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Narcotic administration and fall-related injury in the hospital: Implications for patient safety programs and providers

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Abstract.

OBJECTIVE: Identify factors that predict fall-related injury in hospitalized adults.

DESIGN: Retrospective records review.

SETTING: 435-bed university hospital.

PARTICIPANTS: Inpatients with reported falls in 2010.

RESULTS: Medical records were available for 286/293 (98%) of reported falls in 251 patients. 25% (63/286) of falls were associated with injury, 4% (11/286) with serious injury. Compared to all fallers, patients with injury did not differ by gender or age. In univariate analysis, patients who reported hitting their head, had pre-fall confusion, or who received narcotics within 24 hours before falling were more likely to suffer injury (estimated odds ratios 6.04, 2.00 and 5.1, respectfully). In multivariate analysis, receiving a narcotic prior to falling was the strongest predictor of injury (estimated odds ratio 5.38; 95% confidence intervals 2.07–13.98, $p < 0.001$).

CONCLUSIONS: In this single-institution study, 25% of patients who fell suffered injury and 4% serious injury. Neither age nor gender predicted fall-related injury. Recent narcotic administration was the strongest predictor of injury. Strategies to prevent fall-related injury in the hospital should target patients receiving narcotics. When evaluating inpatients who have fallen, providers should be especially vigilant about injury in patients who have pre-fall confusion, hit their head, or have received recent narcotics.

Keywords: Falls, hospital, injury, narcotics, patient safety

1. Background

Falls occur frequently in hospitalized patients, with recent studies reporting 2–4 falls/1,000 hospital days [1–4]. Inpatient falls have serious medical and legal consequences, as 2–6% of falls result in serious injury [1–5]. Previous studies have demonstrated falls are more common on medical and psychiatric than

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31 surgical units [1–5], and approximately 40% are associated with toileting [1, 2]. Compared to non-fallers,
32 patients who fall in the hospital have longer hospital stays and higher hospital costs [6]. Though there
33 are many tools to assess inpatients for risk of falling, these tools have low predictive value [7, 8]. Patient
34 education, intensive exercise, bed alarms, and multimodality programs designed to prevent inpatient falls
35 have had limited success [9–12]. Despite objections from experts that inpatient falls are poorly predictable
36 and fall-related injury is unpreventable, the Centers of Medicare and Medicaid of the United States of
37 America (USA) have recently imposed financial penalties on hospitals when their patients fall and suffer
38 injury [13, 14].

39 A number of studies have examined factors associated with inpatient hospital falls, but few have looked
40 at clinical factors that predict fall-related injury. Inconsistent associations of fall-related injury have been
41 reported with increased age [2, 15], falls in a location other than the patient's room [2], unassisted falls
42 [2], pre-fall ambulatory status [16], and administration of certain medications [17]. Previous authors have
43 concluded that fall-related injury in the hospital is “largely unpredictable and more research is needed to
44 determine how injury can be prevented in patients at risk of falls” [18]. This study was designed to (a)
45 identify demographic and/or clinical factors which predict fall-related injury among hospitalized adults,
46 and (b) judge the adequacy of physician documentation related to adult patients who fell in the hospital.

47 2. Methods

48 This study was conducted at the University of New Mexico Hospital, a 435-bed tertiary-care academic
49 hospital in a large urban city in the southwestern region of the USA. It is the only Level 1 trauma center
50 in a state with a population of just over two million. A large majority of patients are admitted through the
51 emergency department. Patients with psychiatric diagnoses are admitted directly to an adjacent psychiatric
52 hospital unless they have acute medical illness or drug overdose. The hospital uses an electronic health
53 record and computerized provider order entry for all clinical encounters. Nursing staff are required to
54 report all hospital falls through the hospital's computerized Patient Safety Network (PSN). At the time
55 of this study, the hospital was gathering baseline data for a falls prevention program. There was much
56 emphasis on complete and prompt reporting, and nurse managers were instructed to review all falls within
57 24 hours to ensure that a PSN report had been entered for falls that met the World Health Organization
58 definition of a medical fall (“an event which results in a person coming to rest inadvertently on the ground
59 or floor or other lower level”) [19].

60 The authors performed a retrospective chart review of all PSN reported falls that occurred during 2010.
61 Patients younger than 18 years, pregnant women, and prisoners were excluded. We used a chart extraction
62 tool to record for each patient the following characteristics: age, gender, platelet count, and international
63 normalized ratio (INR); if the fall was witnessed; if the patient was observed or reported to have hit their
64 head or had loss of consciousness; if within 24 hours before falling the patient had abnormal mental
65 status or had received narcotics, benzodiazepine, antihistamines or zolpidem; if the patient had Foley
66 catheterization at the time of the fall; if the fall was related to toileting; if there was injury and severity
67 of injury; and whether there was a post-fall evaluation documented by a physician in progress notes or
68 discharge summary. Severity of injury was assigned as none, mild (bruising, skin tear, laceration not
69 requiring closure) or serious (laceration requiring closure, fracture, intracranial bleeding or death). The
70 chart review abstraction technique was standardized and rehearsed. 10% of charts were reviewed by
71 two reviewers and no inconsistencies were noted. The degree of injury for all patients with injury was
72 independently reviewed by two reviewers and no differences in assigning degree of injury were found.

73 This study was granted exempt status by the Human Research Protections Office of the University of
74 New Mexico Health Sciences Center.

75 Since there were some repeated observations on the same patients (some patients fell more than once),
76 we used logistic regression with repeated measure solved by the generalized estimating equation (GEE).
77 Using this equation, we calculated odds ratios, their 95% confidence intervals and the corresponding
78 *p*-values to assess the association between fall with injury and each of the demographic and clinical
79 characteristics of patients. In an attempt to understand if predictor variables were independent predictors
80 of injury, we retained those variables with *p*-value <0.05 for multivariate analysis. We eliminated one
81 of these predictor variables (if the patient was observed or reported to have hit their head or had loss of
82 consciousness) because in a very large number of observations (198/286) the medical notes did not record
83 whether or not the patient was observed or reported to have hit their head or had loss of consciousness.
84 Including the small number of observations for which the data was available severely limited the power
85 of the multivariate analysis. The retained two variables were tested for independent significance after
86 adjusting for the effect of each other using a multivariate logistic GEE model.

87 3. Results

88 Medical records were available for 286/293 (98%) of PSN-reported falls in 251 eligible patients. Fall
89 rate was 3.25 falls/1,000 patient days. Falls occurred in 152 males (61%), and 99 females (39%). 48% of
90 falls occurred while toileting. 25% (63/286) of falls were associated with injury, and 4% (11/286) with
91 serious injury (laceration requiring closure or fracture). There were no fall-related deaths. Compared
92 to all fallers, patients with injury did not differ by gender (males 38/152 vs. females 25/99, *p*=0.96).
93 Patients older than 64 years who fell were no more likely to suffer injury than younger adults (13/64 vs.
94 50/187, *p*=0.31). In univariate analysis (Table 1), patients who reported hitting their head, patients with
95 pre-fall confusion, and patients who received narcotics within 24 hours before falling were more likely
96 to suffer injury (estimated odds ratios 6.04, 2.00 and 5.1, respectfully). In multivariate analysis (Table 2),
97 receiving a narcotic within 24 hours before falling was the strongest predictor of injury (estimated odds
98 ratio 5.38, 95% confidence intervals 2.07–13.98, *p*<0.001). 33% (21/63) of falls with injury had no
99 physician documentation of the fall or a post-fall evaluation in the hospital record, and only 21% (13/63)
100 of falls with injury were mentioned in the discharge summary.

101 4. Discussion

102 The results of our study include several new findings with regard to inpatient falls. Mion and coauthors
103 [17] previously reported an association of fall-related injury with use of narcotics and psychiatric medica-
104 tions, but the effect size was small. The current study demonstrated that receiving narcotics was a strong
105 predictor of fall-related injury in the hospital and suggests that reducing inpatient narcotic use might be
106 an effective strategy to prevent hospital fall-related injury. Interestingly, hip fracture has been associated
107 with narcotic use in community dwelling elderly adults [20]. A recent study from a large University hos-
108 pital in Japan showed that hypnotics and opioid narcotics were associated with inpatient falls, although
109 fall-related injury was not specifically studied [21]. Our study failed to demonstrate that benzodiazepines,
110 antihistamines or zolpidem were associated with injury. It may be that these medications are less likely
111 than narcotics to be associated with fall-related injury, or patients who receive narcotics may differ from
112 patients receiving these other medications in ways that our study did not identify.

Table 1
Univariate analysis of clinical characteristics predicting fall-related injury

Odds ratio	95% confidence interval	<i>p</i> -value	Clinical characteristic
0.72	0.24–2.13	0.5482	Witnessed fall
0.73	0.37–1.45	0.3745	Fall related to toileting
1.19	0.62–2.30	0.5982	Foley catheterization at time of fall
6.04	1.95–18.73	0.0018	Patient observed or reported hitting head
2.55	0.40–16.37	0.3247	Patient observed or reported to lose consciousness
2.00	1.08–3.70	0.0273	Patient observed to have pre-fall confusion
0.91	0.34–2.44	0.8587	Receiving anticoagulant or antiplatelet drugs
1.28	0.65–2.52	0.4678	Abnormal INR (>1.3) or thrombocytopenia (<149,000)
5.12	1.96–13.41	0.0009	Received narcotic prior to fall
1.33	0.69–2.54	0.3931	Received benzodiazapine prior to fall
0.61	0.18–2.05	0.4226	Received zolpidem prior to fall
0.41	0.09–1.77	0.2318	Received antihistamine prior to fall

Table 2
Multivariate analysis of clinical characteristics predicting fall-related injury

Variable	Odds ratio	95% confidence interval	Z statistic	<i>p</i> -value
Pre-fall confusion	2.08	1.11–3.91	2.28	0.0224
Received narcotic	5.38	2.07–13.98	3.46	0.0006

Many existing inpatient fall prevention programs are designed to assess all patients on admission for fall risk, and provide multimodality interventions throughout the hospitalization for patients at high risk [12]. The majority of these programs use screening instruments that include clinical factors associated with risk of falling in ambulatory adults such as previous fall, advanced age, gait disturbance, lower extremity weakness, and cognitive impairment [12]. Unfortunately, these screening instruments have been shown to have low predictive value for inpatient falls [7, 8]. Our study demonstrated that clinical factors used in most of these instruments were also not predictive of fall-related injury. Hospital fall prevention programs that focus on fall-related injury rather than prevention of all falls, screen for clinical factors associated with injury identified in this study (pre-fall confusion and narcotic use), and use daily screening for risk of fall-related injury might prove to be effective.

This study also demonstrated that in our hospital, physicians infrequently documented inpatient falls in the health record, resulting in potential gaps in clinical care and surveillance. Despite the fact that delayed recognition of fall-related injury has serious clinical and risk-management implications [14, 22], there is limited literature to guide providers when assessing hospitalized patients for fall-related injury; what has been published is primarily expert opinion rather than evidence-based [14, 23]. Our study suggests that when evaluating a patient who has fallen in the hospital, providers should be especially vigilant to the possibility of injury if the patient had pre-fall confusion, reported hitting their head, or had received narcotics in the previous 24 hours. We now use in our hospital, a multidisciplinary tool designed to aid provider evaluation and documentation of the inpatient who falls [24].

Our study is subject to several limitations. It is the experience of a single institution and the conclusions may not be generalizable to institutions with different patient populations and/or types of providers. It only studied falls reported to our PSN. At the time of this study, there was much emphasis on complete reporting, and though we believe that almost all falls were reported, the PSN may not have captured all inpatient falls, and ascertainment bias may have occurred. Pregnant women and prisoners were excluded; the results of this study may not apply to these types of patients. Also, patients admitted to the adjacent psychiatric facility were not included in this study; different results might have been found with the inclusion of these patients. This study was a retrospective chart review subject to limitations of completeness, accuracy, and human error. Finally, the study's small sample size limits the ability to do extensive hypothesis testing.

5. Conclusions

In this single-institution retrospective cohort study, 25% of inpatients who fell suffered injury and 4% serious injury. Compared to all fallers, patients with fall-related injury did not vary by gender or age. Receiving a narcotic within 24 hours before the fall was a strong predictor of injury. Strategies to prevent fall-related injury in the hospital should target patients receiving narcotics. In this study, physician documentation of inpatient falls was poor. Improved physician documentation of occurrence and evaluation of falls may improve patient care and surveillance by hospital systems improvement programs. Providers evaluating inpatients who have fallen should be especially vigilant about injury when patients had pre-fall confusion, hit their head, or have received recent narcotics.

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208 [checklist.pdf](http://www.pogoe.org/sites/default/files/POGOe%20falls%20huddle%20checklist.pdf) Accessed 15 July 2013.