). Falls significantly impact patient lives, the ability to meet patient safety
goals, and healthcare costs (Centers for Disease Control and Prevention [CDC], 2011). Prevention is a major key to decreasing falls (Miake-Lye et al., 2013). However, a large variety of evidence based interventions and programs makes choosing the most appropriate fall prevention program for the specific environment and patient specialty a challenge. This study has determined the effectiveness of the LEAF Program by meaningfully comparing pre and post implementation fall rates of the LEAF Program, and then determined nurse responses to challenges of the LEAF Program. This data has determined the effectiveness of the program, enhanced knowledge of the program and its translation into practice, and added to the body of knowledge that determines effective combinations of evidence based fall prevention interventions in the trauma setting. The following literature review explores what is currently known about fall prevention programs and fall prevention strategies.
CHAPTER II

LITERATURE REVIEW

A literature search was performed using CINAHL, Google, Google Scholar, ERIC, MEDLINE, JSTOR, Science Direct, and PubMed databases to determine current knowledge of the effectiveness of fall prevention programs. Boolean terms included: nurse, multidisciplinary, teamwork, fall, hourly, rounds, prevention, effectiveness, measuring, and program. This literature review yielded several systematic reviews and meta-analyses and numerous recent studies on the effectiveness of fall prevention programs.

Between 1983 and 2011, it estimated that there have been more than 766 publications on hospital fall prevention strategies and programs (Hempel et al., 2013). Recent studies have explored cost-effective fall prevention strategies (Frick, Kung, Parrish, & Narrett, 2010), patient preferred fall prevention strategies (Haines & McPhail, 2011), reporting methods (Hill et al., 2010), fall prevention scales (Tang, Chow, & Lin, 2014), motion detectors (Ferrari et al., 2012), sensors (Rantz et al., 2014), and the effectiveness of digital video teaching versus written material for fall prevention in older adults (Lovarini & Bawden, 2010). Studies have focused on developing knowledge of fall risk and impact in certain age groups (Fujita, Fujita, & Fujiwara, 2013; Matteson, Henderson-Williams, & Nelson, 2013), fall related diagnoses (Foisy, 2013; Quigley, Barnett, Bulat, & Friedman, 2014), treatments (Payne, Abel, Simpson, & Maxwell,
2013), prevention strategies (Sahota et al., 2014), and staffing and unit characteristics (Everhart, 2014). Despite the development of a large body of knowledge about falls and fall prevention strategies, awareness of falls recently increased when the Centers for Medicare and Medicaid Services defined an inpatient fall as a hospital-acquired condition (Church, Robinson, Angles, Tran, & Wallace, 2011). Hospitals no longer receive additional payment for injuries related to an inpatient fall, and The Joint Commission on has listed fall prevention as one of their key Patient Safety Goals (The Joint Commission, 2011).

Quality of fall prevention research is scrutinized by a number of trustworthy and reliable global organizations including the Cochrane Collaboration, the American and British Geriatrics Societies, and the Campbell Collaboration (Fixsen, Scott, Blase, Naoom, & Wagar, 2011). The National Centers for Injury Prevention and Control (2010) share their collaborative fall prevention efforts with the Administration on Aging (2012), Centers for Medicare and Medicaid Services (2012), and the American Geriatric Society (2012) produces clinical practice guidelines (CPGs) for fall prevention, and the Premier Safety Institute (2012) provides evidence-based fall intervention and prevention strategies for both hospitals and the public.

Following this, there is a discussion of current literature on multidisciplinary teamwork and hourly rounds, two strategies that were implemented with the LEAF Program. This literature review supplied current knowledge of the effectiveness of fall prevention programs in the acute care setting and highlights the need for further study on the effectiveness of trauma population specific fall prevention programs.
Systematic Reviews and Meta-Analysis

This literature review starts with three examples of systematic reviews and meta-analyses with the goal of determining the effectiveness of fall prevention programs. In the first, Choi and Hector (2012) performed a systemic review and meta-analysis to examine the reported effectiveness of intervention programs designed to prevent falls. A systemic literature search for randomized controlled trials (RCTs) of fall prevention programs and interventions that took place between 2000 and 2009, were available in English, and had full text availability using Medline, PubMed, PsychINFO, CINAHL, and RefWorks databases produced 227 potential studies. Choi and Hector excluded studies that did not identify a study design, were quasi-experimental, were not specific in their inclusion or exclusion criteria, and the intervention did not last or was not followed for at least at least five months, and performed a subsequent meta-analysis of the 17 remaining studies. The total sample size in the meta-analysis was 5501 participants, including faller and non-faller in each of the 17 studies that fit within the meta-analysis study categories. Results indicated that RCTs of fall prevention programs conducted in the last ten years were effective in reducing fall rates by 9%, although there were substantial differences between individual program results. Multifactorial interventions decreased fall rates by 10%, community interventions by 9%, and programs that included an initial intervention with follow-up decreased falls by 12%. Recommendations for future fall prevention programs included identifying risk factors, determining predisposing factors and intervening accordingly, providing intervention programs that focus on balance, considering psychological factors (fear of falling), and classifying injuries based on the International Classification of Diseases. Limitations to this study
included the limited study type (RCTs only), small sample size (17 studies), difficulty in estimating between study effect and variance, difficulty in comparing and pooling a variety of outcomes measurement methods, and the need for further review.

In a second systematic review and meta-analysis, Hempel et al. (2013) searched the Database of Abstracts of Reviews of Effects (DARE), the Cochrane Database of Systematic Reviews, PubMed, CINAHL, and the Web of Science for studies evaluating interventions aimed at reducing falls in the hospital setting. The search was limited to English. Diverse approaches were used to identify studies that included a variety of fall prevention interventions, including reference mining, consultation with experts in hospital-based fall prevention, use of combinations of free text words, and separate searches for psychometric properties of risk assessment scales, resulting in 3,180 records to screen. Excluded were studies without numerical data or comparators, those aimed to reduce restraint use or injuries related to falls, studies which reported on falls that occurred in other settings, or case studies of individual patients. Data was extracted from the remaining 59 studies, which ranged over 28 years. Forty-eight of these studies compared time sequencing (before and after), 39 targeted select units or wards, 16 evaluated changes in an entire hospital, and 4 evaluated more than one hospital. Participants per study ranged between 50 and 10,000. Hempel et al. assessed implementation strategies, intervention components, fall risk assessments, comparators, adherence strategies, fidelity data, outcomes, effectiveness results, meta-regressions, and publication bias of fall prevention programs. Of the 59 included in the study, only a fraction reported enough detailed evidence to compare fall rates, which became a significant limitation to this study. Low statistical power limited quantitative analyses,
though pooled evidence determined no statistically significant intervention effect. The authors found that most interventions were combined to create unique approaches at fall prevention, and most included risk assessment strategies, visual alert indicators, patient family instruction, rounds, pressure alarms, and post-event evaluations. The success of each of these strategies was influenced by the sensitivity and specificity of the tool to the environment, situation, and user. The authors suggest that readers should not consider this lack of evidence of the effectiveness of fall prevention programs as evidence that fall prevention implementation strategies are unimportant. Instead, they encourage a review of successful studies and a pursuit of tactics that are most harmonious with the hospital philosophy and patient population available.

In the third meta-analysis, Dibardino, Cohen, and Didwania (2012) performed a systemic review and meta-analysis to evaluate multidisciplinary fall prevention strategies specific to the hospital setting. They completed a search of EMBASE, CINAHL, MEDLINE, and the Cochrane Library for primary studies with dates up to December 1, 2011, related to inpatient fall prevention, and excluded data from psychiatric wards, rehabilitation units, subacute facilities, and long term facilities. Meta-analysis of the 6 resulting studies included the intervention(s) used, markers of study quality, the study period, population, age of participants, sample size, and fall rates. It was noted that data favored elderly patients hospitalized on general medicine or geriatric units, and that most multidisciplinary fall prevention programs implemented a complex combination of interventions based on evidence available and modifiable risk factors. Most fall prevention programs in the study included a fall risk assessment, mobility assessment and assistance, medication modification, education, signage, bedside
interventions (beds, alarms, rails, location, position), and toileting schedules. Some programs included hourly rounds, improved documentation, fall tracking programs, hip protectors, therapy involvement, exercise programs, or the use of sitters. Results from the meta-analysis indicated that multidisciplinary fall prevention strategies statistically have a significant impact on fall rates (combined odds ratio 0.90), though the clinical impact may be limited. Based on study fall rates that ranged between 1.7 to 9.5 per 1,000 patient days, it was estimated to require 1,250 patient days to prevent a single inpatient fall using multidisciplinary interventions. This finding raised concern about the cost-effectiveness of these programs, as well as the complexities of designing, maintaining, and measuring them. Limitations to this study included limited scope and small sample size of quality primary studies on inpatient fall prevention programs, and the ineffectuality of comparing complex, non-uniform treatments.

Fall Prevention Programs

A literature search produced many examples of studies that have attempted to determine the effectiveness of a fall prevention program in the acute care setting. In the first, Sahota et al. (2014) evaluated the effectiveness of a program that included sensor technology between January 2009 and March 2011 on inpatient falls at the Queen's Medical Centre, a teaching medical center with 1,800 beds in Nottingham, UK. Patients admitted to three acute general medical elderly care wards were randomly assigned to an intervention group or control group. The intervention group received either a bed or chair pressure sensor, while the intervention group received standard care (no sensor). Exclusion criteria included being permanently bed bound, comatose, a comfort care or
hospice patient, or previous inclusion. When pressure was relieved on a sensor, an alert was conveyed to the pager of a nursing team member. During the study period a total of 65 patients fell (85 bedside falls) in the intervention group (8.71 per 1,000 bed days), failing to differ significantly from the 64 patients that fell (83 bedside falls) in the control group (9.84 per 1,000 bed days). On average, it took 7 days for the first bedside fall to occur in the intervention group as opposed to 6 days in the control group, and the length of stay was significantly longer (9 to 20 days) for those patients who suffered one or more fall ($n=127$). The results indicated that the use of bed and chair pressure sensors connected to a pager system failed to significantly reduce falls or nursing time to bedside after a fall, and were not cost effective in the acute general medical elderly wards in the UK. Authors attributed a lack of effectiveness to patient population, staffing, organizational change, leadership, commitment, and communication. They suggested that pressure sensor use be limited to high-risk patients in order to ensure maximum effectiveness. Limitations of this study included potential under use of the fall reporting system, a lack of ability to blind staff to the study (they usually figured out the ‘dummy bed alarms’), limited population, and occasional faulty equipment and usage.

Carroll, Pappola, and McNicoll (2009) studied the effectiveness of interventions implemented to reduce the fall rate at Rhode Island Hospital. Rhode Island Hospital had inpatient fall rates that were higher than the national average. The subsequent focus on reducing fall rates helped them to develop a multidisciplinary fall prevention team and fall prevention program, and then implement this program throughout their 14 medical-surgical units and 10 intensive care units and step-down units. Strategies included the Rhode Island Hospital Fall Risk Assessment Tool, a ‘falling
star’ on rooms and the assignment board, a wrist band, a computer fall order to identify high fall risk patients, changes in charting, hourly rounds, early ambulation, frequent repositioning, call light use, education, personal belongings kept close, and frequent toileting. Alarms were made available, clutter kept to a minimum, catheters and intravenous catheters were removed as soon as appropriate, and nursing education classes were more nurse friendly. Results of the study showed an initial rise and then subsequent decrease in both fall rates and related injuries. However, in the head trauma and neurological patient population falls decreased from an average 14.18 to 2 falls per 1,000 patient days. Limitations of this study included the single hospital setting, lack of details for other population results, and the lack of information on the reliability and validity of tools used.

Another much larger fall prevention program study was undertaken to determine the effectiveness of a fall prevention toolkit on hospital falls. Using a cluster randomized study, Dykes et al. (2010) compared fall rates in four hospitals in the Partners HealthCare System in the Boston, Massachusetts area in a total of eight units between January 1 and June 30, 2009: four units (5114 patients) that received usual care and four units (5160 patients) that received the intervention. The intervention was a fall prevention toolkit (FPTK) which integrated communications and workflow patterns such as the Morse Fall Risk Scale (MFS) with health information technology, which then produced corresponding interventions. The nurse edited the recommendations to fit patient needs, and then the FPTK automatically printed a bed poster with corresponding icon, a patient education handout, and a plan of care specific to the patient’s needs. The control units were provided standard fall education of risk assessment and prevention methods,
including the MFS, use of existing forms, use of generic fall risk signs for patients with a score above 45 on the MFS, standard patient education materials and handouts, and performed manual documentation of the fall prevention plan. The results of the study indicated a significant decrease of falls in the intervention group (67) compared with the control units (87), while site adjusted fall rates were higher in the control units (4.18) than the intervention units (3.15). The FPTK was especially effective in decreasing falls in patients over 65 years of age, though no significant effect was noted on fall-related injuries. Limitations of the study included that it was performed within four hospitals that were all part of the same healthcare system, was not blind, was not effective with younger patients, and the time period limited measurement of effectiveness with repeat fallers.

In a fourth study, Yates and Tart (2012) performed a retrospective study of a revised fall prevention program in a 258-bed non-profit community hospital on three psychiatric units and seven medical units. The purpose of the study was to compare falls in psychiatric and medical inpatient populations prior to, during, and after revisions were made to the policy, and to assess nursing knowledge and perceived effectiveness of the revised policy and program. Phase I measured falls that occurred between October 1, 2005 and September 30, 2006, while Phase II measured falls between October 1, 2006 and September 30, 2007, after the revisions were in place. During Phase I basic demographic characteristics of fall patients were gathered, including gender, age, mental status, type of fall, severity of injury, and fall prevention compliance. During Phase II, these data were enhanced with the addition of a survey of nursing which gauged nursing knowledge and perceptions of the effectiveness of the 2006 revised policy and
interventions. Fall program revisions included use of a new type of slipper sock for patients, education brochures for patients and their families, a medication profile review by pharmacy for high fall risk patients, mandatory annual staff fall prevention education, and supplemental education of the MFS. In the course of Phase I there were 62 psychiatric falls and 25 medical falls, and in the course of Phase II there were 42 psychiatric falls and 53 medical falls, representative of a 32% decrease in falls in the psychiatric population and a 112% increase of falls in the medical population. A primary factor associated with the high fall rates was a lack of compliance by nursing staff. Findings showed that 4 of the 42 psychiatric and 27 of the 53 medical fallers were not wearing appropriate footwear, more than half of the medical high risk patients did not have their medication profiles reviewed, 15 medical bed alarms were not turned on, and in medical populations there was a high failure to complete required patient education. Limitations of this study included the single hospital focus which limits its applicability to other populations and the lack of effectiveness in the medical population.

In a fifth study, Wexler et al. (2011) performed a study of the Ruby Red Slipper Program to determine the effectiveness of the program on falls in two medical-surgical units at New York Hospital Queens, a 500-bed Level 1 Trauma Center. The units, a medical oncology (MedOnc) unit and orthopedic neurology (OrthoNeuro) unit, each recruited a nurse falls champion who was then supported by the hospital falls committee and a nurse falls expert during implementation. The program was introduced in a three day falls education program for all team members (nurses, unit secretaries, and all ancillary staff) to promote teamwork, teach fall prevention strategies, and present data. Strategies implemented by the Ruby Red Slipper Program included bright red non-slip
socks, a ‘ticket-to-ride’ for transportation fall risk identification, non-verbal fall signage to enhance culturally diverse understanding of the fall risk, fall mats, a revised and more immediate post-fall analysis processes, and new routes used for the dissemination of fall data (which also promoted a friendly competition between the units). Initial fall rates decreased on both units, though more significantly in the OrthoNeuro unit (11.48 to 9.41 falls per 1,000 patient days). Challenges for study participants included diverse supervisory priorities and a lack of time to devote to the program. The program was sustained with additional strategies, including increased managerial support, teamwork promotion, a shifting of mentorship responsibilities, and positive recognition. The fall rates dropped again, leading to a 71% decrease of falls in the first quarter of 2008 for the MedOnc unit and 6% for the OrthoNeuro unit compared to falls in 2007. Limitations of this study included the limited sample size and diversity of the patient populations used.

In a long-range study, Weinberg et al. (2011) measured falls pre and post a fall prevention initiative (FPI) between 2006 and 2010 using 425 medical/surgical beds of the 714-bed Staten Island University Hospital in the North Shore long Island Jewish Hospital System. A 2005-2008 review of existing fall prevention policy and procedures, compliance, falls, and associated injuries established a baseline and guided the planning process. The FPI was related to adaptive and business management models with an emphasis of continual quality improvement and evidence based strategies, normal accident theory which emphasizes optimal resource utilization, high reliability theory which emphasizes cultural influences on care, and Kanter’s hypothesis that power and opportunity are primary determinants of employee behaviors and attitude. Prior to implementation, culture change was encouraged using staff education, monthly fall
reviews, and management participation. Program implementation promoted the use of bed alarms, appropriate documentation of risk using the Staten Island University Fall Risk Factor Assessment Scale, protocols for the use of Diphenhydramine, Hydroxyzine, and Furosemide, assisted toileting, and an amended fall reporting system which identified specific circumstances of each fall, trends, and missed preventive opportunities. During Phase I, the 12-month pre-intervention phase, 756 falls occurred, with a range of 3.2 to 3.7 falls per 1,000 inpatient days. After four years, the fall rates decreased by 63.9%, documentation of injury level increased by 83%, minor and moderate injury related falls decreased by 54-64%, and survey results showed that FPI had a strong impact on fostering cultural change. Success was attributed to safety awareness and culture change (including friendly competition), nurse empowerment, critical thinking, accountability, and sustainability. A limitation of this study was the restricted geographic population.

In a seventh study, Barker, Kamar, Morton, and Berlowitz (2009) performed a retrospective study of falls at The Northern Hospital (TNH) in Australia between 1999 and 2007 to determine the effectiveness of a fall prevention program and bridge the gap between research and practice. In 2002, a TNH falls committee designed the fall prevention program, developed tools and strategies, integrated the program into documentation practices, and implemented the program. The fall prevention program strategies included a modified version of the STRATIFY assessment tool, room signage, bathroom supervision, floor level beds, assistive devices within reach at all times, a toileting regime, bed or chair alarms, and a revised computer-based reporting system that allowed for data collection, demographics, and audits of nursing compliance. Results showed an increase in falls over the pre-implementation period between 1999 and 2001,
remained stable during the three years immediately after implementation (2002-2005), increased in 2006, and then decreased during 2007 to rates below 2002-2007. Although there was no significant decrease in the fall rate, there was a significant decrease in fall related injury rates (1.6 to 0.61 per 1,000 patient days). Some concern was identified on staff reporting practices, the limited number of interventions used in the program, adherence to new protocols, and the types of beds used (decrease injury, not falls). Limitations of this study included the low initial fall rate, the population specific design of the program, and the population changes during the study period.

Finally, a study was accomplished by Alexander, Kinsley, and Waszinski (2012) to determine the effectiveness of a fall prevention program in the emergency department (ED) at Hartford Hospital which treats an estimated 96,000 patients annually. Interventions began in July 2008 with a nurse education program for the fall risk assessment tool and screening process and a fall cart was made available with fall prevention resources (bracelets, green triangle used for identification, exit alarms, hip protectors, Velcro belts, and distraction items). Falls remained high, and the ED designed a new fall risk assessment tool, the KINDER1. This new tool, which was embedded into the documentation system, included risks of age greater than 70, presenting to the ED due to a fall, altered mental status (AMS), impaired mobility, and nursing judgment as risk factors, which were more sensitive to the ED population. The KINDER1 was implemented August 10, 2010 after a comprehensive nursing education and awareness program, but falls remained high (0.45 to 0.52 per 1,000 patient days between 2008 and 2011). College student volunteers were then integrated into the program to rotate and meet needs of high fall risk patients, including all skilled nursing facility patients and
those with AMS. The volunteers rounded on 6,876 high fall risk patients identified using the KINDER1 between October 2010 and September 2011, and only one patient fell while receiving regular rounding from a volunteer during this time, bringing the fall rate down to an estimated 0.38 per 1,000 patient days. Limitations to this study include the limited population sample size of a single ED, a lack of a study design, and a lack of detail for resulting fall and injury rates.

These studies share the importance of measuring the effectiveness of a fall prevention program, and how they can be used to further decrease fall rates in a variety of hospital settings. Current literature on fall programs fail to evaluate the effectiveness of a fall program similar to the LEAF Program within the trauma patient setting, and therefore the current study has the potential to fill this gap in literature.

LEAF Program Elements in Literature

Multidisciplinary teamwork and hourly rounds are primary elements of the LEAF Program which are found in literature. A review of this literature, then, is essential when determining the effectiveness of the LEAF Program. Following is a review of a few studies that included these elements.

Multidisciplinary Teamwork

Hoffart and Woods (1996) performed a landmark study of elements used in the Nursing Practice Model, including teamwork. The Nursing Professional Practice Model was a system that supported nurse control over the environment and delivery of nursing care using five subsystems, one of which was professional relationships. Professional relationships were cited as most important to fostering teamwork,
collaboration, and consultation. Upon further analysis, it was found that these relationships were often based on nurses’ beliefs and personal attitudes, and that the skills needed to respect one another, communicate effectively, and collaborate as teams were essential for effective participation in multidisciplinary work. Fostering these skills, knowledge, and attitudes then promoted multidisciplinary work, which was foundational for patient centered care, shared governance, and quality and safety management.

The Institute of Medicine (IOM) report, “To Err is Human: Building a Safer Health System” (1999) focused on patient safety, and reinforced the importance of care providers working together as a team in order to improve efficiency, effectiveness, and patient safety. The IOM’s “Crossing the Quality Chasm: A New Health System for the 21st Century” (2001) went on to establish how important it is to reinvent healthcare in a way that will foster innovation and improve the delivery of care. The aim of this report was to present what safe, effective, patient-centered, timely, efficient, and equitable care should look like. To do this, the IOM presented ten rules for redesign, and rule number ten required cooperation between clinicians to ensure appropriate exchange of information and coordination of care to enhance quality and safety.

Several studies show how effective and important teamwork is in quality and safety. First, Chang, Huang, Chiang, Hsu, and Chang (2012) performed a cross-sectional study on data collected through a survey of nurses over a nine-month period between 2008 and 2009. Data points included social capital (structural, relational, cognitive, interaction, trust, shared vision), knowledge sharing, patient safety (goal achievement), and personal information (age, gender, education, marital status). The sampling frame comprised 1,026 full-time employed nurses at a major medical center in Taiwan.
Excluded were nurses who worked for less than three months as a registered nurse and questionnaires that were not complete, providing a total response of 919 (86.7%). Data analysis included the partial least squares to evaluate relationships between the data points. Questionnaire items were completed on a 5-point Likert scale. Study results established that the relationship between social interaction and knowledge sharing is not statistically significant, but that trust and shared vision significantly and directly affect knowledge sharing, which is significantly related to patient safety. Shared vision had the largest impact on patient safety, and the authors suggest that this could be fostered by hospital administrators encouraging and fostering group trust and a common vision, both of which can lead to knowledge sharing and improved patient safety. Study limitations included a self-reported and therefore potentially biased reporting system, a limited scope of registered nurses within a single medical setting which limits its applicability or generalizability to other professional groups or medical centers, and further research could determine causality.

In a second study of teamwork’s effects on safety, Richardson and Storr (2010) performed a literature review on the impact of nursing empowerment, leadership, and collaboration with the aim to demonstrate the impact of these elements on patient safety. The British Nursing Index and Health Business Elite database, Medline, CINAHL, and a variety of key nursing and safety websites were scoured for English studies published between 1998 and 2008. Search terms included empowerment, patient safety research, innovation, strategy, advocacy and assertiveness, change management, management culture, decision making, inter-professional collaboration and communication, leadership, and organizational culture. Upon further review of the
produced 1,788 titles, 65 met the inclusion criteria: 1) a measure of impact from a study or audit, 2) patient safety and nursing focused, and 3) identified one of the following key professional nursing issues: leadership, advocacy, interdisciplinary working, empowerment and collaboration. Exclusion criteria included a focus on nurse staffing numbers, levels, and workload. Three of the final 11 papers that were critically reviewed included a focus on nurse teamwork, collaboration, and patient safety. The first found that specialty teams were effective in safety management, while the second and third determined that communication was an essential element in promoting patient safety. The literature review concluded that gaps in patient safety knowledge will need to be addressed before a comprehensive analysis of how nursing empowerment, leadership, and collaboration impact safety can occur. Additional limitations of this study included a lack of hand searching journals, not considering material written prior to 1998, and not including languages other than English.

Lastly, Merrett, Thomas, Stephens, Moghabghab, and Gruneir (2011) accredited teamwork as a successful factor in nursing care. Merrett et al. described the Geriatric Emergency Management-Falls Intervention Team (GEM-FIT), a nurse led initiative using collaborative efforts by nurses to decrease falls in the elderly population. Emergency health nurses referred and enrolled potential elderly candidates based on risk factors. Each participant was assigned a public health nurse who visited every 2 weeks for 12-14 weeks and an occupational therapist who visited 1-3 times during this time period. Measurements for outcomes were performed at initiation (T1), immediately after the program (T2), and at discharge 6 months after completion (T3). Although the study did not identify fall rates as outcomes, it used the Timed Up and Go Scale, the Berg
Balance Scale, the Reintegration to Normal Living Postal Scale, and the Activities-specific Balance Confidence Scale to show that the fall risk is decreased in the elderly using this teamwork model. Challenges of the program included time, participant continuation in the program, and a paper communication system between multidisciplinary team members. Recommendations included identifying team member responsibilities and accountability, enhanced communication techniques using modern technology, and minimizing time, cost, and resources.

**Hourly Rounding**

A literature review and meta-analysis of hourly rounds was completed by Halm (2009), who searched MEDLINE and CINAHL for research studies performed using the hourly round intervention. Halm analyzed 11 reports and found that most hourly round interventions were performed by direct care nurses, although one study involved a charge nurse making rounds every two hours. One study was quasi-experimental, while the remaining ten lacked rigorous analysis on which to base conclusions. Hourly round programs were found to reduce call light use (37%), fall rates (52%), pressure ulcers (14%), and restraint and attendant use, while increasing patient satisfaction. Most studies observed nurses using an ‘every other hour’ support person, although some used interdisciplinary team members or the charge nurse who then communicated patient needs to the nurse for follow-up. Halm noted that having adequate support for the nursing staff to partner with was crucial for success. Limitations of this literature review were a lack of high quality study designs, small sample size, and lack of rigor.
Other studies highlight benefits and challenges with the use of hourly rounds despite a lack of focus on fall prevention. Gardner, Woollett, Daly, and Richardson (2009) performed a nonrandomized parallel group trial design using a quasi-experimental pre and post-test to measure the effectiveness of hourly patient rounds on patient satisfaction and nursing perceptions. This study implemented nursing assistants in standardized hourly comfort rounds to positively influence patient care management and reduce demand on nurses. Research was conducted over eight weeks on two acute surgical wards, and included a total of 129 patients and 39 nurses. Upon discharge, participating patients completed the Patient Satisfaction Survey, while nurses completed the Practice Environment Scale of the Nursing Work Index (PES-NWI) three times throughout the study period: the week prior to starting comfort rounds, the fourth week of the comfort rounds, and two weeks after completion of comfort rounds. The results from the PES-NWI showed an improvement in perceptions of quality care and professional relations with the nurses. Limitations of this study included a deterioration of attitude in the control group and a limited size and scope.

Moran et al. (2011) examined the effect of hourly rounds in a mental health setting. Hourly rounds included scripted questions and checking to make sure patient needs were met, though some patient populations were excluded by diagnosis or stress level. By examining patient feedback logs, it was determined that hourly rounds decreased patient requests and complaints to patient services and improved patient satisfaction with nurse response times and explanations. Limitations of this study included a lack of description of the design or rigor. Ford (2010) studied the effect of hourly rounds on patient satisfaction and call light use at the Baltimore Washington
Medical Center. Hourly rounds included scripts, specific interventions appropriate to the patient, and an assessment of the four P’s: position, pain, personal needs, and placement. These hourly rounds were found to improve patient satisfaction (assessed with post discharge phone calls) and decrease call light use (assessed with call light logs).

Limitations of this study include the lack of design, rigor, or definitive results. Duffin (2010) found that Bupa Cromwell Hospital, Croyden Health Services, and Whipps Cross University Hospital have all tested hourly rounds and found that hourly rounds decreased falls, call light use and nurse stress. Hourly rounds appear to have some benefit to fall rates, patient satisfaction, and call light usage, and therefore an important concept when measuring the effectiveness of the LEAF Program.

Discussion and Transition

Recent healthcare policy changes have renewed interest and awareness of acute care fall prevention programs and interventions while vast amounts of fall related literature add to a body of knowledge of evidence-based fall prevention strategies and programs. Systemic and organizational cultural characteristics may drive change methods and influence effective implementation of quality evidence-based interventions (Fixsen et al., 2011). Meta-analyses of recent fall prevention programs provide evidence of successes and challenges. Choi and Hector (2012) attributed successes to multifactorial programs that appropriately identified fall risks and intervened appropriately, while Hempel et al. (2013) determined that effectiveness was influenced by the compatibility of the program to the environment, situation, and users. Dibardino et al. (2012) found concern with the cost-effectiveness of fall prevention programs. Despite this, the most
recent meta-analyses show some hope for the success of fall prevention programs (Choi & Hector, 2012).

Studies of individual fall prevention programs similar to the LEAF program in this literature review present a wide array of successes and failures. Concerns were identified throughout these studies. For example, Carroll et al. (2009) studied a program with interventions most similar to the LEAF Program, yet initial results showed a rise in falls followed by only a slight decrease in falls. Promising here was that there was a larger decrease of falls in the head trauma and neurological patients, of which the Trauma Unit cares for. Dykes et al. (2010) identified the importance of integrating fall prevention with current technology and applying signage to rooms of the elderly, both of which the LEAF Program has done minimally (MFS is available in EMR, and posters are available). Yates and Tart (2012) assessed falls in a psychiatric and medical patient population, which could be comparable to some of the trauma population under study. Their study highlighted the need for staff compliance of policy and protocol. Wexler et al. (2011) studied medical oncology and orthopedic neurology units, of which only the latter could be compared with some of the trauma population. Challenges in this study highlighted the need for proper time, managerial support, teamwork, and leadership responsibilities during the implementation phase of the program. Weinberg et al. (2011) studied medical surgical units which could be comparable to some trauma unit patients, and highlighted the impact cultural change may have. Barker et al. (2009) presented how a fall program may have a larger impact on fall injuries than on fall rates, while the study by Alexander et al. (2012) in the ED can be compared to the Trauma Unit as it takes the
fall prevention program and continues to develop it over time adapting it to a patient specific population.

Additional to these studies, elements of the LEAF Program such as multidisciplinary teamwork and hourly rounds have been shown in literature to be effective under certain circumstances. For example, Hoffart and Woods (1996) delineate skills required to develop professional communications and multidisciplinary work that would be essential in a multidisciplinary fall prevention program, and the IOM (2001) presents what teamwork should look like to improve efficiency, effectiveness and patient safety. Several studies validated the importance of teamwork in fall prevention and successful nursing, while acknowledging the challenges of creating a successful teamwork organization. Halm’s (2009) meta-analysis of hourly rounds found that having support was required for hourly rounds to be successful, making the integration of hourly rounds and teamwork two elements crucial to the LEAF Program’s success. This idea was supported in several studies that identified challenges with hourly round programs, including adequate staffing, teamwork, leadership support, and time. Following this literature search will be a description of the study. This will include research methodology, sample, ethical considerations, data collection procedures, and the reliability and validity of survey tools used.
CHAPTER III

RESEARCH STUDY

The purpose of this study was to 1) determine the effectiveness of the LEAF Program implemented in a Trauma Unit at a Northern California Level 1 Trauma Center through measurement of trauma unit falls pre and post implementation of the LEAF Program, and 2) seek feedback from trauma unit nurses to determine challenges experienced with implementation of this program. The research questions included:

- What was the effect of implementation of the LEAF Program on the number of falls six months post intervention as compared with the number of falls in the six months prior to the fall prevention intervention?
- What was the nursing response to challenges of the LEAF Program?

Answering these questions had the potential to determine the effectiveness of the LEAF Program and establish concerns, challenges, difficulties, frustrations, and knowledge about the implementation of the LEAF Program. These data were used to improve fall prevention strategies in the hospitalized trauma population by determining the practicality and feasibility of the program, enhancing implementation and program practices, highlighting educational needs, and assisting with translation into practice. Following is a description of the methodology, sampling, ethical considerations, data collection, reliability and validity, and analyses that were used to answer these research questions.
Methodology

A mixed methodology was selected to determine the effectiveness of a flexible multidisciplinary hourly round fall prevention program (LEAF Program) in the trauma setting. The mixed methodology combined quantitative and qualitative designs within different phases of the research process. The quantitative quasi-experimental design allowed for a single population pre and post comparison post facto to the intervention (Burns & Grove, 2009). This design facilitated a comparison of falls that occurred 6 months after the LEAF Program was implemented to falls that occurred on this same unit 6 months prior to the intervention using fall data gathered from the hospital-based fall tracking system. Access to a single population that had implemented the LEAF Program limited quantitative design options to this most appropriate choice.

For purposes of determining the effectiveness of the LEAF program, documented fall data was collected for the six months prior to the LEAF intervention and six months after the LEAF program was implemented on July 1, 2012. Fall data came directly from the hospital-based fall tracking system and represented falls that occurred per 1,000 patient days prior to implementation of the program and during the first six months after implementation. Falls were then analyzed using the paired t-test to determine the statistical difference of the number of falls before and after the implementation of the LEAF program. Following this, a survey using the website by SurveyMonkey assessed nursing challenges during the implementation process of the LEAF Program to produce qualitative descriptive data. The survey used a combination of Likert scale and open-ended questions to address the variables of concerns, challenges, knowledge, responses, and suggestions for improvement of the LEAF Program. Data was
obtained from SurveyMonkey using a password-protected system and analysis of the data was provided through SurveyMonkey via contract with the Center for Nursing Research in Patient Care Services at the hospital where the study occurred. Correlational statistical analyses examined relationships between variables, described responses to LEAF Program challenges, and identified potential improvement strategies for the LEAF Program. These data were then used to determine the practicality and feasibility of the program, enhance implementation and program practices, highlight educational needs, and assist with translation into practice.

Sample

The sampling frame for this study was the Trauma Unit in a Northern California Level 1 Medical Center. This unit was chosen due to its recent implementation of the LEAF Program, which was conducive to the current study. A target population sample of the entire fall population was compared before and after the implementation of the LEAF Program. Eligibility criteria for inclusion in this population included patients who had experienced a sudden, uncontrolled, unintentional, downward displacement of the body to the ground or other object, excluding falls resulting from violent blows or other purposeful actions, during the six months before and after the LEAF Program was initiated on the Trauma Unit (between January and December, 2012). Exclusion criteria included all falls that occurred on other units, in transit between units, falls by non-patients, and events that did not meet the definition of a fall as determined by the falls committee at the medical center.
Convenience sampling was used for nurse selection for survey completion. Surveys were presented by the researcher or unit clerk during each shift huddle for one week on the Trauma Unit. Demographic and consent forms were provided to all current shift nurses. Exclusion criteria include nurses who did not work on the Trauma Unit or were not familiar with the LEAF Program. Consent and demographic forms were filled out and returned to a locked box in a private locker room only accessible by security code. The researcher was the only person who had access to this information. The LEAF Survey was then able to be accessed at any time throughout the nursing shift by going to the SurveyMonkey website. Small reminder slips were readily available at the clerk desk, the report room, and the staff hallway on the LEAF board with website information. These slips were taken to remind each nurse to complete the survey as well as the location of the survey. A thank you was posted by the confidential box for submission of the demographic and consent forms as an advanced expression of appreciation for completing the survey. Nurses had the ability to withdraw at any time with no repercussions of any kind by the investigator or management staff.

Ethical Considerations

Human rights protections safeguard the self-respect, dignity, and health of study participants. Prior to implementation, this study was reviewed by the Internal Review Boards (IRBs) of the hospital that the study occurred in, as well as at California State University of Chico. This process of review ensured that the study would not harm participants, the study was important enough to warrant research, and the research was worth the potential risk.
Each stage of the study maintained patient and nurse confidentiality, anonymity, and rights. Comparison fall data for the Trauma Unit for the six months prior to the intervention and six months after the intervention were obtained from the hospital’s fall tracking system. This data included the number of patient falls and quarterly patient days. Patient confidentiality was maintained during this process.

During the survey process, rights of self-determination and autonomy were protected with nurse determination of inclusion, completion of a short anonymous demographic form and LEAF Survey, and the ability to withdraw or leave the study at any time. Consent (Form B1 and B2), demographic forms (Form B3), and survey reminders (Form B4) were handed out during huddle of each nursing shift by the researcher or the unit clerk and any questions answered. Submission of these forms was at the discretion of the nurse, and was completed in the privacy of a secure location (the locker room, secured with keypad). Each nurse then had the opportunity to complete the survey online. The survey was completed at the nurse’s convenience in a private location (computers were available on the Trauma Unit at each nursing station, in several private nursing cubbies, and in the report room). Data collected from the demographic forms and surveys was then kept confidential. Forms and data were locked in the nursing manager’s office on the Trauma Unit, and will be confidentially shredded and burned five years after completion of this study. The researcher will maintain participant privacy, anonymity, and confidentiality when processing, reporting, and publishing the results of this study.
Data Collection

The process for collecting fall data for the time periods of six months prior to and six months after the implementation of the LEAF Program occurred as follows:

1. Obtain number of falls and patient days from the hospital fall tracking system.
2. Compare the number of falls that occurred during the six months prior to the LEAF Program with the number of falls that occurred during the six months after the LEAF Program was implemented per 1,000 patient days.

After the collection of falls data, surveys were used to gather descriptive data about the LEAF Program. The process for surveys to be completed occurred in the following manner:

1. Obtained IRB approval through the Level 1 Medical Center and California State University, Chico.
2. Present the survey on SurveyMonkey, including the purpose, IRB approvals, optional participation, how to participate, and extra copies of consent, demographic, and reminder forms on the LEAF board in the staff hallway.
3. Provide labeled locked box for returned forms in the secure locker room.
4. Present survey to nurses at huddle each shift, including purpose, option to participate, consent forms, demographic forms, website survey reminders, and encouragement.
5. Leave instructions on how to participate and extra copies of the forms at the clerk desk and in the report room.
6. Monitor the return of demographic forms and completed online surveys to achieve a 50-75% participation rate of the current 68 unit nurses (34-51 completed surveys).

7. Use correlational statistical analyses to examine relationships between variables and responses to LEAF Program challenges, and identify potential improvement strategies for the LEAF Program using SPSS predictive analytics software from the Center for Nursing Research at the Medical Center.

8. Present the results to the staff using the LEAF Program board in staff hallway.

Reliability and Validity

Processes used to ensure reliability and validity throughout the study were imperative to the quality of the study. The design needed to be appropriate to the purpose of the proposed study, be feasible given constraints, and be effective in reducing threats against validity (Burns & Grove, 2009). The methodology of the study integrated a quasi-experimental design of a quantitative measurement of falls on a Trauma Unit to determine effectiveness of the LEAF Program with a descriptive correlational survey that determined nurse experiences, challenges, and responses to the LEAF Program. The subjects and the environment coincided to provide a quality framework for the current study. The study was feasible within the time constraints given, and threats to the validity were reduced by accurately identifying and verifying falls, controlling the survey environment, ensuring the measurement tools fit the purpose of the study, reducing bias, decreasing the chances of a type 2 error, ensuring statistical analyses were appropriate for the data gathered, and restricting the generalizability of this study.
Quality of the study was promoted using a variety of strategies. Unit falls, patient days, fall rates, and the comparison of falls prior to and after the implementation of the LEAF Program were verified with the unit manager and the falls tracking system prior to being included in the study. The LEAF Survey’s construct reliability, validity, and sensitivity were assessed by leadership members of the Trauma Unit, a group of individuals who are familiar with the LEAF Program. The survey was edited based on feedback in order to accurately, consistently, and precisely best examine and answer the research question using the identified variables. The surveys were completed in a climate controlled unit with comfortable chairs, water, and computers. If needed, the charge nurse and clerk were able to help control extraneous factors such as patient and phone calls during the time used to complete the survey, and the time period required was kept short to enhance nurse involvement (roughly 5 minutes per demographic and consent form, and 5-10 minutes per survey). Upon completion of the surveys, data was presented in an organized manner that directly represented the variables used to answer the study questions. The entire study is auditable with a review of leadership feedback on survey construct reliability, validity, and sensitivity, unit falls and patient days as reported by the hospital, demographic forms, consent forms, surveys, and produced data.

Data Analysis

The process of data analysis included preparing the data, describing the sample, ensuring reliability, exploring analysis, and confirming analysis (Burns and Grove, 2009). The research question for this study involved equal interval (six months each) matched-pairs design (trauma population pre and post the intervention), making it
appropriate for the use of the paired t test (Burns & Grove, 2009, p. 466). Care was observed in preventing measurement errors (what actually exists versus what was measured), data entry errors, identifying missing data, and confirming the statistical analysis with a statistician at Sacramento State. The t-test was able to examine the difference between fall rates prior to and after the implementation of the LEAF Program per 1,000 patient days.

The descriptive correlational survey using the online program Monkey Survey was able to assess nursing challenges during the implementation process of the LEAF Program and produce qualitative descriptive data. The survey integrated a combination of Likert scale and open-ended questions to address the variables of concerns, challenges, knowledge, responses, and suggestions for improvement of the LEAF Program. Descriptive correlational statistical analyses using SPSS predictive analytics software examined relationships between these variables, described responses to LEAF Program challenges, and identified potential improvement strategies for the LEAF Program.

Transitional Statement

The purpose of this study was to 1) determine the effectiveness of the LEAF Program implemented in a Trauma Unit at a Northern California level one Trauma Center through measurement of trauma unit falls pre and post implementation of the LEAF Program, and 2) seek feedback from trauma unit nurses to determine challenges experienced with correctly implementing this program. A mixed methodology using quantitative quasi-experimental and qualitative descriptive designs, convenience sampling, processes used to protect human rights, a detailed data collection plan for
obtaining fall rates and nurse feedback, and measures taken to maintain reliability and validity of data facilitated a quality study of LEAF Program effectiveness. After IRB approval (10 months), the survey process took approximately four weeks.
CHAPTER IV

RESULTS

Falls

After consultation with a statistics professor at California State University of Sacramento, calculations for the t-test were run through GraphPad QuickCalcs Software. Twenty-five falls occurred during the six months preceding implementation of the LEAF Program \( (n=6, \mu=4.17, \sigma=2.48) \). There were 6,450 patient days with a six-month fall rate of 3.876 prior to the implementation of the LEAF Program (Chart C1). Twenty-two falls occurred during the six months after the implementation of the LEAF Program \( (n=6, \mu=3.67, \sigma=0.82) \). There were 6,468 patient days during the six-month period with a fall rate of 3.40 (Chart C1). The t-test was used to determine a statistical difference between the equal interval matched-pairs (fall rates prior to and after the implementation of the LEAF Program in the trauma population). Assuming a normal distribution and an independent distribution of falls, \( t=0.5906 \) with the \( df=5 \), and a standard error of difference =0.847. There was a 95% CI of this difference between -1.68 to 2.68. The result was a two-tailed p-value of 0.5805, a difference not considered statistically significant.

The result only slightly changed when the t-test was run on falls per patient 1,000 days due to the small difference of patient days between the two six-month periods (18). Assuming a normal distribution and an independent distribution of falls, the first six
month falls per 1,000 patient days ($\mu=3.711, \sigma=0.875$) compared to the second six month falls per 1,000 patient days ($\mu=3.40, \sigma=0.437$) results in $t=1.000$ with $df=1$ and a standard error of difference $=0.310$. There was a 95% CI of this difference between -3.623 to 4.24. This provided a two-tailed $p$-value of 0.50 that was not statistically significant.

Survey

The survey was available to nurses between February 22 and March 23, 2014. The participating Trauma Unit had a total staff of 68 nurses at the time the survey was rolled out: 34-day shift nurses and 31 night shift nurses. Forty-five demographic and online surveys were completed resulting in a 66% participation rate. Twenty-five surveys were completed by day shift nurses (73%) and twenty surveys were completed by night shift nurses (65%). The majority of nurses that completed the survey were female nurses (89%) between the ages of 20-40 (82%) with less than five years nursing experience (69%) (Chart C4). This was representative of the nursing population on the unit (94% female, 76% between 20-40 years of age, and 56% with less than 5 years nursing experience). 100% of surveyed nurses participated in the LEAF Program, however 12 (27%) did not participate during the 2012 rollout time period. Of surveyed participants, 62% received their LEAF Program education through initial rollout Town Hall meetings during 2012, while the remaining 38% obtained their LEAF Program education via individual instruction on the unit. Most respondents held a Bachelor’s Degree of Nursing (80%), while 2% held a Master’s Degree and 17% held an Associate’s Degree of Nursing (Chart C3).
The survey was organized using alternating positive and negative statements that could be rated on a Likert style scale (Charts C5-9). Each statement addressed the following variables: concerns, challenges, knowledge, responses, and suggestions. The survey was followed by two open ended questions that addressed challenges and suggestions (Charts 10-11). Survey results presented a wide range of LEAF Program data. Overall results of the survey showed that trauma nurses who responded to the survey believed they understood how the LEAF Program worked (100% either agreed or strongly agreed), felt adequately educated about the LEAF Program prior to implementation (88% either agreed or strongly agreed), and denied a need for further education on certain portions of the LEAF Program (73% either disagreed or strongly disagreed). Trauma nurses believed that the LEAF Program was effective in preventing falls (82% either agreed or strongly agreed), and felt they were successful in meeting the challenges of the LEAF Program (88% either agreed or strongly agreed). Nurses felt that they had appropriate resources including beds, identification bands, restraints, and alarms available to them when needed (93% either agreed or strongly agreed) and felt they had the ability to accomplish hourly rounds when needed (73% either agreed or strongly agreed). Nurses disagreed that the program was confusing (91% either disagreed or strongly disagreed), that their nursing practice had negatively adapted to the LEAF Program (84% either disagreed or strongly disagreed), or that the LEAF Program was overwhelming (77% either disagreed or strongly disagreed). Nurses believed that nurses created the LEAF Program (90% either agreed or strongly agreed), believed that the trauma teams were concerned about falls (88% either agreed or strongly agreed), and that
their suggestions for improvement were acknowledged or valued (88% either disagreed or strongly disagreed).

Despite this positive feedback, survey results showed that nurses did not feel that ancillary staff participated in the LEAF Program (53% either agreed or strongly agreed), felt that only nurses participated in the program (57% either agreed or strongly agreed), and believed that the LEAF Program could be improved (52% agreed). Only 50% of nurses agreed or strongly agreed that fellow nurses assisted adequately with hourly rounds, while others (48% agreed or strongly agreed) felt that the charting of hourly rounds in EMR and a LEAF note was difficult. Although 64% of nurses felt that the challenges of the LEAF Program did not diminish the effectiveness of the program, survey results presented supportive data that a falls program that is effective for both fall prevention and nursing remains a challenge in the trauma population, and methods for improvement were identified using open-ended questions at the end of the survey.

The two open-ended questions at the end of the survey produced a variety of responses and themes. The first question was: What challenges have you faced with the LEAF Program? This question elicited clear themes about nursing and ancillary staff involvement, charting, time required, LEAF Program education, and the risks commonly associated with typical trauma patients. Examples include:

*It would be nice if any ancillary staff or other nursing staff when passing by would participate.*

Another nurse’s challenge was time management:

*The only challenge I find with the LEAF Program is time management when it comes to checking on the patient each hour, such as if I had another patient that was not doing well. However, time management is a challenge in every aspect of nursing, not necessarily specific to the LEAF Program. Also to note: If everyone*
does their part by checking on the patients that (are) on the LEAF Program, then making each hourly round would be less stressful and challenging.

A third nurse identified lack of participation and education issues as challenges of the program:

*Only RNs help with rounds, no ancillary staff assistance is provided, though I am aware that if such staff witnesses any patient close to falling or other dangerous behavior the RN will be notified. I was not hired until after the LEAF Program was in place. I did not receive appropriate training on what it is. I didn’t know for quite some time that other nurses can and should participate and sign the LEAF sheet."

The second open ended question was: What changes would you like to see made to the LEAF Program? Themes included altering the current charting practices, providing education, increasing support from coworkers and ancillary staff, integrating automatic protocols, and editing the fall score for required intervention. Examples are as follows:

One nurse suggested additional education:

*Quarterly education/re-education of the program to keep awareness present and increase participation from nursing, SDCGs (sitters), and volunteers.*

Another suggested decreasing the charting requirements:

*I would like to see the EMR hourly rounds and LEAF note disappear. I feel that the LEAF hourly rounds check list should be sufficient charting.*

A third nurse suggested increasing awareness, limiting LEAF inclusion, and changing the fall score used to initiate interventions:

*More ancillary staff be aware. Only put people on the LEAF that actually need it. At times patients receive (a) score of 60 or greater but they truly aren’t a fall risk.*

Study results show that the difference in falls 6 months after the intervention (implementation of the LEAF Program) were not considered statistically significant compared to the falls 6 months prior to the intervention. Significant nurse concerns with
the program included participation, time, charting, and education. Following is a discussion of study results.
CHAPTER V
DISCUSSION

Falls

The difference between the fall rate during the six months prior to the implementation of the LEAF Program and the fall rate during the six months after the implementation was statistically insignificant with a two-tailed p-value of >0.50. There was a decrease from 25 to 22 falls, a difference of 12% which created a declining trend line for falls during 2012 after implementation of the LEAF Program (Chart C2). This is similar to what Choi and Hector (2012) indicated that effective fall prevention programs could achieve. Choi and Hector accredited effective fall prevention programs with a 9% reduction of inpatient falls, and programs that included an initial intervention with follow-up programs with a 12% decrease in falls. Miake-Lye et al. (2013) indicated that effective multicomponent programs had the potential to reduce relative risk for falls by as much as 30%. This was not observed in this study. Hempel et al. (2013) found that only a fraction of studies on falls reported enough detailed evidence to compare fall rates, which became a significant limitation to their meta-analysis. This study provides adequate data to measure and compare falls in the hospital trauma setting.

Survey

The ‘Let’s Eliminate All Falls’ (LEAF) Program was a flexible multidisciplinary hourly round fall prevention program designed by trauma nurses that
combined evidence based fall prevention strategies that had the potential to be effective in decreasing falls in the trauma setting. To determine the effectiveness, feasibility, concerns, challenges, difficulties, frustrations, and knowledge of the LEAF Program for nursing, nurses took an online survey. Qualitative descriptive data of the implementation process was gathered using a computerized survey to identify challenges of program implementation. Correlational statistical analyses examined the relationships between these variables (presented above). Demographics of the surveyed nurses may have been influenced by a recent change in hospital policy to hire only Bachelor Degree prepared nurses (Chart C3). This would explain the increase in Associate Degree holders with more than 5 years nursing experience. The unit manager preference for hiring new graduates through the hospital nurse residency program may also have contributed to a high number of young nurses with limited experience. Although this factor may have impacted feedback obtained via the survey, it also an opportunity to promote a common goal, nursing responsibility for outcomes, and integration of evidence based practice throughout nursing practice.

Overall, 82% of the surveyed nurses felt that the LEAF Program was effective in preventing falls, yet the decrease in the fall rate after the implementation of the LEAF Program was statistically insignificant. Nurses felt that the program was working, even if it wasn’t by much. Additionally, 64% of surveyed nurses denied that challenges of the LEAF Program diminished the effectiveness of the program. This contested the 52% that believed that the program could be improved, 20% that felt that their fellow nurses did not adequately assist with hourly rounds, 53% that believed that ancillary staff did not participate in LEAF, 58% that believed that only nurses participated in the program, and
the 29% that believed that charting requirements were difficult. These statistics supported the overall concerns and challenges that were identified in the survey: time, participation (teamwork), education, protocols, and charting.

Two of the primary evidence based fall prevention strategies in the LEAF Program included hourly rounds and teamwork, so it was anticipated that challenges of the program would include time for hourly rounds and teamwork. Three nurses (6.66%) reported that they felt they did not have the ability to accomplish hourly rounds when needed. Six nurses (13.33%) that felt they could not change their practice enough to decrease falls in the trauma population. In the open ended question nurses identified the unit patient population, acuity, and fast pace of nursing required on the unit as challenges to having the time to spend attempting to eliminate falls. Halm’s (2009) meta-analysis attributed a 52% reduction in fall rates to hourly rounds, but also found that most studies observed nurses using an ‘every other hour’ support person, interdisciplinary team members, or the charge nurse for support, and noted that having adequate support for the nursing staff to partner with was crucial for success. Halm supported current findings, as nurses found the hourly rounds a challenge, but found it manageable when the number of patients on the program were limited and teamwork helped to decrease the workload.

Teamwork results showed that 53% of nurses did not feel that ancillary staff participated in the LEAF Program, 57% felt that only nurses participated in the program, and only 50% felt that fellow nurses assisted adequately with hourly rounds. The Institute of Medicine (1999, 2001) recognized and published on multiple occasions the importance of cooperation between clinicians to enhance quality and safety. The idea was reinforced by Chang et al. (2012), who determined that effective teamwork required trust and shared
vision. Trust and shared vision significantly and directly affected knowledge sharing, and knowledge sharing was significantly and positively related to patient safety. Likewise, Merrett et al. (2011) attributed teamwork to a decrease in patient falls and an increase in patient safety. Therefore, teamwork is considered an essential element for a fall prevention program to be successful.

Knowledge-based survey questions raised concern in LEAF Program education. Four nurses (8.89%) stated they were not sufficiently educated about the LEAF Program. This is reinforced by eight nurses (17.78%) who felt they needed more education on certain portions of the LEAF Program. Though this appears to be a low percentage, having any nurses uneducated on the program disrupts the potential effectiveness of it. One of the survey questions addressed education obtained prior to LEAF Program implementation, taking into consideration the extensive program rollout plan (town hall meetings required for all nurses for an hour each). It is reasonable to consider that some of the nurses that were hired more recently (2013 or 2014) did not obtain sufficient education through the orientation program, highlighting a need for an improved integration of the LEAF Program into the unit orientation program. As an example of the impact nursing education can have on a fall prevention program, Yates and Tart (2012) surveyed and evaluated nursing knowledge of a fall prevention program and found that a primary factor associated with the high fall rates was a lack of compliance by nursing staff. Findings showed that fallers were not wearing appropriate footwear, patients did not have their medication profiles reviewed, bed alarms were not turned on, and there was a high failure to complete required patient education. Clearly,
nursing education on the expectations and policies of a fall prevention program are key to the success of the program.

The LEAF Program incorporated automatic protocols to simplify the identification and prevention strategies used for high fall risk patients. These protocols expanded on hospital protocols, creating a more defined assessment, intervention, and treatment of high fall risk patients. Suggested changes from the survey included protocol changes that would more closely match those of the hospital, limiting the number of patients put on the LEAF Program to increase effectiveness, changing charting protocols (simplifying), and incorporating LEAF rounds into the volunteer program. The protocols or ‘rules’ of any fall prevention program are considered an important component of ensuring success. Yates and Tart (2012) determined that a contributing factor to an increase of falls in a medical population was policy intervention noncompliance by staff. The impact of lack of policy understanding, prioritization, and implementation may lead to a significant increase in the risk for falls in the inpatient setting, while changes to these protocols could assist nurses in more accurately identifying fall risk patients, save time, and gain ancillary assistance in performing and charting rounds.

Charting requirements impact nursing’s ability to facilitate the LEAF Program. In the survey, 48% of nurses believe that the charting requirements were difficult. Nurses identified redundancy, frequency, placement, and time as challenges to accomplishing the current LEAF Program charting requirements. They also identified recent changes in the EMR as support for change in charting requirements of the LEAF Program. Van Harten-Krouwel et al. (2011) found that more complicated and advanced interventions are typically implemented less often by nurses. If nurses felt that the
charting was complicated and time consuming, then they were less likely to find it a priority. Additionally, if they felt that protocols of the LEAF Program were complicated and too advanced, then the likelihood of success was diminished.

Implications

The number of falls six months after the intervention as compared to the number of falls in the six months prior to the intervention was a statistically insignificant decrease in falls. The nursing response to challenges of the LEAF Program, a flexible multidisciplinary hourly round fall prevention program, highlighted confidence in the program while maintaining concern for participation, education, charting, and protocols currently in place. The implication of these results along with the literature review is that the LEAF Program has the potential to be a practical and feasible fall prevention program for nursing, patients, and ancillary staff. Although concerns related to participation, education, charting, and protocols need addressed, the program itself appears to have the potential to decrease falls in the trauma setting without overwhelming the staff. Additionally, the study has implications for nursing research, nursing education, and nursing practice.

Nursing Research

This study contributes to nursing research. Meta-analyses provided evidence that fall prevention programs are an effective method of hospital fall prevention (Choi & Hector, 2012; Dibardino et al., 2012; Hempel et al., 2013). Through these meta-analyses it was determined that the majority of fall prevention programs included strategies similar to the LEAF Program (unique combination of evidence based strategies including risk
assessment strategies, visual alert indicators, patient family education, rounds, bed-exit alarms, and post-fall evaluations). Additionally, there were numerous studies that determined the effectiveness of specific fall prevention strategies and combinations. Studies included in this study’s literature search involved strategies most similar to those used in the LEAF program, and enhance current knowledge of effective fall prevention programs.

Sahota et al. (2014) evaluated the effectiveness of a program that included bed and chair sensors and found an insignificant decrease in falls, which warranted questioning the cost-effectiveness of the intervention. They suggested limiting use to high risk patients to ensure maximum effectiveness. The LEAF program had bed and chair alarms available which paged the nurse, similar to what was observed in this study. Therefore, limiting these to high-risk patients should be considered to increase effectiveness. Carroll, Pappola, and McNicoll (2009) evaluated a fall prevention program that was found to be the most similar to the LEAF program and attributed a significant decrease in falls in the head trauma and neurological patients to the success of the fall prevention program. The Trauma Unit also cares for these types of patients, giving hope to the future success of the LEAF Program. Dykes et al. (2010) evaluated the effectiveness of a fall prevention toolkit (FPTK) which integrated communications and workflow patterns with health information technology and produced corresponding interventions. Similar to the LEAF Program, the program was adaptable to specific situations and included a bed poster, a patient education handout, and a plan of care specific to the patient’s needs. The results of the study indicated a significant decrease of falls in the intervention group, especially in patients over 65 years. Yates and Tart (2012)
compared falls in psychiatric and medical inpatient populations prior to, during, and after revisions were made to the policy. The LEAF Program was similarly designed to adapt to unit specific needs over time. The results were a significant decrease of falls in the psychiatric population and a significant increase in the medical population. Wexler et al. (2011) performed a study of the Ruby Red Slipper Program. Shared with the LEAF Program were strategies (socks, fall signage, and fall mats) and types of patients (orthopedic and neurological). Results were mixed. Weinberg et al. (2011) measured falls pre and post a fall prevention initiative (similar to this study) and success was attributed to a change in safety awareness and culture, nurse empowerment, accountability, and sustainability. Barker et al. (2009) performed a retrospective study of falls after implementation of a fall prevention program and had mixed results. They attributed this to staff reporting practices, adherence to protocols, and equipment used (decrease injury, not falls). The LEAF Program used similar equipment, and should continue to monitor the effectiveness of it with measurement of injury acuity versus falls. Alexander et al. (2012) determined the success of a fall prevention program that implemented the use of volunteers rounding on high fall risk patients. The Trauma Unit had attempted to incorporate volunteers into the LEAF Program, but appears to be struggling with participation. This suggests that a stronger volunteer program could be effective for fall prevention.

An understanding of current fall prevention literature, successful and unsuccessful hospital based fall prevention program outcomes, and current study outcomes positively impact fall prevention knowledge and research in the area of trauma based fall prevention programs. However, the current study implies that there is much
more research to be done to adequately identify effective fall prevention programs and strategies in the hospital trauma setting. Nursing research will continue to be strengthened with additional investigation in this area.

**Nursing Education**

Nursing education has evolved over the years to include a wide variety of subject matter and focus. The current study adds to the knowledge base of safety strategies used to provide quality nursing care. These evidence based strategies will help to strengthen nursing education quality. Additionally, this study suggests that the Interacting Systems Framework and Theory of Goal Attainment (King, 1981) appropriately guided a study of a fall prevention program, implying that current nursing education theory is appropriate for current methods of study.

The Interacting Systems Framework was used to explain how interactions at different system levels led to a minor decrease in falls in a Trauma Unit. Interactions between systems, groups, and individuals each affected the results of LEAF Program. According to the Interacting Systems Framework, each nurse interacted within systems, groups, and individuals toward goal attainment.

Systemic influences on groups and individuals involved authority, power, status, and decision making (King, 1981). Systemic influences on the success of the LEAF Program included cultural expectations, family, religion, local influence, and hospital protocols. For the Trauma Nursing unit and nurses, the hospital exerted power and influence with policy and procedure, and the local area has had an influence with a wide variety of cultural and religious beliefs, all within the integration of an education focused healthcare system. In this setting, the hospital has also incorporated a new focus
on nursing leadership which promoted and supported nursing involvement in unit quality and safety initiatives, unit leadership, and the promotion of fall prevention responsibility and ownership.

Interactions, communication, and transactions allowed groups to influence systems and individuals (King, 1981). Groups required organization, interactions with systems, and involved individuals who communicated and worked together towards a common goal. In the pursuit of a decrease of falls, Trauma Unit nurses designed a multidisciplinary hourly round fall prevention program to decrease inpatient falls. These nurses belong to the unit as well as other groups and systems. Trauma nurses interacted within social, media, religious, and activity groups which also influenced their personal value systems, the care they provided, and their investment in a fall prevention program.

Individual nurses interacted within these systems and groups to individually provide care for patients. Interactions, assessments, communications, and perceptions were influenced by these systems and groups when working with a patient. For example, a nurse who valued education may have chosen to attempt education for a patient, while another nurse in a similar situation may have preferred another intervention based on her own experiences, group, and system influences. Nurses on the Trauma Unit each have their own values and preferences, and based their decision making on their own experience (or lack thereof), group values (LEAF Program, unit protocols), and system influences (hospital protocols). The result of the interactions between these was mixed. It was noted that some hospital protocols may have influenced LEAF protocol understanding by nurses, highlighting a need for further LEAF Program education. Additionally, nurses individually did not feel fully supported by their coworkers and
ancillary staff. Despite these findings, the hospital and unit have recently had a
unwavering ‘safety first’ support system, have the support of leadership at both the unit
and hospital levels, and the LEAF Program engaged complex human behaviors within
each of these systems to promote quality of care in the acute care setting.

King’s Theory of Goal Attainment described the interactions that must occur
between the nurse and client to achieve a goal, including: a) nurse assessment of client
concerns, problem, or health disparity, b) nurse and client perceptions of interference, and
c) sharing of information with family (King, 1995). Effectiveness of the LEAF Program
was influenced by a) the nurse assessment of the fall risk, b) what the nurse and patient
thought, felt, and did about that risk, and c) who and what information was shared with
the family or visitors. Each of these interactions was influenced by system, group, and
individual factors, making goal attainment of a decreased fall rate dynamic and ever
changing.

King’s Interacting Systems Framework and Theory of Goal appropriately
guided this study of a fall prevention program, supporting education and continuation of
its use in nursing education. The study of effective fall prevention strategies in the trauma
setting add to the nursing knowledge of quality and safety, and should also be
incorporated in current nursing education. Nursing education strategies and components
are strengthened with this study.

**Nursing Practice**

The translation of fall prevention evidence into practice remains a concern as
evidence continues to evolve, continually needing critical evaluation for applicability in
specific settings (Haines & Waldron, 2011). Understanding effect strategies to
incorporate in one’s nursing practice in the trauma setting is made more difficult by a lack of literature, research, and education in this specific area. Nursing practice is influenced by a number of quality and safety measures, entities, and overseeing powers at many different levels, and yet specific knowledge of an effective fall prevention program specific to the trauma setting is far from clear. Nurses playing a critical role in providing high quality patient care and meeting accreditation standards often struggle with whether to focus on the one patient who is at risk, or try to do hourly rounds on all their patients, taking time away from that one patient. Understanding the effectiveness of the fall prevention program currently in place, what literature shares on effective fall prevention strategies and programs, and what the nursing experience is will enhance the effectiveness of the program and aid in the translation to practice.

Limitations

Limitations of this study included the lack of root cause analysis of falls in this unit, long term data, and knowledge of specific population characteristics. The small sample size was limited by diversity, location, and participants of the LEAF Program in a single hospital. The t-test used to measure the effectiveness of falls before and after the intervention assumed that there was an independent distribution of falls; however, there is a lack of data regarding who the fallers actually were. The survey had a self-report structure that could introduce bias, was completed by a majority of young nurses with little nursing experience and a Bachelor’s of Science in Nursing which may skew the results. The results of this study cannot be generalized to any other group of nurses, nursing units, or fall prevention programs, as the program was designed for a specific
patient population and setting, and the assessment was tailored in reliability, validity, and sensitivity to the nurses who cared in this setting.

Recommendations

This study identified numerous areas of potential improvement for the LEAF Program. A literature review recommended determining unit specific predisposing fall factors, producing enough detailed evidence to compare fall rates, and pursuit of fall prevention approaches that are most compatible with the hospital culture and patient population. Research also suggested the following fall prevention strategies: adding risk factor education for nurses, therapy involvement, exercise programs, limiting use of bed alarms to high-risk patients to ensure maximum effectiveness, and creating a stronger volunteer program that is involved in hourly rounds for high fall risk patients.

Nurse recommendations via the survey include adding strategies to increase participation, change charting requirements, and alter current protocols with the potential to relieve time related constraints to effectively preventing falls in a busy nursing environment. Education suggestions included an annual or semiannual LEAF education program for nurses, orientation program LEAF education, an education program for ancillary staff, volunteers, and doctors that would increase awareness, participation, and charting of rounds, and a fall prevention education program for patients. Charting suggestions included making the charting less, different, simplified, or streamlined. Documentation practices should be changed to keep up with technology in a manner that encourages effective time management and prevents redundant charting. Identification and clarification of EMR requirements and abilities to assist nursing in accomplishing
required charting should be explored. Participation suggestions included education, encouragement, and rewards. Additional recommendations included 1) promotions such as drawings, reward programs, and other supportive measures to enhance participation in the LEAF Program, 2) enhancing the volunteer program with a fall prevention volunteer who focuses on fall prevention methods, including moving items closer to the patients, providing them with bathroom or ambulation devices (when appropriate), and obtaining help when needed, and 3) amending LEAF protocols to decrease confusion and increase effectiveness of interventions.

Additional research is needed to determine effective fall prevention strategies for the hospital trauma based population. Additional suggested studies include a root cause analysis of falls, population specifics, and patient specific fall data (repeat fallers, age, diagnosis, fall risk, and treatments), as well as a follow-up study of falls and the LEAF Program after changes are made to determine the effectiveness of these changes for nurses and patients.

Summary

Fall rates remain high in hospital settings throughout the United States (HHS, 2012), high fall rates fail to meet quality and safety goals, hospitals are no longer reimbursed for fall related injuries through the Centers for Medicare and Medicaid Services, and hospitals have significantly increased costs associated with fall related morbidity and mortality (The Joint Commission, 2012). Hospitals often use fall prevention programs to decrease the risk of inpatient falls and impact patient outcomes (Wexler et al., 2011). A gap in literature was identified that addressed the most effective
combinations of fall prevention evidence based strategies in a hospital trauma-based setting. The current study fills that gap and contributes evidence to the growing body of knowledge by addressing the following questions:

- What was the effect of implementation of the LEAF Program on the number of falls six months post intervention as compared with the number of falls in the six months prior to the fall prevention intervention?

- What was the nursing response to challenges of the LEAF Program?

This research contributed to the nursing knowledge base and improves nursing awareness, implementation, and potential outcomes by implementing more advanced interventions, sequela, related legal litigation, and overall healthcare costs, all while meeting rigorous quality and safety goals in a trauma setting. This study contributes to and advances the development and merit of a profession by providing quality measurements of a flexible multidisciplinary hourly round fall prevention program in the trauma setting.
REFERENCES


67


http://www.patientsafety.gov/CogAids/FallPrevention/index.html#page=page-3


APPENDIX A
## Preparation of Study

<table>
<thead>
<tr>
<th>Question #</th>
<th>Question type/style</th>
<th>Variable</th>
<th>Question</th>
<th>Strongly disagree</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Positive/Likert</td>
<td>Concerns</td>
<td>The LEAF Program is effective in preventing falls.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Negative/Likert</td>
<td>Challenges</td>
<td>The challenges of the LEAF Program diminish the effectiveness of the program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Positive/Likert</td>
<td>Knowledge</td>
<td>I understand how the LEAF Program works.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Negative/Likert</td>
<td>Responses</td>
<td>My nursing practice has negatively adapted to the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Positive/Likert</td>
<td>Suggestions</td>
<td>The LEAF Program was created using suggestions by nursing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Negative/Likert</td>
<td>Concerns</td>
<td>Ancillary staff does not participate in LEAF.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Positive/Likert</td>
<td>Challenges</td>
<td>I am successful in meeting the challenges of the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Negative/Likert</td>
<td>Knowledge</td>
<td>The LEAF Program is confusing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Positive/Likert</td>
<td>Responses</td>
<td>I have the ability to accomplish hourly rounds when needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Negative/Likert</td>
<td>Suggestions</td>
<td>I feel my suggestions for improvement are not acknowledged or valued.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Positive/Likert</td>
<td>Concerns</td>
<td>I believe that the trauma teams are concerned about falls.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Negative/Likert</td>
<td>Challenges</td>
<td>The LEAF Program is overwhelming.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Positive/Likert</td>
<td>Knowledge</td>
<td>I was sufficiently educated about the LEAF Program prior to implementation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Negative/Likert</td>
<td>Responses</td>
<td>I cannot change my nursing practice enough to decrease falls in the Trauma population.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Positive/Likert</td>
<td>Suggestions</td>
<td>The LEAF program can be improved.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Negative/Likert</td>
<td>Concerns</td>
<td>Only nurses participate in the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Positive/Likert</td>
<td>Challenges</td>
<td>I believe that resources such as appropriate beds, identification bands, restraints, and alarms are available when needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Question #</td>
<td>Question type/style</td>
<td>Variable</td>
<td>Question</td>
<td>Strongly disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly agree</td>
</tr>
<tr>
<td>------------</td>
<td>---------------------</td>
<td>----------</td>
<td>--------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>---------</td>
<td>-------</td>
<td>----------------</td>
</tr>
<tr>
<td>18</td>
<td>Negative/Likert</td>
<td>Knowledge</td>
<td>I need more education on certain portions of the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Positive/Likert</td>
<td>Responses</td>
<td>My fellow nurses assist adequately with hourly rounds.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>Negative/Likert</td>
<td>Challenges</td>
<td>Charting the hourly rounds and LEAF note in EMR is difficult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>Open-ended</td>
<td>Challenges</td>
<td>What challenges have you faced with the LEAF Program?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Open-ended</td>
<td>Suggestions</td>
<td>What changes would you like to see made in the LEAF Program?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Chart A1: Organization and Variables of SurveyMonkey*
APPENDIX B
Permission to Take Part in a Human Research Study

Title of Research Study: Measuring the Effectiveness of a Flexible Multidisciplinary Hourly Round Fall Prevention Program

Investigator: Siri Johnson, RN, CN3, MSN-C

Why am I being invited to take part in a research study?
You have been invited to take part in this research study because you have the ability to share your personal experiences, challenges, concerns, knowledge, and responses to the Let’s Eliminate All Falls (LEAF) Program, a fall prevention program implemented on your nursing unit.

What should I know about a research study?
(Below are the Experimental Subject’s Bill of Rights of all participants of any research study. Details of the study follow this section.)

- Someone will explain this research study to you, including:
  - The nature and purpose of the research study.
  - The procedures to be followed.
  - Any common or important discomforts and risks.
  - Any benefits you might expect.
- Whether or not you take part is up to you.
- You can choose without force, fraud, deceit, duress, coercion, or undue influence.
- You can choose not to take part.
- You can agree to take part now and later change your mind.
- You can ask all the questions you want before you decide.
- If you agree to take part, you will be given a copy of this document.

Who can I talk to?
If you have questions, concerns, or complaints, or think the research has hurt you, talk to the research team at UCDMC. The primary investigator (researcher) for this study is Siri Johnson, and she can be contacted at 530-391-0781.

This research has been reviewed and approved by an Institutional Review Board (“IRB”). Information to help you understand research is online at http://www.research.ucdavis.edu/IRBadmin. You may talk to a IRB staff member at (916)703-9151, IRBadmin@ucdmc.ucdavis.edu, or 2921 Stockton Blvd, Suite 1400, Room 1429, Sacramento, CA 95817 for any of the following:
- Your questions, concerns, or complaints are not being answered by the research team.
- You cannot reach the research team.
- You want to talk to someone besides the research team.
- You have questions about your rights as a research subject.
- You want to get more information or provide input about this research.

For IRB Use

Document Revision Date: February 22, 2013

Form B1. UCDMC and CSUC IRB Approved Consent Form, page 1.
Permission to Take Part in a Human Research Study
of 2

Why is this research being done?
The information you share can be used to determine the practicality and feasibility of the LEAF Program, enhance implementation and program practices, highlight educational needs, assist with translation into practice, and contribute evidence to the growing body of knowledge describing the most effective combinations of fall prevention interventions in a hospital trauma-based fall prevention program.

How long will the research last?
We expect that your participation in this research study will take up to ten minutes. Data collection may last for a couple weeks.

How many people will be studied?
We invite the 72 regularly assigned bedside trauma nurses working in the Trauma Nursing Unit who area familiar with the LEAF Program to participate and no other nurses.

What happens if I say yes, I want to be in this research?
You will review this consent form, fill out a demographic form, and complete an anonymous online survey which takes approximately 5-10 minutes to complete. Individual responses will not be identified and only group data will be reported.

What happens if I do not want to be in this research?
You may decide not to take part in the research at any time for any reason, and it will not be held against you in any way.

What happens if I say yes, but I change my mind later?
You can leave the research at any time and it will not be held against you.

Is there any way being in this study could be bad for me?
Completion of the required forms and survey could take a few minutes away from your shift work or create stress.

Form B2. UCDMC and CSUC IRB Approved Consent Form, page 2.
Demographic Data Sheet

Age: _____

Gender: M   F

Shift:   Days   Nocs

Nursing Experience: _____ years _____ months

Education:   AA   BSN   MSN

LEAF Program Education:   ___  Town Hall Rollout Meeting
                           ___  Other: _________________________

I participated in the LEAF Program between January and December, 2012: Y   N

Form B3. Demographic Data Sheet

LEAF Study Survey Reminder

Please go to http://www.surveymonkey.com/s/MTT3QH9 and complete the survey.

Thank you!

Form B4. Nurse Survey Reminder.
### Result Charts

<table>
<thead>
<tr>
<th>Month 2012</th>
<th>Falls</th>
<th>Patient Days</th>
<th>Fall Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>January</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>February</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>March</td>
<td>5/14 quarterly</td>
<td>3233</td>
<td>4.33</td>
</tr>
<tr>
<td>April</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>June</td>
<td>5/11 quarterly</td>
<td>3217</td>
<td>3.419</td>
</tr>
<tr>
<td><strong>6 month total</strong></td>
<td><strong>25</strong></td>
<td><strong>6450</strong></td>
<td><strong>3.876</strong></td>
</tr>
<tr>
<td><strong>Month 2012</strong></td>
<td><strong>Falls</strong></td>
<td><strong>Patient Days</strong></td>
<td><strong>Fall Rate</strong></td>
</tr>
<tr>
<td>July</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>September</td>
<td>5/12 quarterly</td>
<td>3254</td>
<td>3.711</td>
</tr>
<tr>
<td>October</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>November</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>December</td>
<td>4/10 quarterly</td>
<td>3234</td>
<td>3.092</td>
</tr>
<tr>
<td><strong>6 month total</strong></td>
<td><strong>22</strong></td>
<td><strong>6468</strong></td>
<td><strong>3.40</strong></td>
</tr>
</tbody>
</table>

**Chart C1.** Fall Data.

![2012 Trauma Unit Falls](image)

**Chart C2.** Fall Trend.

**Chart C3.** Formal Education of Surveyed Nurses.

**Chart C4.** Age and Nursing Experience of Surveyed Nurses.
<table>
<thead>
<tr>
<th>Strongly Disagree 1</th>
<th>Disagree 2</th>
<th>Neutral 3</th>
<th>Agree 4</th>
<th>Strongly Agree 5</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 1: The LEAF Program is effective in preventing falls.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
<td>8%</td>
<td>17.78%</td>
<td>32%</td>
<td>11.11%</td>
<td>5</td>
</tr>
<tr>
<td>Question 6: Ancillary staff does not participate in LEAF.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.44%</td>
<td>2.22%</td>
<td>9%</td>
<td>20.00%</td>
<td>18%</td>
<td>40.00%</td>
<td>6</td>
</tr>
<tr>
<td>Question 11: I believe that the trauma teams are concerned about falls.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.27%</td>
<td>2.27%</td>
<td>3%</td>
<td>6.82%</td>
<td>27%</td>
<td>61.36%</td>
<td>12</td>
</tr>
<tr>
<td>Question 16: Only nurses participate in the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00%</td>
<td>11%</td>
<td>8%</td>
<td>17.78%</td>
<td>19%</td>
<td>42.22%</td>
<td>7</td>
</tr>
</tbody>
</table>

### Chart C5. Results by Variable: Concerns.

<table>
<thead>
<tr>
<th>Strongly Disagree 1</th>
<th>Disagree 2</th>
<th>Neutral 3</th>
<th>Agree 4</th>
<th>Strongly Agree 5</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 2: The challenges of the LEAF Program diminish the effectiveness of the program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22.22%</td>
<td>28%</td>
<td>12%</td>
<td>26.67%</td>
<td>4%</td>
<td>8.89%</td>
<td>0%</td>
</tr>
<tr>
<td>Question 7: I am successful in meeting the challenges of the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00%</td>
<td>0%</td>
<td>5%</td>
<td>11.11%</td>
<td>35%</td>
<td>77.78%</td>
<td>5%</td>
</tr>
<tr>
<td>Question 12: The LEAF Program is overwhelming.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18.18%</td>
<td>26%</td>
<td>59.09%</td>
<td>18.18%</td>
<td>4%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Question 17: I believe that resources such as appropriate beds, identification bands, restraints, and alarms are available when needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.22%</td>
<td>12%</td>
<td>26.67%</td>
<td>10%</td>
<td>22.22%</td>
<td>33.33%</td>
<td>5%</td>
</tr>
<tr>
<td>Question 20: Charting hourly rounds and LEAF note in EMR is difficult.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00%</td>
<td>5%</td>
<td>1%</td>
<td>2%</td>
<td>37%</td>
<td>82.22%</td>
<td>5%</td>
</tr>
</tbody>
</table>

### Chart C6. Results by Variable: Challenges.

<table>
<thead>
<tr>
<th>Strongly Disagree 1</th>
<th>Disagree 2</th>
<th>Neutral 3</th>
<th>Agree 4</th>
<th>Strongly Agree 5</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 3: I understand how the LEAF Program works.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0%</td>
<td>0%</td>
<td>0%</td>
<td>37.78%</td>
<td>28%</td>
<td>62.22%</td>
<td>45</td>
</tr>
<tr>
<td>Question 8: The LEAF Program is confusing.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.00%</td>
<td>32%</td>
<td>71.11%</td>
<td>4%</td>
<td>8.89%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>Question 13: I was sufficiently educated about the LEAF Program prior to implementation.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.00%</td>
<td>4%</td>
<td>8.89%</td>
<td>1%</td>
<td>22.22%</td>
<td>36%</td>
<td>57.78%</td>
</tr>
<tr>
<td>Question 18: I need more education on certain portions of the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>33.33%</td>
<td>27%</td>
<td>60.00%</td>
<td>4%</td>
<td>8.89%</td>
<td>17.78%</td>
<td>0%</td>
</tr>
</tbody>
</table>

### Chart C7. Results by Variable: Knowledge.

<table>
<thead>
<tr>
<th>Strongly Disagree 1</th>
<th>Disagree 2</th>
<th>Neutral 3</th>
<th>Agree 4</th>
<th>Strongly Agree 5</th>
<th>Total</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Question 4: My nursing practice has negatively adapted to the LEAF Program.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31.11%</td>
<td>24%</td>
<td>53.33%</td>
<td>11.11%</td>
<td>4.44%</td>
<td>0%</td>
<td>45</td>
</tr>
<tr>
<td>Question 9: I have the ability to accomplish hourly rounds when needed.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.22%</td>
<td>2%</td>
<td>4.44%</td>
<td>9%</td>
<td>20.00%</td>
<td>28%</td>
<td>62.22%</td>
</tr>
<tr>
<td>Question 14: I cannot change my nursing practice enough to decrease falls in the Trauma population.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.44%</td>
<td>25%</td>
<td>55.56%</td>
<td>12%</td>
<td>26.67%</td>
<td>5%</td>
<td>11.11%</td>
</tr>
<tr>
<td>Question 19: My fellow nurses assist adequately with hourly rounds.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.27%</td>
<td>5%</td>
<td>18.18%</td>
<td>19%</td>
<td>29.55%</td>
<td>43.18%</td>
<td>3%</td>
</tr>
</tbody>
</table>

### Chart C8. Results by Variable: Responses.
Question 21: What challenges have you faced with the LEAF Program?

<table>
<thead>
<tr>
<th>Anon. Participant</th>
<th>Nurse Participation</th>
<th>Ancillary participation/volunteers</th>
<th>Time for rounds or charting</th>
<th>Prioritizing rounds vs. other care</th>
<th>Patient Acuity</th>
<th>Charting</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>✓</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>12</td>
<td>6</td>
<td>2</td>
<td>4</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Chart C10. Challenges.

Question 22: What changes would you like to see made in the LEAF program?

<table>
<thead>
<tr>
<th>Anon. Participant</th>
<th>Increase Nurse Participation</th>
<th>Increase Ancillary Participation/Volunteers</th>
<th>Change in Protocols</th>
<th>Change Charting Requirements</th>
<th>Education</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>1</td>
<td>12</td>
<td>2</td>
<td>5</td>
<td>4</td>
</tr>
</tbody>
</table>

Chart C11. Desired Changes.