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Focused interventions to decrease inpatient falls

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by

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Abstract

Background: Falls are the most commonly reported safety incidence in the hospital setting (Morris R. et al., 2017). Because falls may be a result of many factors, evidence shows that multicomponent fall interventions best reduce fall rates (Bargmann et al., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021). In this project, a needs assessment identified a need for fall prevention strategies to reduce fall rates on inpatient units.

Setting: A step-down/telemetry Cardiovascular Intervention Unit (CVI) (15 beds) and Cardiovascular Unit (CVU) (12 beds) in a suburban private hospital.

Purpose: The purpose of this evidence-based project was to evaluate the effectiveness of education on nurses' implementation and documentation of falls prevention interventions on the CVI and CVU

Methods: This project consisted of an interrupted time series design. Fall rates, fall prevention and documentation rates were audited and compared before and after an educational read-and-sign discussing multicomponent changes (new falls risk assessment, new interventions, and focus on documentation).

Intervention: The intervention was an educational read-and-sign conducted with unit staff to review the current falls prevention interventions and documentation requirements. Data regarding the use of interventions and documentation were collected and analyzed.

Results: Post-intervention, four of eight variables demonstrated significant improvement including use of fall bracelet ($p<.001$), bed in lowest position ($p=.07$), siderails in upright position ($p=.003$), and call light in place ($p=.05$). Nursing documentation of intervention use also demonstrated significant improvement post-intervention.

Key words: Falls, fall risk, fall rates, interventions, education.

Background

Patient falls are the most common adverse event to occur within the hospital setting (LeLaurin & Shorr., 2019). The national benchmark for fall occurrences is "3.44 falls/1000 patient days on general medical, surgical, and medical-surgical units" (Venema et al., 2019, p. 1). It is also reported that between 700,000 and 1,000,000 people fall in the hospital in the United States each year, which indicates a need for change (Ganz et al., 2021).

A fall during a hospitalization is a devastating complication that may result from many contributing factors. Falls are often preventable and typically occur because of lack of education of hospital staff and patients, environmental factors, patients' use of assistive devices, lack of consistent fall-prevention hospital policies and procedures, poor rehabilitation strategies, and/or patient cognitive impairment or chronic or acute medical conditions that may cause lack of coordination (Morris M. et al., 2022). A significant number of inpatient falls occur in the elderly population (Patient Safety Network., 2019). Falls often lead to negative outcomes including patient injury, increased length of hospital stays, potential legal liability of the hospital, increased costs for patients and hospitals, loss of patient confidence, increased patient fear of falling, and delays in functional recovery time (Morris et al., 2017; Schwendimann et al., 2006). Both intrinsic and extrinsic factors can lead to inpatient falls.

Intrinsic factors that increase a patient's likelihood of falling include age (specifically 65 years or older), gender, musculoskeletal disease, patient imbalance or changes in gait, vision and/or hearing impairment, urologic disorders (frequency/urgency) and drug use (Najafpour et al., 2019; AHRQ., 2017). Drugs that pose a higher risk for falls include sedatives, antidepressants, hypnotics, antipsychotics, laxatives, diuretics, and glycemic medications (Najafpour et al., 2019; AHRQ., 2017). Extrinsic factors that increase a person's likelihood of

falling include environmental hazards (clutter in the patient room, poor lighting, low toilet seats, lack of handrails, unstable furniture, unstable or unlocked/broken wheels), personal safety hazards (improper clothes or shoes), poor equipment use (missing wheels, broken bed/chair alarms, incorrect wheelchair or walker), physical restraints, excess equipment use or addition of surgical equipment including items such as chest tubes, external pacemakers, and central lines (AHRQ., 2017). Patients with multiple intrinsic and extrinsic factors have an elevated risk of falling (AHRQ., 2017). Many investigators report that the use of falls prevention interventions and education for hospital staff, patients and their families provides benefit to limit the number of falls that occur in high-risk patients, both in the hospital and at home (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020).

Cardiovascular disease (CVD) has been associated with fall occurrence rates (Denfeld et al., 2022). Based on a study of 2,456 adults hospitalized with CVD (including patients with complications of myocardial infarction, atrial fibrillation, and heart failure), greater than 60% of patients with CVD had a moderate to high risk of falling, regardless of age, indicating that patients with CVD have a higher-than-average risk of falling (Denfeld et al., 2022; Manemann et al., 2018). It is also seen that fall rates are higher in patients with heart failure with a 43% fall rate, compared to a 30% fall rate for those with other chronic diseases (Denfeld et al., 2022). There is also a higher prevalence rate of falls in patients with arrhythmias, specifically those with atrial fibrillation (OR=1.98) (Denfeld et al., 2022; Manemann et al., 2018). Risk factors specifically linked to the presence of CVD highlight the necessity of a strong falls prevention program for patients with cardiovascular-related diagnoses.

Literature Review

Multicomponent Falls Prevention Interventions

Throughout the published literature, there are several interventions and risk factors evaluated for evidence in reduction of patient falls. Multiple investigators report the positive effects of multicomponent falls prevention bundles on the occurrence rate of patient falls, finding that the use of multiple interventions rather than an isolated falls risk assessment or a single intervention was important in the prevention of falls (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021). Dykes et al. (2010) conducted a clustered randomized study (N=10,264) in four urban hospitals, on a total of eight units (four control and four interventional units) during a six-month period. The investigators examined the difference between typical falls prevention strategies (control group) and the use of a Falls Prevention Tool Kit (intervention group). The Falls Prevention Tool Kit incorporated the use of a falls risk assessment scale and bedside signs to facilitate patient and staff communication and improve awareness of the patients' risk of falling. Within the intervention group, the use of the tool kit showed a decrease in fall incidences (p=0.02) and had significance specifically in the elderly population (65+ years) (p=0.003). However, the tool kit use did not significantly decrease injurious and non-injurious fall rates for patients less than 65 years of age (p=0.66).

Dykes and colleagues replicated their 2010 study in a larger population (N=37,321) (Dykes et al., 2020). Using a non-randomized controlled trial, the investigators evaluated the effectiveness of the falls prevention tool kit on fall rates with and without injury. The study was conducted in multiple institutions, including 14 medical units in medical centers in Boston and New York (Dykes et al., 2020). Similar results were found in this replication trial with significant association between use of the tool kit and falls occurrences. The investigators found

a 15% reduction in the postintervention falls (p=0.01). The investigators also found a reduction of overall postintervention fall rate (p=0.003), with 45% reduction of injurious falls in patients 65 years and older (p=0.004), but only 19% reduction of injurious falls in patients younger than 65 years of age (p=0.28). The investigators concluded that the tool kit was more effective in preventing fall-related injuries in the elderly population.

Bargmann & Brundrett (2020) completed a quality improvement project on a 26-bed medical-surgical telemetry unit in a Level 1 military trauma center. They evaluated the addition of a patient safety agreement form, along with daily patient education on falls risk factors during shift assessment. Using the John Hopkins Fall Assessment, Bargmann and Brundrett found a 55% fall rate reduction within the first four months of implementation. However, unlike previously reported studies, age did not seem to be a significant factor. The use of a patient safety agreement form could be beneficial to both patients and staff in creating a collaborative environment with improved fall prevention education for patients.

Strini et al. (2021) reached a conclusion similar to Bargmann and Brundrett (2020) after completing a systematic review of falls risk assessment tools. No data were analyzed to determine the success rate of each tool, but the authors discussed the use and purpose of each tool and where to use them, explaining the differences between them. According to Strini et al. there is no ideal tool that can be used in any context or that performs a perfect risk assessment. Although the work of Strini et al. supported earlier findings by Dykes et al. (2010; 2020) and Bargmann and Brundrett the earlier demonstration that multiple interventions was most effective led to the recommendation for concurrent use of multiple fall prevention strategies. Strini et al. also suggest that the professional team caring for patients be appropriately trained and educated on how to maintain correct and appropriate prevention measures in relation to falls prevention

strategies. Strini et al. also suggested using appropriate fall risk assessment tools to identify high risk patients and allow the professional team to appropriately direct care.

The benefit of multiple fall prevention strategies for inpatients has not been replicated in outpatients. Fritz et al. (2022) had different results after completing a cohort study (N=1,396) to assesses whether use of a multicomponent falls prevention intervention, including patient education, review of home medications, and completion of a home safety assessment, would be associated with a reduction of patient falls at home post-surgery. The investigators included a control group that received usual care (n=698) and an intervention group that received the multicomponent falls prevention intervention (n=698). The investigators found that this multicomponent intervention had no significant impact on the prevention of post-surgical falls with 32.7% of the intervention group and 32.2% of the control group having falls within one-year post-surgical procedure. Although, after assessing pre- and post-surgical quality of life with a physical and mental composite score using the Veterans RAND 12-item health survey, the intervention group had improvement of scores at one-year post-operation indicating that the multicomponent safety intervention was useful. The study showed patient reports of improved quality of life because the intervention reduced post-operative complication. The investigators concluded that other interventions may be necessary to improve fall incidences in post-operative patients.

Assessment of Risk Factors

Numerous investigators have discussed the multiple related risk factors for falling. Several investigators found increased age as a risk factor for falling (Fritz et al., 2022; Lan et al., 2020; Lo et al., 2019; Sillner et al., 2019); while others reported that age was unrelated or that

there was not enough evidence to determine the significance of age (Bargmann & Brundrett., 2020; Fernando et al., 2017).

Two investigative teams studied the relevance of gender to falls risk. Lo et al. (2019) evaluated risk factors related to likelihood of falling following total hip replacements and/or total knee arthroplasties (N=1,292,698) and found women to be more likely to fall. Similarly, Morris et al. (2021) found gender to be a significant risk factor, with 55% of falls in their study occurring in females.

Other fall risk factors identified in the literature include physical limitations such as frailty and cognitive impairments such as dementia and/or delirium. Multiple investigators found frailty to be significantly associated with increased risk for falling and increased risk for those falls to result in injury (Hu et al., 2021; Lan et al., 2020). In a systematic review that included 17,403 cases, Hu et al. used the Mantel-Haenszel statistical method and found frailty to be a strong predictor ($p<0.00001$) of injurious falls, specifically patients undergoing hypertension treatment. Lan and associates also found that in-hospital frailty increased the risk for future falls ($p<0.000$). Fernando et al. (2017) compared the risk for falls in hospital and community settings for cognitively impaired patients 55 years and older. They found no significant risk factors that were consistent among one setting compared to the other. However, in the hospital setting, ambulation with a mobility aid ($p=0.001$), visual impairment, increased central nervous system-based medication use, use of more than four prescriptions, a history of falling ($p=<0.001$), and an increased dementia severity score were all associated with an increased falling risk. Similarly, Sillner et al. (2019) reported that delirium often goes unrecognized in patients with preexisting dementia, increasing the risk for delirium-related falling (RR=4.5, range 1.4-12.6).

Discussion

Multiple investigators evaluated fall risk assessment, fall prevention interventions, and outcomes. Quite commonly, investigators found the need for a multifactorial intervention tool with a combination of strategies to prevent falls (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021).

The evidence for multiple fall prevention interventions is strong. The Let Evidence Guide Every New Decision (LEGEND) appraisal model (Cincinnati Children's., 2012) was used to rank level of evidence for this review. Using this model, published evidence is ranked from 1 (highest) to 5 (lowest) with a sub-designation in each category of: a (good quality study) or b (lesser quality study). For the 11 publications used in this review, six are graded Level 1, two are Level 2, two are Level 3, and one is Level 4 (Table 1). All studies were graded as strong-quality evidence in their respective levels. Though the literature is fairly strong, there are study biases and a lack of research in multiple settings. For example, there is minimal evaluation of residential risk factors home, diverse populations, and varying age groups. Although limitations were found in the literature review, the articles chosen for this proposal provide strong evidence for fall prevention strategies for hospitalized patients.

Table 1

Evidence Hierarchy using the LEGEND Model

Authors	Type of Study/Study Design	Level a = good quality b = lesser quality
Bargmann & Brundrett., 2020	Quality Improvement	4a
Dykes et al., 2010	Clustered Randomized Study	2a
Dykes et al., 2020	Non-Randomized Controlled Trial	3a
Fernando et al., 2017	Systematic Review	1a
Fritz et al., 2022	Prospective Cohort Study	3a
Hu et al., 2021	Systematic Review and Meta Analysis	1a
Lan et al., 2020	Systematic Review	1a
Lo et al., 2019	Systematic Review	1a
Morris et al., 2021	Clustered Randomized Study	2a
Sillner et al., 2019	Systematic Review	1a
Strini et al., 2021	Systematic Review	1b

Literature Summary

Falls that occur in a hospital setting may have multiple internal and external causes, but are preventable. Patients require individualized care that includes thorough fall risk assessment and use of multiple interventions to reduce the risk for falling. Multiple investigators demonstrated improved fall rates following implementation of focused interventions (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021). The literature also suggests a need for improved patient and staff education and increased collaborative efforts between patients, families, and the hospital staff to decrease fall occurrences (Bargmann & Brundrett., 2020; Strini et al., 2021). Implementing strategies that have been documented to reduce falls in the hospital setting should improve patient recovery times, decrease length of stay, and improve patient outcomes.

Problem

Fall risk and occurrences in hospitalized patients are well documented in the literature. Several investigators found that multiple interventions were the best way to reduce fall occurrences, rather than simply the use of one intervention (Bargmann et al., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021; Tricco et al., 2017).

Intervention

The intervention for this project included education on the multiple falls prevention interventions recently implemented on two cardiovascular units at a suburban private hospital. The fall prevention interventions included implementation and evaluation of two new falls risk assessments and unit-based safety interventions for patients with elevated falls risk scores. Patients' fall risks were scored using the Hester-Davis Falls Risk Assessment (Hester & Davis., 2013) for the first 24 hours of admission, followed by twice daily reviews of patient specific EPIC Predictive Analysis scores.

The Hester-Davis Falls Risk Assessment is an instrument created by Hester and Davis (2013). The Hester-Davis Fall Risk Assessment is measured on a scale of 0 to 77, with a score of greater than or equal to 15 classifying a patient as high fall risk. The Hester-Davis Falls Risk Assessment was validated in 1,904 patients on a neuroscience unit. An initial cut score of 7 produced a sensitivity of 100% and specificity of 24.9%, while a cut score of 10 provided a sensitivity of 90.9% and specificity of 47.1%. Based on the literature, Hester and Davis concluded that a cut score of 15 reasonably indicates a high fall risk.

The EPIC Predictive Analysis is an automated artificial intelligence process that runs in the background of EPIC (Madison, WI), an electronic health records system, to calculate a patients fall risk. This model is objective, standard, and updates as new data elements become

available, with automatic updates every four hours. The EPIC Predictive Analysis uses patient information supplied in the patients' electronic health record (EHR) to supply a personalized fall risk score. The analysis score is calculated from patient demographics, vital signs, assessment changes, lab results, medications, procedure orders, and present lines, drains, and/or airways. The EPIC Predictive Analysis is measured on a scale of 0 to 100 with a score of greater than or equal to 50 classifying a patient as high fall risk.

Concurrently, to decrease fall rates on these units, the nursing staff had been encouraged to increase attention to purposeful hourly/bihourly rounding, as well as ensuring the use of bed and chair alarms and use of patient assistive devices during ambulation. Nursing staff had also been encouraged to conduct post-fall huddles with checklists and diligence to documentation. The unit also focused on improving documentation of fall protocol interventions in the patients' EHR.

Rationale

Needs Assessment

A fall-related needs assessment was conducted with the unit manager of CVI and CVU. The CVI unit nurses care for patients before and after cardiac interventions including stress tests, pacemaker placement, ablation procedures, cardioversion for atrial fibrillation, cardiac catheterization with and without stent placement, and transaortic valve replacement surgeries (TAVRs). The CVU team cares for patients who have had cardiac-specific or open-heart surgeries including coronary artery bypass grafting (CABG), mitral and/or aortic valve replacements, and chest cavity debridement. The fall-related needs assessment identified a need for standardized fall prevention interventions and education for nurses, patients, and patient families. During 2020, on these two units, there were a total of 32 patient falls with nine of the

falls (28%) resulting in patient injury. In 2021, the goal of the unit staff was to have less than or equal to 29 patient falls and less than or equal to eight fall-related injuries. In 2021, the units reported a total of 23 patient falls with five of the falls (22%) resulting in injury, an improvement from the year prior. The long-term goal of both the CVU and CVI unit staff is to have no patient falls occur within a 12-month period.

Purpose and Aims

The purpose of this evidence-based project was to evaluate the effectiveness of education on nurses' implementation and documentation of falls prevention interventions on the CVI and CVU. The aims of the project were to: (a) increase nursing staff education; (b) increase implementation of falls prevention strategies; (c) reduce patient falls; and (d) increase the formal documentation of falls prevention strategies.

The short- and long-term goals for the project were to achieve (a) ≤11 patient falls on CVU within the 2024 fiscal year and ≤12 patient falls on CVI within the 2024 fiscal year, with an eventual long-term goal of 0 patient falls within a fiscal year and (b) 90%-unit staff compliance with implementation of falls prevention interventions within three months, with a long-term goal of 100% unit staff compliance of implementation of interventions and documentation.

Conceptual Framework/Process Improvement Model

The Plan-Do-Study-Act framework (The W. Edwards Deming Institute., n.d.) was applied to this project. The Plan-Do-Study-Act model is a four-step framework that follows the project implementation process and allows for revision/improvement of the project as it is conducted (The W. Edwards Deming Institute., n.d.). The Plan consisted of creating a team and mapping out the project implementation process. The Do process was the implementation of the

plan over a course of time. In the Study phase, the project was implemented and evaluated for any areas that needed improvement or further change. In this phase, the project leader reviewed the pre-intervention data collection process and education plan, adjusting as was necessary based on unit events. Lastly, in the Act process, the project leader evaluated pre- and post-intervention data to determine the project success.

The PDSA model was applied to the project as follows:

Plan: The plan portion consisted of creating an interdisciplinary team and working with unit management to determine what patient care issues in the units needed improvement. The needs assessment led to the recognition for needed improvement in falls prevention. A literature review provided evidence that the best path was a multiple falls prevention strategy approach. At this hospital, there were several recently implemented interventions for falls prevention. Since this implementation, there had been some nursing staff confusion and inconsistent use of these interventions. The current project included implementing a short read-and-sign for unit staff which reviewed unit fall goals, fall-based interventions, and the required falls prevention documentation. The planning also consisted of determining data collection and analysis strategies, such as auditing tools.

Do: To gather baseline data, the project leader audited implementation and documentation of fall prevention interventions for five days each week for four weeks prior to the unit fall-based educational read-and-sign. A fall-based educational read-and-sign was then provided to educate unit staff on unit fall data, goals for fall prevention, current fall-based interventions, and fall prevention documentation requirements. Following this education, the project leader again audited fall prevention intervention and associated documentation for five

days a week for four weeks on all high-risk fall risk patients (based on Hester-Davis Fall Risk Assessment Score and EPIC Predictive Analysis scores).

Study: The project leader then performed audits and compared pre- and post-education data on falls prevention intervention uses and documentation. The outcomes were then analyzed to determine if the project goals were met.

Act: The project leader analyzed data to determine gaps in the project process and need for process modification. Further education was provided to the unit staff as needed. The project leader presented data to the management team and discussed the success of the project. The project will later be reviewed with the hospital quality improvement team to determine whether to move forward with a broad adoption of the interventions throughout the hospital.

A visual representation of the project PDSA model can be seen in Figure 1. A visual representation of the project timeline can be seen in Figure 2.

Figure1

PDSA Model for Falls Prevention Interventions

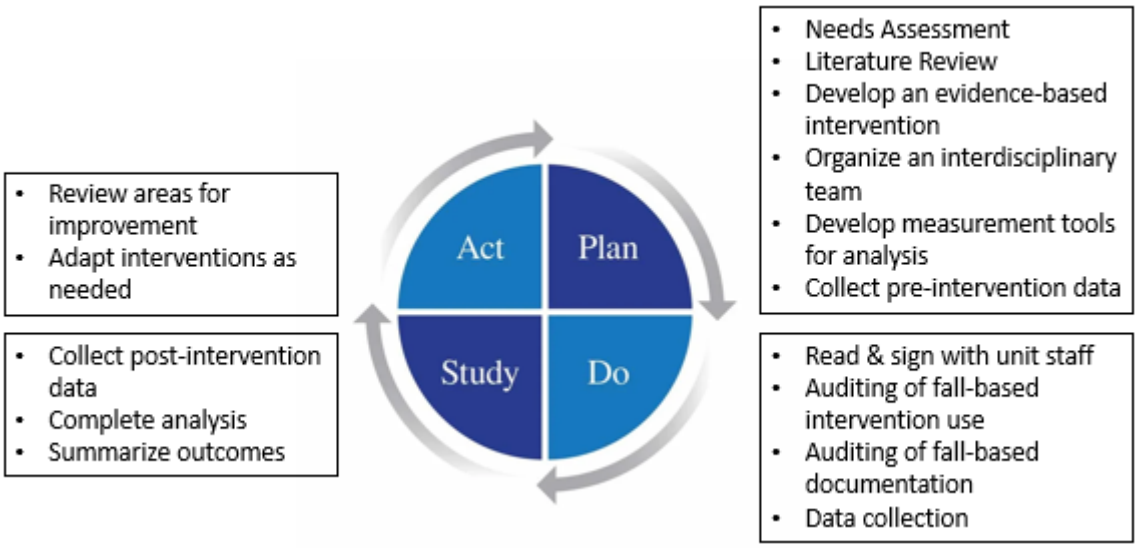
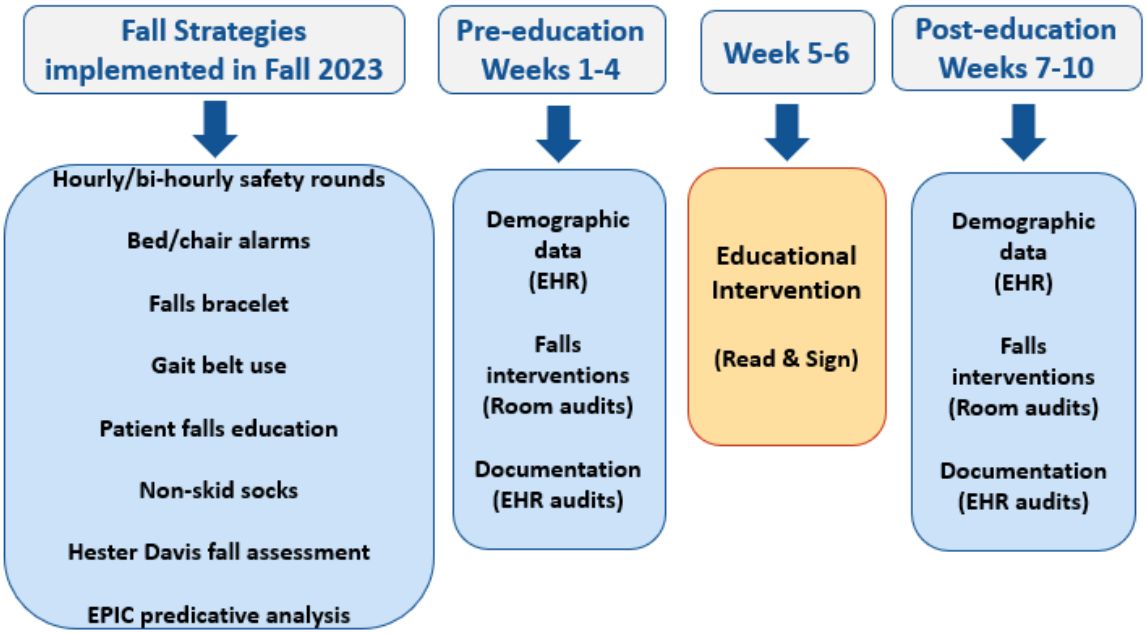


Figure 2

Project Timeline



Methods

Design

This project used an interrupted time series design. The project leader compared unit fall rates, intervention implementation, and documentation prior to and following unit education.

Intervention

At the start of this project, an internally created falls assessment scoring system was used throughout the hospital system. In October 2023, the Hester-Davis Falls Risk Assessment and EPIC predictive analysis were implemented as the standard of care for falls risk assessment. Patients who qualified high fall risk are required to have a “Falls Risk” indicator on their hospital room door entrance tablet, wear a bright yellow arm band and bright yellow non-skid socks, use a gait belt for walking assistance, and use the bed or chair alarms at all times. Staff are required to round on patients hourly during dayshift (7am-7pm) or bihourly during nightshift (7pm-7am)

to assess for patient needs and assess that falls prevention measures are in place. Bed alarms are now active on all patients during nighttime sleep hours regardless of falls risk. Documentation of falls risk interventions were audited five days a week for a total of eight weeks to assess for compliance.

Table 2

BHL Falls Prevention Interventions

High Fall Risk Patients	All Patients
• Fall risk indicator on door entrance tablet • Bright yellow armband • Bright yellow non-skid socks • Gait belt for walking assistance • Bed/chair alarms on at all times (Zone 2) • Fall risk education with patient at shift handoff	• Hourly rounding 7AM-9PM • Bi-hourly rounding 10PM-6AM • Bed alarms at night (Zone 2) • Fall risk discussion in shift handoff • Documentation of safety assessment in EPIC EHR flowsheet with corresponding rounding times • Hester-Davis Fall Risk Assessment each shift for first 24 hours of admission • EPIC predictive analysis score review each shift • Call light within reach

Setting

Patients/Sample

Patients on the CVU and CVI were admitted directly from clinical departments, transferred from other affiliated hospitals, or transferred from other hospitals in the local area. Some patients were admitted directly from outpatient provider offices for evaluation and

treatment. CVU includes 12 beds, with a nurse:patient ratio of 1:4. CVI consists of 15 beds, with a nurse:patient ratio of 1:4 or 1:5.

Many patients admitted to these two units had cardiovascular-based primary diagnoses such as chronic heart failure (CHF), acute myocardial infarction (MI), non-ST elevation myocardial infarction (NSTEMI), ST-elevation myocardial infarction (STEMI), endocarditis, pericarditis, deep vein thrombosis (DVT), pulmonary embolism (PE), atrial fibrillation with or without rapid ventricular rate, hypertension, mitral/tricuspid/aortic regurgitation/stenosis, sick sinus syndrome, asymptomatic bradycardia, aortic dissections, and/or aortic aneurysms. Many patients had additional diagnoses that are non-cardiac related. Many patients on CVU had open heart surgery including coronary artery bypass grafting (CABG), cardiac valve replacement, sternal wound debridements, and/or aortic dissection/aneurysm repairs. Patients on CVU often had newly implanted devices that required nursing management, including chest tubes, external pacemakers, and indwelling urinary catheters. The patients on CVI often had vascular interventions (cardiac catheterizations with and without stent placement, ablations, pacemaker placements, and pacemaker lead extractions) or other cardiothoracic interventions such as a thoracentesis or intravenous (IV) diuresis for chronic heart failure. The average length of stay for patients on these two units is 4.67 to 4.95 days (American Hospital Directory., 2022).

As previously described, CVD is associated with a high risk for falling. Thus, the use of appropriate falls prevention interventions are directly beneficial to patients on cardiovascular units (Denfeld et al., 2022). Those with CVD also have cardiovascular-related risk factors for falling, including hypertension/hypotension, reduced cardiac output, heart failure, heart arrhythmias, and risk of syncope related to cardiac disease or abnormalities and medication side

effects. Patients could also have non-cardiac risks for falling, including visual impairment, gait disturbance, and/or cognitive impairment.

Unit staff include registered nurses and certified nursing assistants. The staff consists of 65 members, of which are full time, part time, PRN, and traveling nurses. The education level of staff members ranges from high school to doctorate. The number of years worked at this hospital ranges from less than one year to 26 years. The number of years worked on this unit ranges from less than one year to 10 years.

Context

Root Causes

There were several reasons that fall rate goals were not met on CVI and CVU. There were multiple changes in the falls prevention protocol at the facility including changes to the fall risk assessment instruments, rounding times, bed alarm protocol, and bed alarm zoning level use. Staff had been encouraged to increase in-patient education at shift change and increase in documentation of interventions used. The rapid sequence of these changes created some inconsistency in fall prevention implementation and documentation.

There were also changes to the physical locations of the units related to building renovation and construction. The recent unit relocation and changes to fall-risk assessment and intervention protocols likely caused some disruption in routines and practices. The unit relocation and remodeling also removed the use of patient specific bedside whiteboards, which seemingly led to decreased fall-related patient and family education at shift change.

Stakeholders

The primary stakeholders for this project were the CVU and CVI patients. Reducing the occurrence of fall rates will directly benefit patients with reduced potential for injury, fewer

complications, and shorter length of CVU, CVI, and/or overall hospital stay. This project aimed to improve quality of care safety measures on the unit. Improved quality and safety reduce complications and improve patient experiences. Other stakeholders included the unit staff (e.g., nurses, nurse aids) unit manager, unit director, decision makers in the hospital (Nursing Research Oversight Team (NROT), CNO), and patients' families. The unit staff and management were directly affected by the changes of practice.

Environmental Culture

Facilitators to the success of the project included support from unit management and unit team members, project committee chair and member. The stakeholders were a key support in facilitating achievement of the project.

Barriers to the project included staff with practice changes and recent unit relocation. Another barrier was the limited timeframe for implementation and evaluation of the project (three-months) which affected the project leader's ability to detect a change in fall rate reduction.

Intervention

Multiple fall prevention strategies were recently implemented; therefore, this project focused on education, compliance documentation, and analyzing fall rates as outcomes of these interventions. The evaluation was a collaborative effort of the project manager, CVU/CVI unit management and team.

The project implementation included the following:

(a) Unit-based falls educational read-and-sign to discuss fall rates, educate staff on the current interventions and documentation processes for falls risk patients, and discuss the goal for zero patient falls

(b) Auditing of fall risk scores and nursing compliance with fall protocols and documentation that was collected five days each week (Table 2).

(c) Fall rates assessment after three months of intervention.

Ethical Considerations

Permission

The proposed project was approved by the Hospital Nursing Research Oversight Team (NROT). The project was also approved by the University of Louisville Institutional Review Board (IRB).

Measures

The intervention took place over three months and included two four-week auditing periods (five days a week each) for compliance and documentation of fall risk interventions (Appendices A & B respectively). Patient identifying information (Appendix C), fall risk scores, and demographic data were audited through EPIC EHR data (Appendix D). Fall occurrence auditing for interventions in place at the time of the fall were audited through fall occurrence documentation in EPIC EHR (Appendix E). Unit staff demographic data including their role (Registered Nurse, Certified Nursing Assistant, or Physical Therapist), number of years worked in their role, number of years worked on CVI/CVU, education level, and position (travel nurse, full time, part time, PRN) was collected via an anonymous staff survey (Appendix F).

Data Analysis

Data analysis was completed using SPSS version 29. Demographic data were reported using descriptive analysis including measures of central tendency and frequencies. Pre- and post-education fall prevention interventions and documentation compliance (fall risk scores and interventions) and were reported as proportions using chi-squared analysis. Fall rates on the

targeted units were compared using pre- and post-data. This was measured by calculating patient falls per patient bed days before and after the intervention.

Results

Project Findings

Sample Description

The pre-intervention audit included 127 CVU and CVI patients from April 1, 2024 to April 26, 2022. The post-intervention period included 121 patients from May 20, 2024 to June 14, 2024. Demographic data including age, race, gender, primary diagnosis, and surgical procedure were collected using EPIC EHRs (Table 3).

Independent t-tests were conducted to compare pre- and post-intervention group mean ages. There was statistically no significant difference in mean age between the pre-intervention (71.57±11.34) and post-intervention (70.88±12.40) groups ($t(246)=.458$, $p=.324$).

In both sample groups, the majority of patients were Caucasian. The pre-intervention group had a higher percentage of men (59.8%) compared to the post-intervention (50.4%) group. The types of surgical procedures performed on each two groups during the implementation of this project were similar (Table 3).

Nursing Unit Staff Description

Of the 65 staff members on the unit, including RNs and CNAs, 29 filled out an anonymous demographic survey, including 19 RNs and 10 CNAs. Of these 65, 34 members completed both a mandatory manager administered falls prevention read-and-sign and an updated read-and-sign provided by the project leader. Staff had worked in their current role (RN or CNA) a mean of 6.9 ± 8.5 years, had worked in this hospital a mean of 4.7 ± 5.7 years, and had worked on their respective intervention units (CVI and CVU) a mean of 2.9 ± 2.5 years.

Table 3

Demographic Characteristics of the Pre- and Post-Intervention Groups

Characteristics	Pre-intervention (N=127)	Post-intervention (N=121)
Mean Age	71.57±11.34	70.88±12.40
Race		
Caucasian	120 (94.5%)	115 (95%)
African American	6 (4.7%)	4 (3.3%)
Pacific Islander	1 (.8%)	0 (0%)
Asian	0 (0%)	2 (1.7%)
Gender		
Male	76 (59.8%)	61 (50.4%)
Female	51 (40.2%)	60 (49.6%)
Primary Diagnosis		
CAD, ACS, STEMI, NSTMI	29 (22.8%)	21 (17.4%)
Dysrhythmia	20 (15.7%)	9 (7.4%)
Valves (aortic, mitral, tricuspid, endocarditis)	18 (14.2%)	14 (11.6%)
Angina	13 (10.2%)	19 (15.7%)
Heart failure, cardiomyopathy, pulmonary edema	14 (11%)	17 (14%)
Pulmonary	13 (10.2%)	16 (13.2%)
Other	20 (15.7%)	25 (20.7%)
Had a surgical procedure		
Yes	87 (68.5%)	74 (61.2%)
No	40 (31.5%)	47 (38.8%)
Type of Surgical Procedure		
Heart Catheterization	49 (38.6%)	31 (25.6%)
CABG	22 (17.3%)	15 (12.4%)
Sternotomy Valve Repair	16 (12.6%)	11 (9.1%)
TAVR	6 (4.7%)	6 (5%)
Aortic Aneurysm Repair	2 (1.6%)	3 (2.5%)
Sternal Wound Debridement	3 (2.4%)	1 (.8%)
Atrial appendage closure	5 (3.9%)	11 (9.1%)
MAZE procedure	1 (.8%)	1 (.8%)
Ablation	2 (1.6%)	1 (.8%)
Pacemaker Procedure	8 (6.3%)	10 (8.3%)
Other	14 (11%)	11 (9.1%)

Nursing Unit Staff Description

Of the 65 staff members on the unit, including RNs and CNAs, 29 filled out an

anonymous demographic survey, including 19 RNs and 10 CNAs. Of these 65, 34 members completed both a mandatory manager administered falls prevention read-and-sign and an updated read-and-sign provided by the project leader. Staff had worked in their current role (RN or CNA) a mean of 6.9 ± 8.5 years, had worked in this hospital a mean of 4.7 ± 5.7 years, and had worked on their respective intervention units (CVI and CVU) a mean of 2.9 ± 2.5 years.

Fall Prevention Bedside Interventions

To determine the significance of the read-and-sign completed by the unit staff, use of bedside fall prevention interventions were audited and are presented in Table 4. Using Chi square analysis, four of the eight variables demonstrated significant improvement following the educational interventions: wearing a yellow arm bracelet, bed in lowest position, siderails in upright position, and call light in place. The other variables, use of bed alarm, use of chair alarm, wearing yellow socks, and using an assistive device had no significant changes in rate of use following the educational intervention. The Chi square analyses are presented in Table 4.

In the pre-intervention group, 19 of 282 patients (6.7%) had a yellow falls bracelet compared to 53 of 219 patients (24.2%) in the post-intervention group. Chi squared analysis demonstrated a significant increase in yellow falls bracelet use (17.5%) (X^2 (1, N = 535) = 21.9, p<.001).

In the pre-intervention group, 138 of 282 patients (48.9%) had their bed or chair alarm on compared to 138 of 210 patients (65.7%) in the post-intervention group. Chi squared analysis demonstrated no significant increase in the use of the bed or chair alarms (X^2 (1, N = 450) = 2.85, p=.07).

In the pre-intervention group, 113 of 242 patients (46.7%) had a chair alarm in the chair and plugged in compared to 111 of 207 patients (53.6%) in the post-intervention group. Chi

squared analysis demonstrated no significant increase in the placement of the chair alarm (X^2 (1, N = 449) = 1.87, *p*=.14).

In the pre-intervention group, 240 of 282 patients (85.1%) had non-skid shoes or socks on compared to 222 of 253 patients (87.7%) in the post-intervention group. Chi squared analysis demonstrated no significant increase in the use of non-skid shoes or socks (X^2 (1, N = 535) = .58, *p*=.37).

In the pre-intervention group, 150 of 158 patients (94.9%) had an assistive device which was in reach of the patient compared to 129 of 145 patients (89.0%) in the post-intervention group. Chi squared analysis demonstrated no significant increase in assistive devices being within reach of the patients (X^2 (1, N = 303) = 2.92, *p*=.06).

In the pre-intervention group, 267 of 282 patients (94.7%) had their bed in the lowest setting compared to 250 of 252 patients (99.2%) in the post-intervention group. Chi squared analysis demonstrated a significant increase in beds being in the lowest setting (4.5%) (X^2 (1, N = 534) = 7.44, *p*=.003).

In the pre-intervention group, 273 of 282 patients (96.8%) had two bed siderails up compared to 252 of 252 patients (100%) in the post-intervention group. Chi squared analysis demonstrated a significant increase in the use of two side rails on the bed (3.2%) (X^2 (1, N = 534) = 6.37, *p*=.004).

Lastly, in the pre-intervention group, 193 of 198 patients (97.5%) had the call light within reach compared to 251 of 252 patients (99.6%) in the post-intervention group. Chi squared analysis demonstrated significant increase in call lights being within reach of the patient (2.1%) (X^2 (1, N = 450) = 2.37, *p*=.05).

Table 4

Chi Square Analysis of Falls Prevention Interventions Implementation

Group 1 (Pre-Intervention Group) and Group 2 (Post-Intervention Group)

Variable	N	Group	n	Y/N	Freq	%	Pearsons X2	df	*p*	Phi
Bracelet	535	1	282	Yes	19	6.7%	21.9	1	<.001***	-.208
				No	263	93.3%				
		2	253	Yes	53	20.9%				
				No	200	79.1%				
Alarms On/Off	450	1	240	Yes	138	57.5%	2.85	1	0.07	-.084
				No	102	42.5%				
		2	210	Yes	138	65.7%				
				No	72	34.3%				
Chair Alarm	449	1	242	Yes	113	46.7%	1.87	1	0.14	-.069
				No	129	53.3%				
		2	207	Yes	111	53.6%				
				No	96	46.4%				
Non-skid shoes/socks	535	1	282	Yes	240	85.1%	0.58	1	0.37	-.038
				No	42	14.9%				
		2	253	Yes	222	87.8%				
				No	31	12.3%				
Assistive Device within reach	303	1	158	Yes	150	95%	2.92	1	0.06	.11
				No	8	5.0%				
		2	145	Yes	129	89.0%				
				No	16	11.0%				
Bed Low	534	1	282	Yes	267	94.7%	7.44	1	.003**	-.129
				No	15	5.3%				
		2	252	Yes	250	99.2%				
				No	2	0.8%				
Side rails	534	1	282	Yes	273	96.8%	6.37	1	.004**	-.124
				No	9	3.2%				
		2	252	Yes	252	100%				
				No	0	0%				
Call light	450	1	198	Yes	193	97.5%	2.37	1	.05*	-.092
				No	5	2.5%				
		2	252	Yes	251	99.6%				
				No	1	0.4%				

Note: *$p \leq .05$
**$p < .01$
***$p < .001$

Nursing Documentation of Falls Prevention Interventions

To evaluate outcomes of the read-and-sign intervention, EPIC charting documentation of safety assessments were audited pre- and post-intervention for percentage of documentation completed over the previous 24-hour period and are presented in Table 5. As seen in Tables 5, the data percentages were collapsed into four categories based on natural breaks in the data.

The percentage of times safety rounding documentation in the past 24 hours was compared pre-and post-intervention and analyzed using crosstabulation tables and is presented in Table 5. The percentage of patients having 80-89% completion of safety rounding documentation improved post-intervention by 3.2%. The percentage of patients having 90-100% completion of safety rounding documentation improved post-intervention by 6.9%. The read-and-sign intervention was found to have no significance on the improvement of percentage of patients with safety rounding documentation complete.

The percentage of times alarm use documentation in the past 24 hours was compared pre-and post-intervention and analyzed using crosstabulation tables and is presented in Table 5. The percentage of patients having 80-89% completion of alarm use documentation improved post-intervention by 6.4%. The percentage of patients having 90-100% completion of alarm use documentation improved post-intervention by 5.5%. The read-and-sign intervention was found to have significance on the improvement of percentage of patients with alarm use documentation complete.

The percentage of times assist level documentation in the past 24 hours was compared pre-and post-intervention and analyzed using crosstabulation tables and is presented in Table 5. The percentage of patients having 80-89% completion of assist level documentation improved post-intervention by 4.5%. The percentage of patients having 90-100% completion of assist level

documentation improved post-intervention by 5.5%. The read-and-sign intervention was found to have significance on the improvement of percentage of patients with assist level documentation complete.

The percentage of times non-skid shoes/socks documentation in the past 24 hours was compared pre-and post-intervention and analyzed using crosstabulation tables and is presented in Table 5. The percentage of patients having 80-89% completion of non-skid shoes/socks documentation improved post-intervention by 8.5%. The percentage of patients having 90-100% completion of non-skid shoes/socks documentation improved post-intervention by 4.6%. The read-and-sign intervention was found to have significance on the improvement of percentage of patients with non-skid shoes/socks documentation complete.

Table 5

Descriptive frequency of Nursing Documentation Percentages

Group 1 (Pre-Intervention) and Group 2 (Post-Intervention)

Variable	N	Group	% documented	n	%
Percent of times safety rounding was documented in the past 24 hours	316	1	0-47	12	3.8%
			48-79	114	36.1%
			80-89	92	29.1%
			90-100	98	31.0%
	282	2	0-47	7	2.5%
			48-79	77	27.3%
			80-89	91	32.3%
			90-100	107	37.9%
Percent of times alarm use was documented in the past 24 hours	316	1	0-47	85	26.9%
			48-79	181	57.3%
			80-89	37	11.7%
			90-100	13	4.1%
	282	2	0-47	61	21.6%
			48-79	143	50.7%
			80-89	51	18.1%
			90-100	27	9.6%
Percent of times assist level was documented in the past 24 hours	316	1	0-47	67	21.2%
			48-79	193	61.1%
			80-89	43	13.6%
			90-100	13	4.1%
	282	2	0-47	43	15.2%
			48-79	161	57.1%
			80-89	51	18.1%
			90-100	27	9.6%
Percent of times use of non-skid shoes/socks was documented in the past 24 hours	316	1	0-47	68	21.5%
			48-79	198	62.7%
			80-89	29	9.2%
			90-100	21	6.6%
	282	2	0-47	56	19.9%
			48-79	139	49.3%
			80-89	50	17.7%
			90-100	37	13.1%

Lastly, to calculate effect of the read-and-sign intervention, pre- and post-intervention admission safety education documentation was audited and is presented in Table 6. In the pre-

intervention group, 266 of 316 patients (84%) had the admission safety education documentation completed and documented. Post-intervention, 261 of 282 patients (92.6%) had the admission safety education documentation completed and documented. Chi square analysis demonstrated significantly improved rates of admission safety education (X^2 (1, N = 535) = .002, *p*=.002).

Table 6

Safety Education Admission Documentation Crosstabulation

Variable	N	Group	n	Y/N	Freq	%	Pearsons X^2	*df*	*p*	*Phi*
Safety Education	535	1	316	Yes	266	84.2%	.002	1	.002**	-.129
				No	50	15.8%				
		2	282	Yes	261	92.6%				
				No	21	7.4%				

Reduction of Inpatient Falls

In the two months prior to the intervention, there were a total of three inpatient falls on the CVU and none on the CVI, one of which resulted in a major patient injury. None were assisted; only one was witnessed by a staff member. None of the patients had a high falls risk Hester Davis score; however, all three patients had a high fall risk according to the EPIC Predictive Analysis. There was variability in the other falls prevention interventions use: all three had non-skid shoes or socks on, only one has a bed alarm on, and none of the three were wearing a fall bracelet or had a gait belt in use.

In the two months following the intervention, there were no inpatient falls on the CVU and one on the CVI. The fall was unassisted and unwitnessed by a staff member. The patient did not score a high falls risk on the Hester Davis score; however, did score a high falls risk according to the EPIC Predictive Analysis. The patient had non-skid shoes or socks on, the bed alarm was not on, there was no falls bracelet or gait belt in use. Each of the pre- and post-

intervention falls involved the patient attempting to go to the bathroom. There was a combined total of 60% improvement in inpatient falls post-intervention.

Discussion

Summary

The purpose of this evidence-based project was to evaluate the effectiveness of education on nurses' implementation and documentation of falls preventions on the CVU and CVI.

This project was identified following a needs assessment on the CVU and CVI that identified an increased number of inpatient falls with newly implemented fall preventive interventions. Additionally, the unit manager identified a need for unit staff education on the fall prevention interventions and their proper documentation.

Interpretation

The unit staff falls prevention educational read-and-sign implemented in this project demonstrated several positive outcomes in alignment with the literature. As recommended in the literature, the falls prevention plan implemented on the project units combined two risk assessments with multiple prevention strategies (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021).

The project outcomes were similar to those reported in the literature. Following the intervention only one fall occurred on CVI compared to no falls on CVI prior. The CVU had no falls following the intervention compared to three falls on CVU prior. These results are similar to those previously reported (Bargmann & Brundrett., 2020; Dykes et al., 2010; Dykes et al., 2020; Strini et al., 2021).

Following the intervention, there was a significant improvement in a few fall prevention interventions including falls bracelet use, keeping the bed in the lowest position, and use of two

siderails. Post-intervention there was also a significant improvement in nursing staff EHR documentation of several interventions, including alarm use, level of assist, non-skid shoes/sock use, and admission safety education documentation. However, unlike the literature, there was so significant post-intervention improvement in a few fall prevention interventions including use of the bed alarm, placement of chair alarms, use of non-skid shoes/socks, keeping assistive devices in reach of patient, and keeping the call light within patient reach. There was also no significance post-intervention in the improvement of documentation of safety rounding assessments.

Limitations

Limitations to this project include several internal protocol and environmental factors, including the recent unit relocations, several recent changes to the falls prevention protocol including the two new fall risk assessment scores, and the limited timeframe of this project. Based on need, the management team implemented a separate read-and-sign related to falls prevention during the pre-intervention period immediately following a patient fall. This likely contributed to a decrease in participation of unit staff with the interventional read-and-sign, which may have altered the outcomes of this project. Similarly, the implementation of two falls-related read-and-signs (management-directed and project-associated) may have had a positive impact on the project outcomes.

Conclusion

In this project, the implementation of a falls prevention educational read-and-sign was followed by several improvements in the use of fall prevention interventions and documentation. The goal of the project was to have 90% compliance of use of falls interventions and documentation, although this was not achieved, there were several interventions and documentation that showed significant improvement.

This project reinforces previous literature reports that the use of multiple fall preventive interventions is beneficial in the reduction of inpatient falls. Continued unit education regarding fall prevention interventions and documentation requirements is crucial to further improve the use and documentation of these interventions. The nursing unit manager desires to continue staff education to further improve fall rates on these units.

The outcomes of this project will be presented to the unit management team and the hospital nursing research oversight team and safety and mobility committee. The findings of this project will be disseminated at the University of Louisville DNP student poster session in the summer of 2024.

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Appendix A

Intervention Auditing Form										
Room #	Date	Time	Project ID	Bed Alarm ON	Chair Alarm ON	Falls Bracelet	Yellow Socks	Gait Belt	Assistive Device w/i	Call light w/i reach
CVU										
Room #1										
Room #2										
Room #3										
Room #4										
Room #5										
Room #6										
Room #7										
Room #8										
Room #9										
Room #10										
Room #11										
Room #12										
CVI										
Room #1										
Room #2										
Room #3										
Room #4										
Room #5										
Room #6										
Room #7										
Room #8										
Room #9										
Room #10										
Room #11										
Room #12										
Room #13										
Room #14										
Room #15										

Appendix B

RN Falls Documentation Check (Previous 24-hours)													
Room #	Date	Project ID	Hourly Safety Rounding Documented	Alarm(s) ON/OFF	Assist level	Gait belt use	Non-slip socks	Falls bracelet	Patient Falls education documented (once)	Hester Davis Score at Admission	Hester Davis score at 12-hours	Hester Davis Score at 24-hours	Most recent Epic Predictive Analysis Score
CVU													
Room #1													
Room #2													
Room #3													
Room #4													
Room #5													
Room #6													
Room #7													
Room #8													
Room #9													
Room #10													
Room #11													
Room #12													

RN Falls Documentation Check (Previous 24-hours)													
Room #	Date	Project ID	Hourly Safety Rounding Documented	Alarm(s) ON/OFF	Assist level	Gait belt use	Non-slip socks	Falls bracelet	Patient Falls education documented (once)	Hester Davis Score at Admission	Hester Davis score at 12-hours	Hester Davis Score at 24-hours	Most recent Epic Predictive Analysis Score
CVI													
Room #1													
Room #2													
Room #3													
Room #4													
Room #5													
Room #6													
Room #7													
Room #8													
Room #9													
Room #10													
Room #11													
Room #12													
Room #13													
Room #14													
Room #15													

Appendix C

Project ID	Patient Name	MRN #
#101		
#102		
#103		
#104		
#105		
#106		
#107		
#108		
#109		
#110		
#111		
#112		
#113		
#114		
#115		
#116		
#117		
#118		
#119		
#120		
#121		
#122		
#123		
#124		
#125		
#126		
#127		
#128		
#129		
#130		
#131		
#132		
#133		
#134		
#135		

Appendix D

Patient Project ID	Admission Date	Diagnosis	Surgical Procedure	Age	Race	Gender
Patient #101						
Patient #102						
Patient #103						
Patient #104						
Patient #105						
Patient #106						
Patient #107						
Patient #108						
Patient #109						
Patient #110						
Patient #111						
Patient #112						
Patient #113						
Patient #114						
Patient #115						
Patient #116						
Patient #117						
Patient #118						
Patient #119						
Patient #120						
Patient #121						
Patient #122						
Patient #123						
Patient #124						
Patient #125						
Patient #126						
Patient #127						
Patient #128						
Patient #129						
Patient #130						
Patient #131						
Patient #132						

Appendix E

CVU Fall Occurrence — Month:

Patient MRN#	Date	Time	Falls Occurrence Explanation	Witnessed Fall	Unwitnessed Fall	Assisted Fall	Hester Falls Score	Predictive Falls Score	Post fall documented in Epic	Bed alarm ON	Chair alarm ON	Yellow socks ON	Falls bracelet ON	Gait Belt in use
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE

CVI Fall Occurrence — Month:

Patient MRN#	Date	Time	Falls Occurrence Explanation	Witnessed Fall	Unwitnessed Fall	Assisted Fall	Hester Falls Score	Predictive Falls Score	Post fall documented in Epic	Bed alarm ON	Chair alarm ON	Yellow socks ON	Falls bracelet ON	Gait Belt in use
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE
				YES/NO	YES/NO	YES/NO			YES/NO	YES/NO	YES/NO	YES/NO	YES/NO	YES/NO/NOT APPLICABLE

Appendix F

CVU/CVI Staff Demographic Sheet

1. What is your role on this unit (please circle one):

   Registered Nurse Nursing Assistant Physical Therapist

2. How many years have you been in this role? _____

3. How many years have you worked at this hospital? _____

4. How many years have you worked on this unit? _____

5. What is your highest educational level? _____

6. What is your position on this unit (please circle one):

   Full-time Part-time PRN