Falls in Acute Care: An Academic Medical Center Six-year Review

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Objective: To describe the overall rate of falls during a six-year period in an academic acute care hospital, explore differences in fall rates and characteristics by type of patient population, and explore changes in rate of falls over time in relation to implementation of a hospital fall prevention program.

Methods: The incidence of falls in hospitalized patients from 1997 to 2002 was examined retrospectively in a 471 bed academic medical center using occurrence screen data. Fall rates were examined overall and by time, type of population (medical, surgical, neuroscience, rehabilitation and psychiatry) and age groups.

Results: In this six-year period, there were 1,932 falls in 1,562 patients for a fall rate (number of falls per 1,000 inpatient days) of 2.63. Rates varied by patient population with rehabilitation patients having the highest fall rate and pediatric patients having the lowest rate.

Overall there was a significant reduction in fall rates of −3.69% average change per year ($P = 0.006$), however the rate of change varied significantly by population (−0.05 to –12.2%).

Conclusions: Caution must be used when comparing overall hospital fall rates. Fall rates vary significantly by patient population, therefore an overall hospital fall rate is dependent on the patient mix of the hospital. Hospitals with higher percentages of patients with medical, neuroscience, psychiatric or rehabilitation disorders are likely to have higher fall rates compared with hospitals with large surgical, critical care, pediatric and obstetric populations. In this study, medical, neuroscience, psychiatric and rehabilitation account for 40.9% of the patient days. The value of looking at falls by patient population and age groups over time is useful in targeting programmatic changes to specific patient populations.

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Falling is a serious problem in the hospital setting. Simply being hospitalized places most people at a higher risk for falls than they would be at home. An unfamiliar environment, acute illness, surgery, bed rest, altered elimination patterns from treatments and medications, and the placement of various tubes and catheters are some of the common challenges patients face when ambulating in a hospital. Whereas most falls do not result in permanent or serious harm, the incursion of serious injury, which occurs in up to 10% of in-hospital falls,[1] is devastating to patients, families and care providers, and creates serious liability risks for hospitals. Additionally, any fall may trigger a fear of falling that results in a downward spiral of reduced mobility, leading to loss of function and further increased risk for falls.

The literature on inpatient falls specific to American general hospitals is surprisingly limited. Whereas fall studies from other countries inform the field, one can argue that differences in admission/discharge practices as well as possible cultural variances (eg, restraint use) raise issues of applicability. Further, the few American hospital fall studies in the literature tend to be confined to either non-general settings like rehabilitation, or only selected units within general hospitals. Only five papers (Table 1) could be found that reported overall hospital fall rates for American general hospitals.[2,3,4,5,6] Four were retrospective studies ranging from six months to five years in hospitals with 411 to 1000 beds. The most recent was a three-month prospective analysis of falls in a 1,300 bed academic medical center.

Studies of fall prevention in American general hospitals are also limited. Oliver, et al,[7] completed a systematic literature review of fall prevention in hospitals and found 21 papers, 15 of which were in American settings. Of these, four were not general hospitals (two Veterans' Hospital Administrations, one Rehabilitation, one Short Stay), eight examined only selected hospital units, and one focused on only patients sixty five years of age and older. The remaining two papers were prospective descriptive studies with historical controls in general hospitals involving all units.[8,9] In these two studies, prevention and intervention through fall risk assessment and various staff/patient education programs were reported to decrease fall rates by 25 to 41%. (Actual fall rates were not reported.) Cumming,[10] in a review of 21 randomized trials of intervention fall studies across all settings, noted the limitations in study of hospital settings and concluded that multifactorial interventions were the most consistent in reducing falls but the intervention targets were community dwelling older adults determined to be at high risk for falls.

There are limits to the studies outlined in Table 1. A fall is defined only in the Rhode and Hitcho studies; definitions were similar, except Rhode excluded assisted falls (patient is

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TABLE 1. In-Patient Fall Rates*: American General Hospitals (all units)†

Author, Date	#Beds	Time Span	Fall Rate	Notes:
Catchen, 1983[2]	895	12 months	3.3	No psychiatric Units
Rohde et al, 1990[3]	1000	5 years	3.1	Excluded "patients eased to floor"
Kilpack et al, 1991[4]	411	12 months	3.0	
		12 months	3.6	
Shorr et al, 2002[5]	528	194 observation days	3.0	Excluded Emergency and recovery room Falls
Hitcho et al, 2004[6]	1,300	3 months	3.38	Excluded psychiatric units and falls during physical therapy

All studies used provider reports of falls.
*per 1000 patient days.
†exceptions noted.

eased to the floor with help) whereas Hitchco included them, but excluded falls during physical therapy. Also, across all studies there is some variability in types of falls excluded, unit data are reported in only three papers, and data are largely from the 1980s (3 of 5 papers). These limitations highlight the need for a more current comprehensive analysis that specifically evaluates fall rates both across units and across time within a hospital setting.

The purposes of this paper are to describe the overall rate of falls during a six-year period in an academic acute care hospital, to explore differences in fall rates and characteristics by type of patient population, and to explore changes in rate of falls over time in relation to implementation of a hospital fall prevention program.

METHODS

A descriptive, exploratory design was used to examine fall rates and characteristics hospital-wide and in specific patient populations during calendar years 1997 to 2002. The study was approved by the Health Sciences Institutional Review Board. The setting is a 471-bed tertiary care hospital with a level-one trauma center. It has 22 inpatient units: four adult intensive care, one pediatric intensive care, 15 adult general care, and 2 pediatric general care. Adult general care units consist of medical, neuroscience (neurology and neurosurgery), and surgical units. Additionally, there are inpatient psychiatry, rehabilitation and research units; inpatient obstetrical care is not provided. Falls were reported for each unit through submission of an event report. A fall was defined as unintentionally coming to rest on the ground, floor, or other lower level; assisted falls were included.

All event reports related to inpatient falls were reviewed. The event report for 1997 to 2000 was a generic form for reporting any sort of untoward patient event as well as system problems that required further investigation. Beginning in 2001, falls were reported on a fall-specific paper event form to standardize the information provided about falls and facilitate data analyses. In 2002, the organization replaced the paper event reporting system with an on-line event reporting system that standardized follow-up questions for specific, common types of events such as falls and medication errors. Reliability testing was done for all (1,350) event reports submitted during 1997 and 2000 when a generic paper event report was used. (It was not considered necessary to do reliability testing to interpret the responses in the later event reports because the questions and answers were standardized). This involved abstracting information from the reporter's written comments about a fall and the effect on a patient, and coding the data onto a specific tool. Abstracted information included patient demographic information (eg, age, hospital unit, physician service), patient risk factors (eg, cognitive status prior to the fall, whether the fall was related to a toileting need) and environmental risk factors (eg, wet floor, tripping), whether the fall was witnessed, and injury from the fall. Patients were considered to have cognitive impairment if the nurse report indicated problems with mental functioning. Injuries were classified using Morse's Classification of Severity of Injury.[11] The incident forms were considered to have face validity. Coding reliability was established at 100% agreement, that is, researchers and assistants coded data together to assure agreement, or if coded independently, three of the authors (Enloe, Wells and Hughes) met to review the independently coded forms and assure 100% agreement by the research team.

Program Evolution: The Original Program

A formal, structured fall prevention program was established in the beginning of 2001 and coincided with the replacement of beds throughout the hospital. The new beds were lower to the ground in their lowest position (15.5 inches) and had built-in scales and bed exit alarms. The fall prevention program consisted of: (a) using a fall risk assessment tool, the Hendrich Fall Risk Model[12]; (b) the development of a checklist of required and optional interventions to be used for patients at high risk for falls; (c) provision of mandatory, house-wide nursing education; and (d) the implementation of a committee to focus on fall prevention. Patients were assessed for fall risk on admission, transfer and with any change in patient condition. The Hendrich Fall Risk Model was integrated with the fall prevention intervention checklist and was to be completed on all adult patients upon admission. Fall prevention intervention studies are mostly multifactorial, so the specifics of which elements of a program are effective in reducing falls are not clear.[7,13] The interventions chosen for this fall prevention program included a combination of strategies found in the literature.[7,13] In addition to staff education, mandatory interventions included: communication alerts that signified the

high fall risk status of a patient; keeping the bed in its lowest position; arming the bed-exit alarm whenever the patient was in bed; physician or pharmacist review of medications; and providing patient/family education. Optional interventions included keeping the door to the patient's room open when no one was in attendance, toileting regimens, frequent checks, assistive devices, physical therapy, bedside commodes, and providing assistance with ambulation and transferring. In some cases, constant observation using a patient safety attendant (sitter) was provided. Optional strategies were applied on all units, but were more specific to patient behavior and risk factors.

The committee created to focus on fall prevention consisted of a nurse representative from each inpatient unit, 3 physicians, 1 physical therapist, and 1 pharmacist. The expectation was for each unit to have a local nurse champion for fall prevention education and implementation of new strategies. Shortly after its inception, the team added restraint reduction efforts to its mission. The concept of creating unit-based nurse champions was modeled after the Pain Resource Nurse Program developed by Ferrell to involve staff nurses more actively in pain management.[14] In this program, unit-based staff nurses with additional learning and support provide unit-based education and act as front line resources in the management of pain.

Fall Reporting Changes

As noted, in 2001 there were changes in how falls were reported; an occurrence screen form that was specific to falls was introduced, triggering the nurse to provide consistent information that would be most useful in the analysis of falls. The form was scanned into a computer to facilitate collection and analysis of data. In 2002, the hospital became an alpha site for an on-line event reporting system, the Patient Safety Net™, available through the University HealthSystem Consortium. This streamlined the information process so that falls could be investigated and analyzed in a timelier manner.

Assessment Changes

Hendrich's original Fall Risk Model identified three levels of risk based on assigned points for six different variables – confusion/disorientation, depression, altered elimination, recent history of falls, non-adaptive mobility/generalized weakness, dizziness/vertigo and primary cancer diagnosis.[12] Based on conversations with Hendrich, in the fall of 2001, the risk assessment tool was replaced with the Hendrich II Fall Risk Model.[15] (Permission to use provided prior to publication.) This model identified only patients at high risk and used eight parameters – confusion/disorientation, depression, altered elimination, dizziness/vertigo, male gender, any prescribed antiepileptics, any prescribed benzodiazepines and item 2 from the Get-up-and-go Test, rising from chair. This assessment tool was developed in a case/control study of 355 fall and 780 non-fall patients, assessing more than 600 intrinsic and extrinsic risk factors (including 18 different classes of medications), using stepwise logistic regression. In the summer of 2002, the admission fall risk assessment tool was embedded in the overall nursing admission form to eliminate the need for nurses to complete a separate form.

Intervention and Communication Changes

The original fall risk intervention checklist, started in 2001, was often buried in the patient's record, limiting awareness and implementation. To facilitate implementation of interventions, in 2002, a nursing order set was created; orders are transcribed to the critical pathway where documentation of implementation occurs. This change coincided with merging the fall risk assessment tool into the nursing admission assessment form.

Data Analysis

Fall rates, numbers of falls per 1,000 patient days, were determined for each year for the hospital as a whole, and for specific patient populations. Falls were only included if a patient fell during an inpatient admission. Whereas outpatient falls were not included, if inpatients fell in other parts of the hospital (eg, cafeteria, radiology, etc.), the fall was included in this data set. Patient day calculations did not include short stay (eg, less than 24 hours) or observation stay patients, nor were falls in these patients included.

For analysis of fall characteristics, each fall was considered an independent event, and data were aggregated across the 6-year period. Groups were compared using Pearson's χ^2 test for categorical variables and the Kruskal-Wallis test for continuous variables.

Annual fall rates were estimated for each age group by unit. For these rates, a small number of falls were missing information on age (20/353 in 1999; 11/321 in 2000; 1/257 in 2001). Overall fall rate estimates, by year, for the entire hospital, were calculated from these rates by adjustment to the age and unit composition of the hospital population, 1997–2002. Age-specific fall rates, by year, were calculated by adjustment to the unit composition of the age-specific hospital population, 1997-2002. Unit-specific fall rates, by year, were calculated by adjustment to the age composition of the unit-specific population, 1997-2002. Annual percentage changes in the fall rates were estimated using log-linear models. A nominal P value of 0.05 was regarded as statistically significant.

RESULTS

General Findings on Hospital-Wide Falls

From 1997 to 2002, 1,932 falls occurred in 1,562 patients for an overall fall rate of 2.63 per 1000 patient days. Fifty-four percent of falls occurred in males, reflective of the percentage of males (54%) in the hospital's population as a whole (Table 2). A third of falls were noted to occur in patients with altered mental status. Thirty-two percent of falls were reported as related to a toileting need. Most falls were not witnessed (70%) and resulted in no injury (59.9%). Of falls resulting in injury, 22.1% had minor injury, 7.9% had moderate injury and 1.2% had major injury. (Injury was unknown for 8.7% of falls.) No falls resulted in death during this period. Fifteen percent of falls were in multiple fallers, patients that fell more than once.

TABLE 2. Unit, Fall and Faller Characteristics Across Six Years

	Overall	Medical	Surgical	Neuroscience	Psychiatry	Rehabilitation	*P* Value
Unit Characteristics							
Age (yrs)	48.3	57.2	52.8	51.3	42.6	45.8	
Male (%)	54.0	51.8	50.6	49.1	38.4	60.3	
Faller Characteristics							
Age (yrs)	56.5	62.1	57.7	53.9	50.1	49.2	.42
Male (%)	54.0	57.6	58.0	50.9	36.4	62.1	<.001
Fall Characteristics							
Multiple Fallers (%)	15.1	11.8	8.7	14.8	23.6	20.0	<.001
Altered Mental Status (%)	32.8	34.1	21.0	37.7	18.3	29.2	<.001
Related to Toileting (%)	32.2	43.5	41.1	34.2	25.4	27.9	<.001
Not Witnessed (%)	70.0	74.3	67.1	76.4	72.6	69.2	.008
Minor Injury* (%)	22.1	22.8	21.8	11.1	34.0	16.7	<.01
Moderate Injury† (%)	7.9	9.3	8.9	4.5	5.1	6.3	.54
Major Injury‡ (%)	1.2	1.8	1.0	0.0	2.0	0.4	.57
Injury Unknown (%)	8.7	8.5	11.1	10.1	6.6	6.7	
Unadjusted Fall Rate¶	2.63	3.78	1.50	4.57	5.86	7.74	<.001
Fall Rate by Age Groups:¶							
<21		1.01	1.45	4.44	3.19	9.82	<.001
21–54		3.21	1.16	4.00	4.53	6.55	<.001
55–74		3.51	1.60	4.84	12.35	9.03	<.001
75+		5.41	2.51	5.34	7.78	10.70	<.001

*Minor Injury includes bruises or abrasions that do not require medical treatment.[11]
†Moderate injury requires medical treatment, including replacement of intravenous line or tubes.[11]
‡Major injury includes fracture, head injury, loss of consciousness or wound that requires major suturing.[11]
¶Falls per 1000 patient days.

Comparisons of Fall Rates and Characteristics Across Populations

Clear differences among fall rates existed by patient population. Critical care and pediatric fall rates were very low (means of 0.78 and 0.30 respectively) and were not included in analyses of population differences. Table 2 shows unadjusted fall rates across patient populations. In comparison across units, fall rates were highest on the rehabilitation unit (7.74 falls per 1,000 patient days) and lowest on surgical units (1.50 falls per 1,000 patient days). Table 2 also shows the rate of falls within specific age groups within each patient population. In general, medical, surgical and psychiatric units showed an increase in fall rates with age. In contrast, neuroscience and rehabilitation units had high fall rates across all age groups.

Faller characteristics and severity of injury varied across the study population. The neuroscience unit had a lower percentage of injurious falls than other units (15.6%) for the six year period. Changes in the percent of falls with no injury over time by patient population can be seen in Figure 1; all areas except neuroscience demonstrated an increase in the percentage of falls with no injury. A fall was more likely to be associated with alteration in cognitive status in both medical and neuroscience patients (34.1% and 37.7%, respectively, $P < .001$). Falls were more frequently related to issues with toileting in the medical and surgical populations than other groups. The percent of male patients falling mirrored the gender distribution of the unit populations (ie, more males in rehabilitation and more females in psychiatry), so differences in gender may be attributed to that factor. The incidence of multiple fallers was higher in psychiatry patients than other patients.

The age distribution of falls for the hospital as a whole is detailed in Table 3. The highest fall rate was in the 75+ age group. However, the greatest number of falls occurred in the 21–54 age group, reflective of the high number of patient days in this age group.

Change in Fall Rates Over Time

Overall, the fall rate declined during this six-year period. Using age and unit-adjusted fall rates to adjust for relative changes in unit and age distribution over time in the population

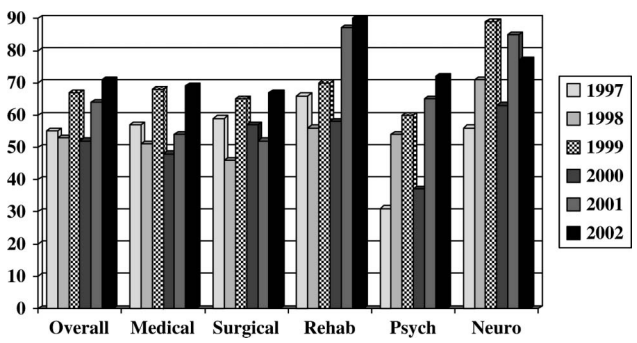

FIGURE 1. Percent of falls with no injury.

TABLE 3. Fall Rates by Age, 1997–2002

			Unadjusted		Adjusted*	
Age	Patient Days	Falls	Rate	(95% CI)	Rate	(95% CI)
Under 21	102,393	85	0.83	(0.66,1.03)	1.69	(1.21,2.17)
21–54	325,132	810	2.49	(2.32,2.67)	2.35	(2.18,2.52)
55–74	214,430	622	2.90	(2.68,3.14)	3.14	(2.88,3.41)
75 or Older	93,523	382	4.08	(3.69,4.52)	3.74	(3.33,4.15)

*Adjusted to the unit composition of the hospital population, all ages, 1997–2002.

base, Table 4 shows the fall rates by year for the hospital as a whole. The average change per year was –3.69%, (95% CI –6.23% to –1.08%, $P = 0.006$).

Patient-Population Specific Changes Over Time

Age-adjusted fall rates (adjusted to overall age population) were calculated by year for groupings of patient populations – medical, surgical, neuroscience, psychiatric, rehabilitation, and other, as shown in Table 5. Average annual fall rates declined significantly in psychiatry (−12.20%, $P = 0.006$) and "other" (−10.66%, $P = 0.023$). (The "other" population included critical care, research and locked security units.) There was a modest decline in fall rates in medical units but this did not reach significance. Neuroscience and rehabilitation units showed no change over the 6-year period.

When examining unit-specific rates more closely by age category, the decline in falls in psychiatry was driven by a significant decline in falls in patients age 55 and older; with an average yearly change of –23.3% for the age group 55–74 ($P < .001$) and an average yearly change of –55.3% for the 75+ age group ($P < .001$). Falls in neuroscience declined significantly for the 21–54-year-old age group (−11.49%, $P = 0.045$), but this was offset by an increase in fall rates for the age groups of 55–74 and 75 plus.

DISCUSSION

This study demonstrates that both baseline fall rates, and the reduction in fall rates in response to a falls prevention program, vary substantially across units. The six year fall rate of 2.63 per 1,000 patient days in this study is lower than that reported in comparable studies (range 3.0 to 3.6).[6,16,11]

TABLE 4. Overall Fall Rate by Year

			Unadjusted		Adjusted*	
Year	Patient Days	Falls	Rate	(95% CI)	Rate	(95% CI)
1997	124,430	341	2.74	(2.46,3.05)	2.74	(2.45,3.03)
1998	124,048	367	2.96	(2.66,3.28)	2.94	(2.64,3.24)
1999	127,662	332	2.60	(2.32,2.90)	2.59	(2.31,2.87)
2000	121,199	310	2.56	(2.28,2.86)	2.59	(2.30,2.88)
2001	116,834	256	2.19	(1.93,2.48)	2.25	(1.98,2.53)
2002	121,305	293	2.42	(2.15,2.71)	2.47	(2.18,2.75)

*Adjusted to the age and unit composition of the hospital population, 1997–2002.

Catchen[2] examined fall accident reports for 12 months (1980 to 1981) at the Bellevue Hospital Center in New York City. He did not provide fall rate by unit or service but found the overall fall rate was highest in those 65 years and over. Rohde, et.al.,[3] reported five years (1983–1987) of fall data from Johns Hopkins Hospital and found, independent of patient age, the highest rates were in psychiatry and neurosciences. Although Kilpack, et.al.,[4] studied only two units within a general hospital, she reported overall hospital fall rates for two years (1985,1986). Shorr, et al,[5] in a 1997 study of restraint use and falls in hospital, found that, similar to Rohde, et al,[3] unit fall rate varied widely from 0.48 per 1000 patient days on obstetrics to 9.19 per 1000 patient days in psychiatry. Hitcho, et.al.,[6] studied 34 separate units with 7 services, prospectively for a three-month period and found large variations in fall rates by patient population for an overall fall rate of 3.38, but with the highest rates, 6.12, in medicine and neurology. Of interest is both the consistency of general hospital overall fall rates from 3.0 to 3.6 per 1000 patient days and, when available, the wide variance across units.[3,5,6] Clearly such variance is important in any targeted effort to reduce falls, but such wide variance raises issue with the meaningfulness of a single overall hospital fall rate without unit or service data.

The overall fall rates described in Table 1 show remarkable consistency. They are also comparable to the 3.07 falls per 1000 patient days in 1997 benchmarking data from the University HealthSystem Consortium.[16] The University HealthSystem Consortium, an alliance of academic health centers, surveyed 41 member hospitals and calculated this ratio based on total number of falls and total number of inpatient days, excluding newborns. Whereas definitions of patient falls varied, most institutions included assisted falls.

This study shows a reduction in fall rates in response to a falls prevention program. The significant decline in age-adjusted fall rates (average decline of 3.69% per year, $P = 0.006$) is encouraging, especially in light of increases in adverse event reporting with an on-line system (73% increase in 2002). However, examination of the overall fall rate tells only part of the story. Significant variations occurred across patient populations in terms of rates, faller characteristics, age-associated risk of falling, risk of injury with a fall and change in rates over time.

The age-adjusted fall rates showed striking differences across units with rates on neuroscience, psychiatric, and rehabilitation units exceeding those on medicine and surgery. Of note, surgical patients were only half as likely to fall as medical patients and this difference in fall rate persisted after adjusting

TABLE 5. Age-adjusted Fall Rates by Patient Population

	Medical (193,576 patient days)		Neuroscience (43,879 patient days)		Other (170,005 patient days)	
Year	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
1997-2002	3.27	(3.00,3.54)	4.48	(3.78,5.18)	1.38	(1.16,1.61)
1997	3.79	(3.05,4.52)	4.07	(2.05,6.10)	1.15	(0.64,1.65)
1998	3.42	(2.78,4.07)	5.28	(3.19,7.37)	1.34	(0.76,1.92)
1999	3.18	(2.44,3.92)	4.56	(3.05,6.08)	1.28	(0.73,1.83)
2000	3.30	(2.70,3.89)	4.64	(3.09,6.20)	2.74	(1.95,3.52)
2001	2.40	(1.87,2.92)	5.07	(3.12,7.01)	0.66	(0.29,1.03)
2002	3.46	(2.84,4.09)	3.41	(2.13,4.70)	1.19	(0.69,1.69)
Annual Change (%)	−3.5%	(−7.5%,0.7%)	−0.5%	(−8.7%,8.4%)	−10.7%	(−19.0%,−1.5%)
	$P = 0.10$		$P = 0.91$		$P = 0.023$	
	Psych (33,635 patient days)		**Rehab (30,488 patient days)**		**Surgical (263,895 patient days)**	
Year	**Rate**	**95% CI**	**Rate**	**95% CI**	**Rate**	**95% CI**
1997-2002	7.33	(6.13,8.53)	8.25	(7.12,9.39)	1.50	(1.33,1.67)
1997	11.95	(7.60,16.31)	8.60	(5.86,11.35)	1.26	(0.94,1.58)
1998	10.61	(6.73,14.49)	10.61	(7.49,13.73)	1.87	(1.39,2.35)
1999	7.55	(4.69,10.40)	7.25	(4.85,9.65)	1.73	(1.25,2.21)
2000	6.45	(3.57,9.33)	5.73	(3.25,8.21)	1.32	(0.89,1.76)
2001	5.45	(3.19,7.72)	9.38	(6.28,12.48)	1.42	(1.00,1.84)
2002	4.03	(1.79,6.28)	8.05	(5.05,11.05)	1.36	(0.98,1.74)
Annual Change (%)	−12.2%	(−20.0%,−3.6%)	−0.5%	(−7.7%,7.2%)	−2.4%	(−8.0%,3.5%)
	$P = 0.006$		$P = 0.89$		$P = 0.42$	

for age. There are a variety of reasons that may explain this: surgical patients may be in better overall health with fewer co-morbidities; ambulation is emphasized, especially assisted ambulation post-operatively; and various tubes or acute post-operative pain prompt the patient to ask for assistance when getting out of bed. Further, in this population, the incidence of cognitive impairment among fallers was significantly less compared with medical or neuroscience patients who fell. (See Table 2, alerted mental status.)

Neuroscience and rehabilitation populations showed no decline in fall rates over the time period. Both neuroscience and medical patients who fell were more likely to have cognitive impairment. However, differences may occur in type of cognitive impairment, with difficulty in impulse control more common to neuroscience and rehabilitation patients. In addition, as our findings show, patients who fall on neuroscience and rehabilitation units are not predominantly the elderly. Younger neuroscience and rehabilitation patients may have better pre-admission strength. This combination of ability to move with lack of impulse control may make fall prevention more difficult. For example, bed alarms are of limited use when the patient may get out of bed so quickly the staff does not have time to respond. Given the specific challenges of neuroscience and rehabilitation patients, fall prevention strategies likely need to be different for this type of population. For example, grouping patients for observation, aggressive treatment of delirium, proactive toileting, and other approaches may be more valuable than bed exit alarms.[7]

Overall, fall rates decreased in conjunction with implementation of the falls prevention program; however, the decline can be attributed to particular patient populations. Analysis by patient population revealed that psychiatry had the most significant decline in fall rate over time, likely impacted to some extent by new medications with fewer side effects, a change in admission triaging and staff education. There was a modest decline in medical and "other" units. This decline was associated temporally with implementation of the fall prevention program in 2001. The heaviest focus for the fall prevention program occurred on one medical unit where a mobility aide walked patients as much as possible, promoting ambulation as a strategy to reduce fall risk. Additional interventions included use of bed alarms, improved assessment using a standardized assessment tool, nursing education, and use of a multidisciplinary fall prevention team with unit nursing representatives. Other studies have shown a decline in fall rates using multifaceted interventions.[10] Our data are consistent with this literature. In a recent study, Dempsey's[1] evaluation of a fall prevention program five years after implementation showed that the gains made in fall reduction in the first year were not sustained over time. We would argue that the sustainability of fall reduction efforts requires an infrastructure and leadership that provides for continual analysis of falls, and constant innovation in practice.

This study has a number of limitations. Changes in fall rate over time may be affected by many different factors including organizational changes such as staffing ratios and turnover, as well as variance in patient acuity and volume. Hospital environments are far from static and the timeframe represented here saw many alterations – environmental as major remodeling projects were undertaken, organizational

evolution in structure and leadership, and staffing mix as more nursing assistants were added. There also may be unit specific differences in the intensity with which the fall prevention program was applied. Whereas our data suggest that the multifaceted intervention was successful in specific patient populations, we don't know specifically which parts of the intervention were critical to success. Another limitation is that data collection regarding fall characteristics relied on nurse reporting. In particular, the fall relationship to toileting may be under-reported. Other studies have shown that a higher percentage of falls are related to toileting needs.[17] The lack of cost data is another limitation of this study.

In addition, there were three different reporting forms/processes during this study period that may have affected the rate of reporting. During 1997 to 2000, a generic paper form was used to report all types of adverse events. The change to a fall-specific event report in 2001 may have caused a decline in reporting and the change to on-line incident reporting in 2002 likely increased the reporting of all types of events, including falls.. The overall rate of adverse event reporting increased by 73% in the first year of on-line reporting (2002), with the percent of falls compared with total reported events falling from 14% to 9.2%. The assumption is that nurses have always been conscientious about reporting falls given the risk of injury associated with falls; the use of an on-line event reporting system increased the reporting of falls modestly when compared with the increase in reporting of a wide range of other events, but this is speculative.

CONCLUSION

Baseline fall rates and reductions in fall rates vary substantially across units. A hospital's overall fall rate is not necessarily a good measure as fall rates from one acute care facility to another will vary depending on the mix of patient populations in that facility. It is interesting to note that Rohde's study of falls by patient population from 1983–1987 shows fall rates and population differences similar to our findings.[3] The National Database of Nursing Quality Indicators is beginning to look at population-specific data as it relates to falls, however the highest risk populations are not captured, ie, rehabilitation and psychiatric falls are not reported and neuroscience falls are embedded in either medical, surgical or combined medical-surgical units.[18] Based on our findings, we would advocate for more patient population-specific benchmarking and targeting aggressive fall prevention efforts to those populations at the highest risk. Fall prevention efforts that clearly identify high fall risk patients and attend to meeting patients' toileting needs in addition to improving mental status and strength will likely be most effective.

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