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Assisted and Unassisted Falls: Different Events, Different Outcomes, Different Implications for Quality of Hospital Care

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Abstract

Background—Many hospitals classify inpatient falls as assisted (if a staff member is present to ease the patient's descent or break the fall) or unassisted for quality measurement purposes. Unassisted falls are more likely to result in injury, but there is limited research quantifying this effect or linking the assisted/unassisted classification to processes of care. A study was conducted to link the assisted/unassisted fall classification to both processes and outcomes of care, thereby demonstrating its suitability for use in quality measurement. This was only the second known published study to quantify the increased risk of injury associated with falling unassisted (versus assisted), and the first to estimate the effects of falling unassisted (versus assisted) on the likelihood of specific levels of injury.

Methods—A cross-sectional analysis of falls from all available 2011 data for 6,539 adult medical, surgical, and medical-surgical units in 1,464 general hospitals participating in the National Database of Nursing Quality Indicators® (NDNQI®) was performed.

Results—Participating units reported 166,883 falls (3.44 falls per 1,000 patient-days). Excluding repeat falls, 85.5% of falls were unassisted. Assisted and unassisted falls were associated with different processes and outcomes: Fallers in units without a fall prevention protocol in place were more likely to fall unassisted than those with a protocol in place (adjusted odds ratio [aOR], 1.39 [95% confidence interval (CI), 1.32, 1.46]), and unassisted falls were more likely to result in injury (aOR, 1.59 [95% CI, 1.52, 1.67]).

Conclusions—The assisted/unassisted fall classification is associated with care processes and patient outcomes, making it suitable for quality measurement. Unassisted falls are more likely than assisted falls to result in injury and should be considered as a target for future prevention efforts.

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Despite quality improvement efforts spanning decades, patient falls in hospitals remain common and potentially serious adverse events, affecting 2%–3% of hospitalized patients, or up to one million falls annually in the United States alone.[1] Falls can result in significant additional care costs, including increased costs due to longer length of stay, and reduced reimbursement from the Centers for Medicare & Medicaid Services.[2–4] Older adults are at higher risk of falling and are eparticularly vulnerable to increased morbidity and mortality following a fall.[15,6] As of 2008, persons 75 years of age and older accounted for 22% of hospital discharges,[7] so that finding ways to prevent fall-related injuries has taken on heightened importance.

On the basis of the classic model pioneered by Donabedian,[8] quality improvement initiatives examine structure (for example, facilities, equipment, qualifications of care providers) and/or process (communication, guidelines, teamwork) domains and subsequent impact on desired outcomes—in this case, patient falls. A quality measure must not only reflect the outcome of interest but also reflect the quality of care, and the structures and processes that determine that quality. In addition, the choice of a measure must be informed by the financial constraints of the institution; that is, the number and type of personnel hours needed to accomplish reliable data collection and entry. The Agency for Healthcare Research and Quality (AHRQ) lists a number of attributes to consider when choosing an outcome measure, including relevance, reliability, validity, feasibility, and ability to be stratified or analyzed by subgroup.[9]

The National Quality Forum recommends total falls and injurious falls for use in quality measurement,[10] and most fall prevention studies have targeted one or the other.[11–18] These measures allow for reliable and valid benchmarking across units and across hospitals, are feasible to obtain, and are clearly relevant. However, measures based only on total or injurious falls provide limited insight into improvable processes of care, and focusing prevention efforts on such measures could even discourage ambulation. For example, an unwitnessed fall that fortuitously does not result in injury may be perceived as a better outcome than a fall with minor injury sustained during supervised rehabilitation.

Some investigators have recommended classifying falls on the basis of on apparent cause as accidental (for example, because of slipping on a wet floor), unanticipated physiologic (for example, due to pulmonary embolism), or anticipated physiologic (due to weak gait),[19] or as preventable or nonpreventable.[20–22] This level of classification requires clinical interpretation and can be useful in individual postfall assessments and targeting interventions to minimize repeat falls. However, using this level of patient-specific classification as a unitor hospital-level quality metric for benchmarking purposes is difficult and expensive in practice, and, from a quality measurement perspective, unsuitable because of the subjectivity and imprecision involved in assigning a single cause to each fall.

A simpler scheme that meets the AHRQ's list of desired attributes of a quality measure is to classify falls as assisted (if a staff member is present to ease the patient's descent or break the fall) or unassisted. Roughly 80%–90% of falls are unassisted,[11,1823–25] the proportion depending in part on the type of unit studied,[23,24] hospital type (academic or nonacademic) and location (rural or urban/suburban),[11] and whether falls by patients using an assistive

device are counted as unassisted.[18] Classifying falls as assisted or unassisted is generally straightforward and requires minimal effort, but it has not been shown that this classification is associated with processes of care. Moreover, although it seems obvious that unassisted falls would be associated with greater likelihood of injury, there has been little in the way of published research to verify and quantify this association.[11]

The rationale for using the assisted/unassisted classification in quality measurement is that a high proportion of assisted falls suggests processes in which health care personnel (1) recognize the high-risk patient and (2) institute supervisory processes during mobilization. By contrast, a high proportion of unassisted falls suggests ineffective processes of care, as patients at risk for falling are ambulating, and falling, without staff assistance. If this classification is both predictive of patient injury and related to improvable processes of care, it may prove a more useful quality measure than total or injurious falls. To assess the suitability of this classification for quality measurement across hospitals, we compared care processes and patient outcomes associated with assisted and unassisted inpatient falls.

Methods

Data Source and Sample

We extracted all available 2011 data on falls from adult medical, surgical, and medical-surgical units in general hospitals participating in the National Database of Nursing Quality Indicators® (NDNQI®).[26] With the approval of the Human Subjects Committee at the University of Kansas Medical Center, the NDNQI collects nursing-related data from nursing units in more than 1,900 acute care hospitals in the United States. The NDNQI is a proprietary database that was owned at the time of this study by the American Nurses Association, which ensured that hospitals' data are kept confidential; the NDNQI does not share data for public reporting purposes.

Hospitals participate in the NDNQI voluntarily for the purpose of tracking and benchmarking their performance on nursing-related indicators. Responsibility for data collection and entry lies with a trained site coordinator in each hospital. In return for an annual fee for participation that varies by hospital bed size, the NDNQI provides centralized data management (including rigorous screening for erroneous data), performance dashboards with a variety of benchmarking options, and telephone support for site coordinators who have questions about data entry, NDNQI definitions, or other issues.

Monthly data on falls were available for 2,181 medical, 1,538 surgical, and 2,820 medical-surgical units in 1,464 hospitals. The mean number of months of data available for the units in the sample was 11.1 (standard deviation, 2.2). All 50 states and the District of Columbia were represented in the sample, and each of the nine US Census Bureau divisions accounted for at least 5% of the hospitals in the sample.

Data Elements

The NDNQI defines a patient fall as an unplanned descent to the floor that may or may not result in injury. A fall is classified as assisted, as stated earlier, if a staff member is present to ease the patient's descent or break the fall; all other falls are considered unassisted. Each

fall event is assigned one of the following injury levels: none (no signs or symptoms of injury); minor (resulting in pain, bruise, or abrasion, or requiring dressing, ice, limb elevation, cleaning a wound, or topical medication); moderate (resulting in muscle/joint strain or requiring suturing, steri-strips, skin glue, or splinting); major (resulting in internal injury or requiring neurological consultation, surgery, casting, or traction); death (due to injuries resulting from the fall).

For each participating unit, hospitals report to the NDNQI the number of total falls during the month, whether each was assisted or unassisted by hospital staff, if the fall was a repeat fall on the unit by the same patient during the calendar month, and the injury level associated with the fall. Hospitals also report each unit's inpatient-days for the month, which allows the NDNQI to compute rates of falls per 1,000 patient-days.

For each fall occurring on a participating unit, hospitals have the option of reporting the gender and age of the patient who fell, whether the patient was assessed for fall risk prior to falling, and whether the patient was at risk for falling based on the most recent risk assessment. For patients deemed at risk, hospitals can also report if there is documentation of a fall prevention protocol (that is, a protocol involving special fall precautions or preventive measures such as bed alarms, bed rails, or one-to-one monitoring) being implemented prior to the fall; if so, the patient is considered to have fallen with a prevention protocol in place.

In addition to these data on individual falls and fallers, we extracted data on the type of each unit (medical, surgical, or medical-surgical) and information on hospital characteristics. Each hospital was classified as a teaching or nonteaching facility, and we created a dichotomous hospital size variable based on the number of staffed beds (≥ 300 or < 300).

Statistical Analyses

All analyses were carried out using SAS 9.2 (SAS Institute Inc., Cary, North Carolina). We excluded repeat falls (which may be less likely to be reported[27]) from the primary analyses. In fitting the statistical models, falls with missing data on one or more variables in the model were automatically excluded.

Characteristics of Unassisted and Assisted Falls—We examined the association between the odds of falling unassisted (versus assisted) and each of the following seven explanatory variables: patient gender, prior risk assessment (yes or no), deemed at risk for falling (yes or no), documented prevention protocol in place (yes or no), unit type (medical, surgical, or medical-surgical combined), hospital size (≥ 300 or < 300 beds), and hospital teaching status (teaching or nonteaching). To estimate the effects of these variables while accounting for the clustering of falls within units, we used the GLIMMIX Procedure[28] to fit hierarchical logistic regression models[29] with a random unit intercept. The dependent variable in each model was an indicator for whether the fall was unassisted. The random intercept allowed us to model (and account for) correlations between falls on the same unit.

We estimated crude odds ratios (cORs) for falling unassisted by fitting a single-predictor model for each of the seven explanatory variables. To estimate adjusted odds ratios (aORs),

we fit a multiple-predictor model with six of the seven explanatory variables included as predictors. Fitting a model with both the at-risk and prior risk assessment variables included as predictors was not an option, as only fallers with a prior risk assessment could have a non-missing value on the at-risk variable. We chose to exclude the at-risk variable because of its strong correlation (r = 0.56) with the protocol in place variable.

Outcomes of Unassisted and Assisted Falls—In a separate set of analyses, we modeled injury as an outcome. Using hierarchical logistic regression models, we assessed the effects on the odds of injury of falling unassisted, as well as the effects of the six explanatory variables used in the multiple-predictor model as described. As in the previous analysis, we estimated cORs using single-predictor models and aORs by using a multiple-predictor model. The dependent variable in these models was an indicator for whether the fall resulted in any injury.

We further explored the association between falling unassisted and fall-related injuries by using hierarchical logistic regression to estimate the cOR of an unassisted versus assisted fall resulting in each level of injury (minor, moderate, major, and death). In each model the dependent variable was an indicator variable for the injury level of interest, and the explanatory variable was an indicator for whether the fall was unassisted.

Results

There were 166,883 falls reported during the study period. The respective fall rates on medical, surgical, and medical-surgical units were 3.82, 2.74, and 3.47 falls per 1,000 patient-days; the overall rate was 3.44 falls per 1,000 patient-days. Of the total number of falls, 9,259 (5.5%) were repeat falls, which we excluded from the primary analyses. Of the remaining falls, 19,607 (12.4%) were classified as assisted and 134,717 (85.5%) as unassisted, the other 3,300 being unclassified. We dropped the unclassified falls from the dataset and based our primary analyses on the 154,324 nonrepeat classified falls.

Hospitals reported patient age for 148,064 falls (95.9% of the 154,324 falls under study), patient gender for 146,691 falls (95.1%), whether a prior risk assessment had been conducted for 137,835 falls (89.3%), whether the faller was classified as being at risk for 131,770 falls (85.4%), and whether a prevention protocol was in place for 139,557 falls (90.4%). Injury level was missing for 1 fall, and there were no missing data on unit or hospital characteristics.

Characteristics of Unassisted and Assisted Falls

There was no difference in average patient age between assisted (65.2 years) and unassisted (65.3 years) fallers. Counts of unassisted and assisted falls by levels of patient, unit, and hospital characteristic variables are shown in Table 1 (page 361), along with crude and adjusted ORs for falling unassisted versus assisted. Male fallers had higher odds than female fallers of falling unassisted (aOR, 1.39 [95% confidence interval (CI), 1.34, 1.43]), and fallers in units without a fall prevention protocol in place had higher odds of falling unassisted than those with a protocol in place (aOR, 1.39 [95% CI, 1.32, 1.46]). Compared with falls on surgical units, falls on medical units were more likely to be unassisted (aOR,

1.49 [95% CI, 1.39, 1.60]), as were falls on medical-surgical units (aOR, 1.35 [95% CI, 1.26, 1.44]). Hospital teaching status and size were not significant predictors of falling unassisted in any model.

Outcomes of Unassisted and Assisted Falls

Crude and adjusted ORs for a fall resulting in any injury (versus no injury) are shown in Table 2 (above). The strongest predictor of injury was the indicator variable for whether the fall was unassisted; unassisted fallers had significantly higher odds of injury than assisted fallers (aOR, 1.59 [95% CI, 1.52, 1.67]). Falls by males (versus females), on medical (versus surgical) units, in nonteaching (versus teaching) hospitals, and in small (versus large) hospitals were also associated with higher odds of injury.

Crude ORs for an unassisted versus assisted fall resulting in each level of injury, as compared with no injury, are shown in Table 3 (above). The odds of each level of injury except death were significantly higher for unassisted falls than for assisted falls, and all cOR estimates exceeded 1.50. The cOR for death was not statistically significant, which is not surprising, given the small number of deaths observed in the study (75) and the large standard error of the odds ratio estimate. However, it is worth noting that 94.7% of the fall-related deaths in the study resulted from unassisted falls.

Repeat Fall Events

Although our focus was nonrepeat falls, we also examined the 9,259 repeat falls in the study (9,036 of which were classified as assisted or unassisted). Documented prevention protocols were reported to be in place for a smaller proportion of the classified nonrepeat falls (75.1%) than of the classified repeat falls (86.1%). Nevertheless, the proportion of falls unassisted was only slightly higher for nonrepeat falls (87.3%) than for repeat falls (86.4%).

Discussion

Benchmarking in health care is a process integral to quality improvement and is increasingly used in health services research. It allows organizations to understand their strengths and weaknesses, realize what level of performance is possible by comparing to other organizations, and promote changes and improvements.[30,31] To be useful, patient safety metrics must be valid, reliable, and feasible to collect, and the resultant data must support the intended use.[32] Thus, we examined the assisted/unassisted fall classification, which is used by the NDNQI and others,[33] in addition to the injurious/noninjurious classification.

Consistent with the findings of Krauss et al.,[11] we found that unassisted falls were associated with higher odds of injury than assisted falls, including higher odds of minor, moderate, and major injury. To our knowledge, this is only the second published study to quantify the increased risk of injury associated with falling unassisted (versus assisted), and the first to estimate the effects of falling unassisted (versus assisted) on the likelihood of specific levels of injury.

Importantly, when falls tend to occur with assistance it suggests that staff have identified at-risk patients and are in attendance during mobilization activities, two important processes of

care. Indeed, we found that lack of a fall prevention protocol was significantly associated with higher odds of a fall being unassisted. That is, although prevention protocols did not prevent the patient falls in this study, they seem to have increased the likelihood of falling assisted rather than unassisted.

We also found several patient and unit characteristics associated with increased risk of falling unassisted. Among patients who fell, males were more likely than females to fall unassisted. We can only speculate about the reasons for this finding, but two explanations seem reasonable. Male patients may tend to overestimate their ability to ambulate, and they may be less willing to ask for assistance when needed, particularly during toileting, when many falls occur.[18] Consistent with our finding that male patients are more likely than females to fall unassisted, others have reported that males are more likely than females to fall[34] and more likely than females to sustain a fall-related injury.[11]

We observed interesting differences among the three unit types. Fallers on medical units were most likely to fall unassisted, and fallers on surgical units were least likely to fall unassisted. One explanation is that a greater proportion of falls on surgical units (and, to a lesser extent, on medical-surgical units) occur while patients are regaining mobility postoperatively by ambulating with assistance. The percentages of falls unassisted on medical (88.6%), medical-surgical (87.4%), and surgical (84.1%) units in our study were slightly higher than the percentage unassisted reported by Lee and Stokic in a study of falls in the rehabilitation setting (82.4%).[25]

In our analysis of repeat falls, we found that a higher percentage of repeat falls than first-time falls occurred with a prevention protocol in place. This seems positive, as hospital staff are apparently implementing prevention protocols after a patient's first fall, but it is troubling that so many repeat falls are occurring, even with prevention measures in place, and that about the same proportion of repeat falls as first-time falls were unassisted.

This study has several limitations. NDNQI participation is voluntary, and hospitals decide which of their units collect data and on which NDNQI indicators. Very small hospitals and for-profit hospitals tend to be underrepresented in the NDNQI, and metropolitan and Magnet-designated facilities tend to be overrepresented.[3536] However, the fall rate we observed was within the range of rates reported in other studies,[5] and we doubt that the patients and falls in our sample were markedly different from other patients and falls nationwide. Moreover, the size and geographic diversity of our sample give us confidence in the generalizability of the associations we observed.

Another limitation is that despite the NDNQI's highly standardized data collection and reporting processes, there may be variation among hospitals, and among units within hospitals, in the accuracy with which falls data are reported. Others have reported similar issues in reliance on staff or incident reports.[37,38]

Although most fall prevention efforts are designed to prevent all falls or injurious falls, a more appropriate patient safety goal is reducing unassisted falls, which pose the greatest preventable risk of injury. In prevention and benchmarking efforts based on rates of total or injurious falls, both assisted and unassisted falls are treated as adverse events. From a

quality-of-care perspective we would argue that an assisted fall, particularly during mobilization, is not necessarily a failure for the hospital staff and should not be treated as such.

We believe that focusing on unassisted falls would enable researchers and clinicians to gain more insight into the prevention of fall-related injuries, hopefully leading to more effective prevention methods that do not involve restraints or discourage mobilization. For example, a falls education program in which patients set behavior modification goals (for example, asking for help, waiting for help) proved very effective in reducing falls among older, cognitively intact patients in a randomized controlled trial.[39] One would not expect an educational approach to prevent all falls, but it seems promising as a means of reducing unassisted falls while respecting patient autonomy and encouraging assisted mobilization.

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Table 1

Frequencies and Odds Ratios for Falling Unassisted vs. Assisted

Variable	Level	Unassisted	Assisted	cOR (95% CI)	aOR (95% CI)
Gender	Male	65,534 (89.1%)	8,009 (10.9%)	**1.38 (1.34, 1.43)**	**1.39 (1.34, 1.43)**
	Female	62,521 (85.5%)	10,627 (14.5%)	Referent	Referent
Assessed for risk	Yes	117,794 (87.4%)	17,014 (12.6%)	1.02 (0.91, 1.14)	**1.14 (1.01, 1.29)**
	No	2,570 (84.9%)	457 (15.1%)	Referent	Referent
At risk for fall	No	21,817 (89.5%)	2,570 (10.5%)	**1.35 (1.29, 1.41)**	—
	Yes	93,385 (87.0%)	13,998 (13.0%)	Referent	—
Protocol in place	No	21,182 (89.4%)	2,518 (10.6%)	**1.32 (1.26, 1.39)**	**1.39 (1.32, 1.46)**
	Yes	100,636 (86.9%)	15,221 (13.1%)	Referent	Referent
Unit type	Medical	54,299 (88.6%)	7,004 (11.4%)	**1.52 (1.43, 1.62)**	**1.49 (1.39, 1.60)**
	Medical-surgical	57,531 (87.4%)	8,262 (12.6%)	**1.35 (1.27, 1.44)**	**1.35 (1.26, 1.44)**
	Surgical	22,887 (84.1%)	4,341 (15.9%)	Referent	Referent
Hospital size	< 300 beds	64,576 (87.5%)	9,217 (12.5%)	1.03 (0.98, 1.08)	1.02 (0.96, 1.08)
	≥ 300 beds	70,141 (87.1%)	10,390 (12.9%)	Referent	Referent
Hospital teaching status	Nonteaching	53,982 (87.6%)	7,614 (12.4%)	1.05 (1.00, 1.10)	1.03 (0.97, 1.09)
	Teaching	80,735 (87.1%)	11,993 (12.9%)	Referent	Referent

cOR, crude odds ratio; aOR, adjusted odds ratio; CI, confidence interval; **boldface** type indicates *p* value < .05.

Table 2

Odds Ratios (ORs) for Fall Resulting in Injury

Predictor	Crude OR (95% CI)	Adjusted OR (95% CI)
Fall unassisted	**1.64 (1.57, 1.71)**	**1.59 (1.52, 1.67)**
Male gender	**1.13 (1.10, 1.16)**	**1.12 (1.09, 1.15)**
Assessed for risk	**1.20 (1.09, 1.32)**	**1.22 (1.09, 1.35)**
No protocol in place	1.00 (0.96, 1.04)	1.00 (0.96, 1.04)
Medical unit*	**1.16 (1.09, 1.22)**	**1.08 (1.03, 1.14)**
Medical-surgical unit*	**1.12 (1.06, 1.18)**	1.03 (0.97, 1.09)
Nonteaching hospital†	**1.21 (1.16, 1.26)**	**1.17 (1.12, 1.22)**
Small hospital‡	**1.13 (1.09, 1.18)**	**1.08 (1.03, 1.13)**

CI, confidence interval; **boldface** type indicates $p < .05$.

*Referent is a surgical unit.

†Referent is a teaching hospital.

‡Referent is a large hospital (≥ 300 beds).

Table 3

Injury Frequencies and Crude Odds Ratios (ORs) for Unassisted vs. Assisted Fall Resulting in Injury

Injury	Unassisted*	Assisted	Total	Crude OR† (95% CI)
None	102,125 (86.2%)	16,291 (13.8%)	118,416	Referent
Any	32,591 (90.8%)	3,316 (9.2%)	35,907	**1.64 (1.57, 1.71)**
Minor	27,766 (90.6%)	2,897 (9.4%)	30,663	**1.55 (1.49, 1.62)**
Moderate	2,999 (92.2%)	253 (7.8%)	3,252	**1.74 (1.53, 1.98)**
Major	1,755 (91.5%)	162 (8.5%)	1,917	**1.58 (1.35, 1.86)**
Death	71 (94.7%)	4 (5.3%)	75	2.59 (0.95, 7.10)

CI, confidence interval; **boldface** type indicates p <. 05.

*The injury level for 1 unassisted fall was missing.

†Numerator is odds of injury of the given type for an unassisted fall.