Use of a comprehensive postfall assessment tool to prevent falls

USE OF A POST FALL ASSESSMENT TOOL TO PREVENT FALLS

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ABSTRACT

Nursing research in fall prevention should not only identify etiologic risk factors to fall, but seek to identify underlying causes, whenever possible. Few studies have investigated the use of a comprehensive post fall assessment tool (PFAT) by nurses as an intervention for the prevention of recurrent falls, especially one that prompts nurses to consider all potential causes through a categorization scheme. This study tested use of a comprehensive PFAT as an intervention, prospectively, facility-wide for 1 year by RNs using a pre-post-test design. A 29.4% reduction in the fall rate ($z=3.89$; $p<0.001$), 27.6% decline in total falls experienced by all fallers ($p<0.001$) and a 34.0% decline for recurrent fallers ($p = 0.025$) from pre-intervention to intervention year was observed when trained nurses categorized falls according to perceived causes. These declines are likely due to consistent and rigorous use by trained nursing staff, prompting their critical examination of each fall.

Key words: fall prevention, elderly, long-term care, post fall assessment

Fall prevention among older adults is a public health priority (Rose, Alkema, Choi, Nishita, & Pynoos, 2007) given the magnitude of fall-related injury mortality and disability due to hip fractures (van Schoor, Deville, Bouter, & Lips, 2002; Rubenstein et al., 1988; Becker et al., 2003; Cali & Kiel, 1995) or traumatic brain injury (Adekoya, Thurman, White & Webb, 2002; National Center for Injury Prevention and Control [NCIPC], 2008b) and their degree of preventability. By far, the highest reported incidence across patient care settings is in nursing homes [NHs], where an estimated 3 out of 4 of the 1.63 million residents fall each year (NCIPC, 2008a; Rubenstein, Josephson, & Robbins, 1994). Many falls are recurrent. To prevent falls, standards of practice for healthcare professionals, particularly registered nurses, call for continual assessment and re-assessment of older adult residents utilizing evidence-based interventions (Gray-Miceli, 2008; Gray-Miceli & Capezuti, 2005) and 'best practice guidelines' (Registered Nurses Association of Ontario, 2005; University of Iowa Gerontological Nursing Interventions Research Center, 2004).

Although evidence to reduce falls in older adults exists, either by improving balance (Barnett, Smith, Lord, Williams, & Baummand, 2003) , physical capacity (Toulotte, Fabre, Dangremont, Lensel, & Thévenon, 2003), strength (Close et al., 1999), environmental risk factor screening (Gillespie et al., 2003), or through multidisciplinary, multifactor assessment and management of health (Tinetti et al., 1994), the bulk of fall prevention interventions are directed to community dwelling populations. Experts note less evidence of effective fall prevention interventions for care of older adults in NHs (Chang et al., 2004); where up to 60 percent of older adults fall repeatedly (NCIPC, 2008a). Here it is vital to develop and test interventions to reduce recurrent falls.

Fall assessment to prevent subsequent falls

Interventions for the secondary prevention of falls include risk factor screening with modification plus a search for treatable fall causes, whenever possible through a comprehensive post fall assessment (American Geriatrics Society, British Geriatrics Society, & American Academy of Orthopedic Surgeons, 2001; American Medical Directors Association, 1998; Moreland et al., 2003; Vu, Weintraub, & Rubenstein, 2005). Without assessment and treatment of underlying conditions found on a comprehensive post fall assessment and environmental modification, older adults cannot benefit from targeted fall prevention interventions (Tinetti, McAvay, & Claus, 1996; Rubenstein Robbins, Josephson, Schulman, & Osterweil, 1990).

An extensive literature search found no evidence testing the effectiveness of post-fall assessment tools [PFAT] as an intervention or improved method to prevent additional falls, other than one report of a quality improvement fall management program (Taylor et al., 2007). A practice dilemma is created as registered nurse [RN] professionals are left with a limited set of evidenced-based interventions and few empirically tested PFATs to use as demonstrated in our earlier statewide survey of NHs (Gray-Miceli, Strumpf, Reinhard, Zanna, & Fritz, 2004).

We have developed and validated a comprehensive PFAT, i.e., The Post Fall Index [PFI], based on expert opinion from members of the American Geriatrics Society/British Geriatrics Society/American Academy of Orthopedic Surgeons Task Force for fall prevention. The PFI possesses good inter-rater reliability (Gray-Miceli, Strumpf, Johnson, Dragascu, & Ratcliffe, 2006), and is capable of discerning fall sub-types such as a fall due to environmental causes or those due to medical conditions

among various levels of judges [a RN, an advance-practice nurse and a physician; Gray-Miceli, Strumpf, & Ratcliffe, 2008]. An examination of clinical outcomes is warranted as the next step: "can falls be reduced when RNs use the PFI as the basis for determining post-fall plans of care in order to prevent recurrent falls?"

Purpose

The purpose of this study was to determine: (1) whether application of the comprehensive PFI can reduce the incidence of patient falls, facility-wide in a continuing care retirement community and (2) to determine the perceptions of feasibility by licensed nurses. The biomedical model of care espoused by the American Geriatrics Society/British Geriatrics Society/American Academy of Orthopedic Surgeons Task Force on fall prevention contributes to the framework of the PFI. The design of the study centers on the conceptual framework of Mitchell's Quality Health Outcomes Model (Mitchell, Ferketich, & Jennings 1998). Use of this model has been helpful in the analysis of our outcome variable (reduced falls and nurse feasibility) on many of the important factors operating in a healthcare organizational setting (i.e. structural) which can influence the adoption of –and outcomes from- an intervention such as the PFI.

Methods

Setting

The continuing care retirement community provides 110 beds of assisted living and skilled nursing on 4 units and nearly 450 independent residential dwelling of varying designs over 250 acres of land located in the NE United States. Nursing care is provided by nurses aides, licensed practical nurses and professional RNs. Assisted living care is predominantly provided by licensed practical nurses and nurses aides with RN

supervision/ assessment for residents on an as needed basis. Skilled nursing care is provided by professional RNs with delegation to staff as needed. Licensed staff included RNs and licensed practical nurses.

Sample

Adults, over age 65, comprised the primary sample; licensed nursing staff comprised the secondary sample. The primary sample is obtained from 2-assisted living and 2 skilled nursing units of the continuing care retirement community.

Design and Data Sources

This is an interventional study with pretest-posttest design of facility-level fall data gathered on all residents who fell over a 3 year period: the *pre-intervention* (June 1, 2004-May 31, 2005), *intervention* (June 1, 2005-May 31, 2006), and *post-intervention* (June 1, 2006-May 31, 2007) years. *Pre-and post-intervention year* data was collected year-end by a trained research assistant by retrospective review of incident reports and medical records. *Intervention year* data was collected prospectively post-fall in the assisted living and skilled nursing units by trained nursing staff.

Procedures

Following Institutional Review Board approval for Human Subjects Protection administrative approval from the continuing care retirement community was granted. For all residents on assisted living or skilled nursing who sustained a fall, the primary nurse gathered informed consent. Residents were told by the RN that customary post fall information was being collected for use in research and that the information was more detailed and focused than that gathered by other forms traditionally used, like an incident

report form. Cognitively intact individuals, with Folstein Mini-Mental State Examinaiton Scores greater than 24 were asked if they objected to participation. Individual residents who did not object were included. For cognitively impaired residents, family caregivers were notified by letter about the fall policy change using the PFI for research purposes. During a 4 month start-up phase (January-May, 2005) prior to the start of the intervention year we replaced current fall analysis tools with the 30-item PFI; trained all nursing staff on use of the PFI; assisted nursing staff to complete a human subject protection certification; notified family members of the change in procedure; and administered satisfaction surveys to nursing staff.

Intervention Year: Procedures for use of the Post-Fall Index

Use of the PFI facility-wide began on June 1, 2005 and concluded on May 31, 2006. Comprehensive data on fallers who had previously enrolled and agreed to receive the PFI were collected by trained nurses using the PFI. Information gathered from the PFI was incorporated into the nursing plans of care. Satisfaction surveys and focus group interviews were conducted with nurses at the end of the year to ascertain acceptability of the PFI compared to previously used post fall tools and feasibility to use the PFI in practice.

Post-Intervention Year: Procedures for using the Post Fall Index

After the study concluded nursing administration independently decided to continue using the PFI for another 365 days facility-wide; but the PFI was not strictly enforced or monitored, and newly hired nursing staff received no formal training.

Measures

Pre-and Post-Intervention Years: Procedures for Retrospective Facility-wide Fall and Fall-Injury Ascertainment

Fall Ascertainment through Incident Report (IR) Analysis

Methods employed to ensure accuracy in fall tabulation included: 1) research assistants hand abstracted facility level fall data from incident reports, retrospectively for the pre- and post- intervention years; and 2) all fall incident reports were verified through the unit manager's monthly fall summary sheet.

Fall-Injury Ascertainment

Physical injuries abstracted from incident reports were tabulated by their exact description in words used by the nurse and their location on the body, i.e. head or leg. For example: 1) hitting their head; 2) presence of a head hematoma; 3) presence of skin redness, laceration or bleeding, 4) swelling of the arm, hand, leg, ankle, foot or 5) possible fracture.

Occupancy Rate Determination

Daily census was tabulated by administrative personnel and verified electronically for the total number of beds occupied on June 1, 2005, 2006 and –2007. Occupancy rates were computed as the percentage of occupied beds divided by the total number of available beds.

Fall Rate Determination

Fall rates were calculated according to the number of bed days and expressed as fall rates/1,000 bed days.

Census Determination

The census was captured electronically for June 1, 2005, 2006 and 2007. We also present the number of new admissions for the pre-intervention year, the intervention year and the post-intervention year to the assisted living or skilled nursing units.

Nursing and Medical Staffing

Employment and termination records for all personnel employed during the three consecutive phases of the study were analyzed retrospectively to determine staffing changes. The overall staffing for the skilled nursing and assisted living healthcare units for each of time period was reported by the Director of Human Resources and includes: direct care providers (nurses aides), care companions (helpers, non-nurses aides) staff nurses, unit managers and administrative director of nurses, medical staff, and nurse practitioners.

Determination of number of hours/patient days for Skilled Nursing

The number of hours per patient per day for all levels of nursing care was calculated for June 1, 2004, 2005 and 2006 for the skilled nursing units. The ratio of hours per patient per day determined the average acuity of nursing care required.

Determination of Facility Level Demographic Variables of Participants

The primary participants' age, race, marital status, gender, and date of death were verified by the Director of Medical Records.

Post-Fall Index [PFI] Intervention

Nurses utilized the 30-item PFI as an intervention following a resident fall to gather a comprehensive assessment. The PFI assisted RNs to gather a thorough fall-focused history and physical assessment including analysis of function, past medical

history, medication use, risks to fall, activity level, environmental circumstances, as well as nurses and resident perception of the fall, and then prompts the RN to consider the fall according to various contributing sub-types using a forced-choice array of possible explanations (Gray-Miceli et al., 2006). RNs are prompted to categorize the fall as either due to: 1) poor safety awareness; 2) chronic medical conditions; 3) misjudgment; 4) environmental; 5) behavioral; 6) acute medical; 7) medication-related; or 8) can not be determined ["unknown"]. Since falls are multi-factorial in etiology among older adults, by including this broad categorization scheme of up to 8 possible explanations for a fall, it allows the RN to identify more than one fall cause per person and/or to render an undecided "can not be determined-unknown" cause for each fall.

RNs used the assessment data and identified fall sub-types or causes to guide subsequent plans of nursing care and team discussions. The PFI guides the RNs decision-making, but does not suggest interventions, which are individualized to each resident. For example, relying on their comprehensive post fall assessment and their working knowledge of the patient, RNs were instructed to consider all factors in making a determination as to what they suspected caused the fall. Based on this critical analysis, nurses developed individualized plans of care. If the fall was perceived due to the environment, RNs developed interventions accordingly. We made it a point to assist only in their critical analysis of the likely all cause and not in determination of an interventions to select. The availability of interventions is specific to the person, type of fall, unit as well as resources on the unit.

Many interrelated processes at the patient, unit and systems level influence fall prevention in NHs. Using Mitchell's Quality Health Outcomes Model helped us

conceptualize how these relevant system level factors assist in determining the successfulness of administration of an assessment tool such as the PFI. Not only is knowledge of 'how to' administer the PFI important (which we provided through training), but having adequate time to perform the comprehensive assessment, amidst adequate skilled nursing staffing.

RN Pre-and Post-Satisfaction Questionnaire

All nursing staff completed a 12-item satisfaction survey to ascertain their opinion about the post-fall assessment process. In the post-intervention year, licensed nursing staff participated in group interviews, led by the PI to learn about their likes/dislikes of the PFI and recommendations. Responses were summarized by the PI according to likes, dislikes and recommendations. Data were verified with staff RNs.

Analysis

Fall rates were calculated and compared for each intervention period using proportion tests. At the individual level, Poisson regression was used to test for differences in the total number of falls per person between periods for all subjects, and in the subset of recurrent fallers. Subjects with more than one fall in their intervention period were classified as a recurrent faller. At the start of each intervention period, the number of falls was set to zero for each subject, regardless of the number of falls in the previous period. Being reset to zero ensured consistency in the recurrent faller definition from one period to the next. Subjects were also classified according to unit or place of fall occurrence (i.e. assisted living or skilled nursing for the 3 time periods); residents from independent housing experiencing a fall were omitted. Differences in baseline

demographics between intervention periods were assessed using ANOVA or Fisher's exact tests, as appropriate. All analyses were conducted in 2008 using SAS 9.1.

Results

In the pre-intervention year, 89 fallers out of 117 residents (76 percent; 54 assisted living and 63 skilled nursing) experienced 286 falls, of which 50 fallers (56.2%) fell more than once (see Table 1). During the intervention year, 77 fallers out of 120 residents (64 percent; 58 assisted living and 62 skilled nursing) experienced 207 falls, of which 44 fallers (57.1%) were recurrent. In the post-intervention year, 99 older adults out of 110 residents (90 percent; 52 assisted living and 58 skilled nursing) fell 307 times, of which, 59.6% were recurrent. A statistically significant decline from pre-intervention to intervention year was observed among number of fallers ($p<.001$).

Across all three groups, most fallers were female, ranging from 82 to 78 percent of the sample, and nearly all were Caucasian.. Most fallers were widowed, (55 to 61 percent) and nearly one-fourth were married. The mean age ranged from 88.9 to 89.3 with no statistical differences in age at the start of a period ($F=0.08$, $df=2$, $p=0.920$) or gender mix ($x^2=0.75$, $df=2$, $p=0.687$) across the three periods in time (see Table 1).

During the pre-intervention period, the fall rate was 6.70/1,000 bed days, dropping to 4.73 during the intervention year and then rising to 7.65 falls/1,000 bed days during the post-intervention year . There was a 29.4% reduction in the fall rate during the intervention year as compared to the pre-intervention year ($z=3.89$, $p<0.001$). Correspondingly, the total number of falls experienced during the intervention year was 27.6% lower than the pre-intervention year ($p<0.001$).

The percentage of recurrent fallers during the 3 periods of time showed no statistical differences between periods (x^2=0.24, df=2; p=0.887); however, during the intervention year recurrent fallers experienced 25% fewer falls, than recurrent fallers in the pre-intervention period (p=0.025). The median number of falls per recurrent faller dropped to 3 during the intervention year.

Fall Sub-types derived from the PFI

RNs categorized falls according to 9 major sub-types (see Table 2). For example, poor safety awareness accounted for 75% (n=145) of causes followed by chronic medical accounting for 64% (n=124) and misjudgment accounting for 49% (n=96). For each of these fall sub-type categories, tailored interventions were designed. Overall, at least 50 percent of all fall sub-types identified received a tailored intervention by the RN.

Injuries

Thirty-eight percent of falls in the intervention year caused physical injury (n=79; Table 1). There were 30 incidences of head trauma representing about 39 percent of the sample (n=77 who fell); 9 individuals were transferred to the emergency department and six died within one week of their last fall.

Organizational level factors

Adherence to the Intervention

Nursing staff used the PFI on all older adults with 100 percent compliance. No resident refused participation. Staff RNs noted by hand the time in minutes spent to complete the tool. The administrative nursing staff voted to use the PFI for one additional year even after the study officially concluded on May 31, 2006.

Nursing and Medical Staffing

The continuing care retirement community employed a total of 214 healthcare staff in the pre-intervention year, 208 in the intervention year and 214 staff in the post-intervention year. Employment records indicated consistent staffing across all three groups in terms of nursing administration (including the Director of Nurses and unit managers) and the medical staff (Medical Director and Advance Practice Nurses; see Table 3).. Terminations and replacements of nursing staff mainly occurred in the post-intervention year, with a total of 4 licensed staff replaced (2 licensed practical nurses and 2 registered nurses) representing a 57% change in staff.

Census and Number of New Admissions for Pre-Intervention-Post-Intervention Years

The total census for pre-intervention year on June 1, 2005 was 55, for the intervention year, on June 1, 2006 it was 52, and for the post-intervention year, it was 51 . There were 251 residents newly admitted in the pre-intervention year to skilled nursing and 22 to assisted living; 246 newly admitted during the intervention year to skilled nursing and 20 residents to assisted living; and 279 newly admitted to skilled nursing and 24 to assisted living in the post-intervention years (see Table 3).

Hours/Patient Days for Skilled Nursing

The total number of hours per patient days for skilled nursing care ranged from 4.04 to 4.28, with no overt differences observed across the three years (see Table 3). Of these hours devoted to patient care, at least 2 hours per patient day was provided by unlicensed nursing staff (nurses assistants) with remaining hours devoted to licensed care by RNs or licensed practical nurses. The number of hours for licensed care was 1.87, 1.98 and 2.01 among the three groups respectively.

Occupational Therapy Consultation

Occupational therapy consultations were performed primarily for residents in independent living compared to resident receiving assisted or skilled nursing care. In all, 103 consults were generated across the three groups residing in independent living versus a total of 16 consults for residents in this study.

Focus Group Interview with Nursing Staff

Nurses who participated in the post-survey reported overall benefit to their plans of care, but dislike of the length of the PFI, averaging 25 minutes to complete.

Discussion

Although use of the PFI as a nursing intervention reduced the total number of falls and fall rate by 29.4% between the pre-and intervention years and recurrent fallers experienced 25% fewer falls than recurrent fallers ($p=0.025$) these results are interpreted with caution due to the main methodological flaws- lack of a pre-intervention control group receiving the PFI intervention and inability to adjust for potential differences in individual fall risk due to a lack of data in the pre-intervention period. We circumvented the lack of a control group by instituting a pre-post test design that accounted for patient level falls and other processes influencing falls in nursing homes at the system level such as census, fall rate per 1,000 bed days, total number of healthcare staff. Given the reduction in fall rate during the intervention year, we attribute 3 major reasons for these findings.

First, trained nursing staff used the PFI correctly and continuously during the intervention year. When the PFI was used by untrained licensed staff, and less rigorously, [during the post-intervention period] a substantial rise in the number of falls

occurred. The combined influence of number and skill of professional nursing staff, consistent patterns in RN staffing for skilled care and similar rates of patient census contributed to the decline in fall rates. Nearly 57% of licensed staff were never trained to use the PFI, but were expected to use it in the post-intervention year.

Second, nurses utilizing the PFI were actively involved in directing plans of care and selecting appropriate interventions according to their individualized assessment and their perception of the underlying fall cause. Nurses categorize falls to be due to various sub-types or causes, and developed interventions accordingly. Third, because the PFI is a comprehensive assessment tool, we postulate that its use re-framed the nurse's analysis of the fall occurrence. Content of the PFI guides the nurse to critically analyze all of the existing multifactorial underlying causes and risks relative to each falling person and their fall circumstance simultaneously, so that appropriate interventions can be tailored to underlying causes-something, which cannot be generated from incident reports alone, or risk factor identification scales. The added value of embedding a fall risk identification scale (e.g., standard practice) within a comprehensive post-fall framework is that fall interventions can be appropriately determined when all salient factors are considered together-risks to fall- as well as identified signs and symptoms associated with falls. Further duplicity of forms is reduced while staff convenience can be increased.

Providing nursing staff with an evidenced-based comprehensive post fall assessment tool allows healthcare professionals to think about all potential underlying 'root' causes (Wald & Shojania, 2001) of a fall and facilitates clinical-decision-making. During times when NHs have limited professional staff and limited access to geriatric

experts, an evidenced-based comprehensive post fall assessment tool based on national clinical practice recommendations adds value to the nursing assessment.

Furthermore, findings from this research conceptually fit, in part, to the current movement toward an "all encompassing classification scheme" that categorizes falls as "accidental", "unanticipated physiological falls" or "anticipated physiological falls" (Morse, 2008). According to Morse's classification, accidental falls occur because of environmental hazards or equipment failure. Unanticipated physiological falls occur among patients without identified risks, including such sudden events like fainting or seizure activity. Anticipated physiological falls occur among patients with know risk factors related to underlying medical conditions. Getting to the specific nomenclature of the type of fall, which occurred, is very important in the overall fall management, thereby streamlining interventions and linking appropriate interventions to likely causes. Using Morse's classification scheme, we can clearly identify 3 of our own categories of causes to fall (environmental, acute medical and chronic medical) to have similar defining elements. We could re-classify the environmental categorization of causes to fall as "accidental", acute medical illness as "unanticipated physiological falls", and chronic medical illness as "anticipated physiological falls". However, the remaining categories, medication, behavioral, poor safety awareness and misjudgment during transfer do not readily fit into Morse's classification scheme and, in essence, would require additional discernment and clinical decision making by the RN at the time of the fall. Furthermore, in geriatric clinical practice settings, falls due to medications; behavior, poor safety awareness and/or episodes of misjudgment may occur from isolated acute events, chronic events, or a combination of both. We further note, misjudgment during transferring, for

instance, is an accident waiting to happen [so to speak], and it's likely to reoccur unless the underlying cause is identified and treated. The term "accidental fall", on the other hand as used in Morse's classification scheme, refers to a one-time occurrence, which will not reoccur. Because falls among older adults in NHs tend to be multifactorial in etiology, use of Morse's classification scheme in this setting is limited. For these reasons we believe the 8-item classification scheme embedded in the PFI is more representative of the patient demography in the long-term care setting and the nursing observation of the older adult patient at the time of the fall..

In addition, staff's dissatisfaction with the length of the tool, despite its success, warrants further research testing with a shorted, perhaps electronic version. Overall, use of a comprehensive post fall assessment tool may be a worthwhile public health intervention as it adheres to the most important standards for falls and mobility problems in vulnerable elders recognized by experts and professional societies.

There were six limitations of this study. First, a detailed foot evaluation and treatment for all of the residents of the continuing care retirement community [which included independent living] was initiated by the occupational therapy department during the intervention year. We note 12.9 percent (n=8) of skilled nursing or assisted living residents [those in the study] to receive an occupational therapy evaluation/interventions (see Table 2).

Secondly, the sample was nearly all Caucasian, making generalization to other ethnic groups unknown. Third, the study was conducted in one continuing care retirement community limiting generalizability to other populations. Fourth, the study was constructed assuming documented fall events were first time occurrences, not only in the

facility, but also in the life of the older adult. Fifth, fall risk assessment was not a routine practice adopted by the facility during the pre-intervention year (2004) for assisted living residents who fell. Therefore there is no gauge of whether or not the residents in the intervention year had a lower fall risk level than the pre-intervention year, which could account for the reduced fall rates. Sixth, only trained professional registered nurses could make an appropriate assessment after using the PFI, thus limiting its use by licensed practical nurses.

In conclusion, the PFI, an evidenced-based comprehensive PFAT appears to be an effective intervention for reducing falls in older adults residing in a continuing care retirement community. Declines in fall rates are most likely due to a consistent and rigorous use of the PFI, which empowered the nursing staff to critically examine each fall incident, circumstance, possible root causes and to design appropriate interventions and plans of care by identifying 8 major categories of causes to fall. Our categorization scheme is a step toward minimizing unnecessary intervention. Findings from this study warrant scientific study of the use of the PFI by registered nurses as a fall prevention intervention in multi-site NHs using a randomized control design.

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TABLES

Table 1. Fall frequency and fall- related injury among fallers

Variable	Pre-Intervention 2004-2005	Intervention 2005-2006	Post-Intervention 2006-2007	p-value
Falls:				
Number of Falls	286	207	307	<.001
Number of Recurrent Falls; n(%)	197 (68.9)	130 (62.8)	208 (67.7)	0.337
Number Recurrent Fallers; n(%)	50 (56.2)	44 (57.1)	59 (59.6)	0.887
Number Falls / Recurrent Faller; median (range)	4 (2-21)	3 (2-11)	4 (2-17)	0.025* 0.166
Bed Days	42,705	43,800	40,150	
Fall rate/1000 bed days	6.70	4.73	7.65	<.001
95% CI for Fall rate	5.95-7.51	4.11-5.40	6.83-8.54	
Injuries:				
Physical Injury; n(%)	66 (23.0)	79 (38.1)	122 (39.7)	0.339
Hit Head	32 (11.1)	30 (14.4)	35 (11.4)	0.260
Emergency Department Visit	5 (1.7)	9 (4.3)	9 (2.9)	0.553
Death in 1 week of fall	9 (3.1)	6 (2.8)	9 (2.9)	0.988

* Intervention year versus: pre-intervention year (p=0.025); post-intervention year (0.166), using a Poisson regression.

Table 2: Interventions According to RNs Categorization of Causes to Fall

Fall Type:	N (%) of Falls	N (%) Of Fall Type Receiving Intervention
Chronic Medical	124 (64.2)	75 (60.5)
Acute Medical	48 (24.9)	32 (66.7)
Medication	30 (15.5)	20 (66.7)
Environmental	68 (35.2)	42 (61.8)
Behavioral	62 (32.1)	32 (51.6)
Poor Safety Awareness	145 (75.1)	88 (60.7)
Misjudgment during Transfer	96 (49.7)	60 (62.5)
Unknown	13 (6.7)	7 (53.8)

Table 3. Facility level variables observed during the study

Variable	Pre-Intervention	Intervention	Post-Intervention
Staffing:			
Total number of healthcare staff for skilled nursing and assisted living units	214	208	214
Number medical staff new hires	0	0	0
Number nursing staff new hires			
Advanced practice RNs	0	0	0
RNs/LPN	0	2	4
Unlicensed nurses	7	18	21
Number nursing terminations			
RNs/LPN	0	2	2
Unlicensed nurses	6	9	9
Net change nursing staff	1	9	14
Hours/patient days for Skilled Nursing:			
Total Census	55	52	51
Number of new admissions: skilled nursing unit assisted living unit	251 22	246 20	279 24
Total hrs/patient days	4.04	4.12	4.28
Licensed care (RN/LPN)	1.87	1.98	2.01
Unlicensed care (NA)	2.17	2.16	2.27
Number OT consults	45	62	12

Residents in AL/SN	3 (6.6)	8 (12.9)	5 (41.6)
Residents in Independent Living	42 (93.3)	54 (87)	7 (58.3)