

NATIONAL QUALITY FORUM

Measure Submission and Evaluation Worksheet 5.0

This form contains the information submitted by measure developers/stewards, organized according to NQF's measure evaluation criteria and process. The evaluation criteria, evaluation guidance documents, and a blank online submission form are available on the [submitting standards web page](#).

NQF #: 0202	NQF Project: Patient Safety Measures-Complications Project
(for Endorsement Maintenance Review)	
Original Endorsement Date: Aug 05, 2009 Most Recent Endorsement Date: Aug 05, 2009 Last Updated Date: Oct 05, 2011	
BRIEF MEASURE INFORMATION	
De.1 Measure Title: Falls with injury	
Co.1.1 Measure Steward: American Nurses Association	
De.2 Brief Description of Measure: All documented patient falls with an injury level of minor or greater on eligible unit types in a calendar quarter. Reported as Injury falls per 1000 Patient Days. (Total number of injury falls / Patient days) X 1000 Measure focus is safety. Target population is adult acute care inpatient and adult rehabilitation patients.	
2a1.1 Numerator Statement: Total number of patient falls of injury level minor or greater (whether or not assisted by a staff member) by eligible hospital unit during the calendar month X 1000. Included Populations: • Falls with Fall Injury Level of "minor" or greater, including assisted and repeat falls with an Injury level of minor or greater • Patient injury falls occurring while on an eligible reporting unit Target population is adult acute care inpatient and adult rehabilitation patients. Eligible unit types include adult critical care, step-down, medical, surgical, medical-surgical combined, critical access, adult rehabilitation in-patient.	
2a1.4 Denominator Statement: Denominator Statement: Patient days by Type of Unit during the calendar month. Included Populations: • Inpatients, short stay patients, observation patients, and same day surgery patients who receive care on eligible inpatient units for all or part of a day. • Adult critical care, step-down, medical, surgical, medical-surgical combined, critical access and adult rehabilitation inpatient units. • Patients of any age on an eligible reporting unit are included in the patient day count.	
2a1.8 Denominator Exclusions: Excluded Populations: Other unit types (e.g., pediatric, psychiatric, obstetrical, etc.)	
1.1 Measure Type: Outcome 2a1. 25-26 Data Source: Electronic Clinical Data, Other, Paper Records 2a1.33 Level of Analysis: Clinician : Team 1.2-1.4 Is this measure paired with another measure? No	
De.3 If included in a composite, please identify the composite measure (title and NQF number if endorsed): N/A	

STAFF NOTES <i>(issues or questions regarding any criteria)</i>
Comments on Conditions for Consideration:
Is the measure untested? Yes <input type="checkbox"/> No <input type="checkbox"/> If untested, explain how it meets criteria for consideration for time-limited endorsement:
1a. Specific national health goal/priority identified by DHHS or NPP addressed by the measure <i>(check De.5)</i> : 5. Similar/related endorsed or submitted measures <i>(check 5.1)</i> : Other Criteria:
Staff Reviewer Name(s):

1. IMPACT, OPPORTUNITY, EVIDENCE - IMPORTANCE TO MEASURE AND REPORT
Importance to Measure and Report is a threshold criterion that must be met in order to recommend a measure for endorsement. All three subcriteria must be met to pass this criterion. See guidance on evidence . <i>Measures must be judged to be important to measure and report in order to be evaluated against the remaining criteria. (evaluation criteria)</i>
1a. High Impact: H <input type="checkbox"/> M <input type="checkbox"/> L <input type="checkbox"/> I <input type="checkbox"/> <i>(The measure directly addresses a specific national health goal/priority identified by DHHS or NPP, or some other high impact aspect of healthcare.)</i>
De.4 Subject/Topic Areas <i>(Check all the areas that apply)</i> : De.5 Cross Cutting Areas <i>(Check all the areas that apply)</i> : Care Coordination , Functional Status , Infrastructure Supports : Workforce , Safety , Safety : Complications
1a.1 Demonstrated High Impact Aspect of Healthcare: Affects large numbers , A leading cause of morbidity/mortality , High resource use , Patient/societal consequences of poor quality
1a.2 If "Other," please describe:
1a.3 Summary of Evidence of High Impact <i>(Provide epidemiologic or resource use data)</i> : The measure focus addresses several national health goals and priorities, for example:
1. Recently enacted Centers for Medicare and Medicaid Services regulations limit hospital reimbursement for care related to fall related injuries.
2. The falls measures fits within the priorities set forth by the National Priorities Partnership. Specifically, it fits within the national priority of Making Care Safer(National Priorities Partnership, 2011).
3. As part of their National Patient Safety Goals, The Joint Commission requires hospitals to reduce the risk of patient harm resulting falls and to implement a falls reduction program.
Other evidence: Falls are one of the most common inpatient adverse events, with estimates of between 2 and 5 falls per 1,000 patient days (Agostini, Baker, & Gogardus, 2001; Oliver et al., 2007; Unruh, 2002; Shorr et al., 2002, 2008). In quarter 3 of 2009, fall rates for nursing units in participating NDNQI hospitals averaged 3.2 per 1000 patient days (median = 2.8 per 1000 patient days). About 30% of falls result in injury, disability, or death (Shorr, 2008) – particularly in older adults. Injury falls lead to as much as a 61% increase in patient-care costs and lengthen a patient's hospital stay (Fitzpatrick, 2011). Jorgensen (2011) estimated that by 2020 the direct and indirect costs of injuries related to falls will reach \$54.9 billion. In addition injury falls are a significant source of liability for hospitals.
1a.4 Citations for Evidence of High Impact cited in 1a.3: Agnostini, J.V., Baker, D.I., & Bogardus, S.T. (2001). Prevention of falls in hospitalized and institutionalized older people. In Making health care safer: A critical analysis of patient safety practices (pp. 281-299). Evidence Report/Technology Assessment Number 43, AHRQ publication No. 01-E058. Rockville, MD: Agency for

Healthcare Research and Quality.

Fitzpatrick, M.A. (2011, March). Meeting the challenge of fall reduction [Supplement]. American Nurse Today, p. 1.

Jorgensen, J. (2011, March). Reducing patient falls: A call to action [Supplement]. American Nurse Today, p. 2-3.

National Priorities Partnership. (2011, September). Input to the Secretary of Health and Human Services on Priorities for the National Quality Strategy. Retrieved from: <http://www.qualityforum.org/Home.aspx>

Oliver, D., Connelly, J.B., Victor, C.R. et al. (2007). Strategies to prevent falls and fractures in hospitals and care homes and effect of cognitive impairment. 384, 82.

Shorr, R.I., Guillen, M.k. Rosenblatt, L.C. (2002). Restraint use, restrain orders, and the risk of falls in hospitalized patients. Journal of the American Geriatric Society, 50, 526-529.

Shorr, R.I., Mion, L.C., Chandler, M., et al. (2008). Improving the capture of fall events in hospitals: Combining a service for evaluating inpatient falls with an incident report system. Journal of the American Geriatric Society, 56, 701-704.

Unruh, L. (2002). Trends in adverse events in hospitalized patients. Journal of Healthcare Quality, 24, 4-10.

1b. Opportunity for Improvement: H ☐ M ☐ L ☐ I ☐

(There is a demonstrated performance gap - variability or overall less than optimal performance)

1b.1 Briefly explain the benefits (improvements in quality) envisioned by use of this measure:

Given that:

- (a) the injury falls measure fits within several national priorities; and
 - (b) that there is evidence that falls are one of the most common adverse patient events and a source of significant injury, disability, and/or death; and
 - (c) there is a performance gap (see 1b.2 below),
- there is a major opportunity for quality improvement. We envision that hospitals and units will implement fall prevention programs that are multifactorial and inter-professional. Further, we envision that hospitals will monitor patient fall rates by unit type to determine if prevention programs are working and what adjustments in the prevention programs need to be made. Ideally, a target of zero injury falls is desired. Regional, state, and national comparisons are available to evaluate performance.

1b.2 Summary of Data Demonstrating Performance Gap (Variation or overall less than optimal performance across providers):
[For Maintenance – Descriptive statistics for performance results for this measure - distribution of scores for measured entities by quartile/decile, mean, median, SD, min, max, etc.]

The following are total injury falls per patient day for NDNQI units by type for first quarter 2011.

Unit	Mean(SD),25th percentile, median, 75th percentile
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Adult critical care:	0.28(0.79), 0.00, 0.00, 0.00
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Adult step down:	0.76(0.84), 0.00, 0.58, 1.23
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Adult medical:	0.92(0.96), 0.00, 0.72, 1.33
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Adult surgical:	0.63(0.79), 0.00, 0.45, 0.98
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Adult med-surg combined:	0.82(0.93), 0.00, 0.60, 1.23
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Adult rehabilitation:	1.19(1.36), 0.00, 0.93, 1.69
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Adult critical access:	1.33(2.27), 0.00, 0.65, 1.67
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4.2% of these units had a 0 injury fall rate.

The maximum injury fall rate was 31.49/1000 patient days. This unit was a small ICU that had 3 injury falls in the quarter. The next highest rate was 12.34/1000 patient days.

There are a wide range of injury fall rates across and within unit types, with room for improvement in all unit types. The greatest opportunities for improvement are critical access, rehabilitation, and medical units.

Citation for descriptive statistics:

National Database of Nursing Quality Indicators. (2011). 2011 Quarterly Report: Staffing and Outcome Indicators, National Summary Statistics. Kansas City, KS: Author.

1b.3 Citations for Data on Performance Gap: [*For Maintenance – Description of the data or sample for measure results reported in 1b.2 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*]

The sample was first quarter 2011 NDNQI units by type. Units are those included in the specifications for the patient injury fall measure (adult critical care, step down, medical, surgical, medical-surgical combined, rehabilitation in-patient and critical access).

About 92% of eligible units submitted data for the injury falls measure. Unit types are as follows.

Unit type:	n of units
Adult critical care:	2325
Adult step down:	1583
Adult medical:	2028
Adult surgical:	1442
Adult med-surg combined:	2533
Adult rehabilitation:	514
Adult critical access:	30

Citation for descriptive statistics:

National Database of Nursing Quality Indicators. (2011). 2011 Quarterly Report: Staffing and Outcome Indicators, National Summary Statistics. Kansas City, KS: Author.

1b.4 Summary of Data on Disparities by Population Group: [*For Maintenance –Descriptive statistics for performance results for this measure by population group*]

N/A

1b.5 Citations for Data on Disparities Cited in 1b.4: [*For Maintenance – Description of the data or sample for measure results reported in 1b.4 including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*]

N/A

1c. Evidence (Measure focus is a health outcome OR meets the criteria for quantity, quality, consistency of the body of evidence.)

Is the measure focus a health outcome? Yes ☐ No ☐ If not a health outcome, rate the body of evidence.

Quantity: H ☐ M ☐ L ☐ I ☐ Quality: H ☐ M ☐ L ☐ I ☐ Consistency: H ☐ M ☐ L ☐ I ☐

Quantity	Quality	Consistency	Does the measure pass subcriterion1c?
M-H	M-H	M-H	Yes <input type="checkbox"/>
L	M-H	M	Yes <input type="checkbox"/> IF additional research unlikely to change conclusion that benefits to patients outweigh harms: otherwise No <input type="checkbox"/>
M-H	L	M-H	Yes <input type="checkbox"/> IF potential benefits to patients clearly outweigh potential harms: otherwise No <input type="checkbox"/>
L-M-H	L-M-H	L	No <input type="checkbox"/>
Health outcome – rationale supports relationship to at least one healthcare structure, process, intervention, or service			Does the measure pass subcriterion1c? Yes <input type="checkbox"/> IF rationale supports relationship

1c.1 Structure-Process-Outcome Relationship (Briefly state the measure focus, e.g., health outcome, intermediate clinical outcome, process, structure; then identify the appropriate links, e.g., structure-process-health outcome; process- health outcome; intermediate clinical outcome-health outcome):

Patient fall rate is an individual healthcare outcome. The elements of structure and process related to the outcome of injury fall rate are nursing structure and process. In other words, the injury fall rate will vary based on the number, types (e.g. RN, LPN, UAP),

education, experience, specialty certification or other characteristics of the nursing workforce.

Theoretical Structure-Process-Outcome (SPO) components for patient fall rate and injury fall rate:

Structural components: characteristics of the nursing workforce (examples were listed above), nurse staffing levels, Magnet status (a status awarded by the American Nurses Credentialing Center based on organization and delivery of nursing care within a health care facility), nursing turnover, and nursing work environment.

Process components: fall risk assessment; frequency and recency of the risk assessment; implementation of prevention protocols

Outcomes:

Fall rate (NQF measure number 0141)

Unassisted fall rate (NQF measure number 0141)

Injury fall rate (NQF measure number 0202)

1c.2-3 Type of Evidence (*Check all that apply*):

Selected individual studies (rather than entire body of evidence)

1c.4 Directness of Evidence to the Specified Measure (*State the central topic, population, and outcomes addressed in the body of evidence and identify any differences from the measure focus and measure target population*):

All studies focused on gathering evidence to support that structure of care (nurse staffing and other nursing workforce characteristics) was related to outcomes of care (patient fall rate or injury fall rate).

Studies were included only if they examined patient fall rate/injury fall rate and nursing characteristics/staffing at the UNIT level (as opposed to the hospital level).

1c.5 Quantity of Studies in the Body of Evidence (*Total number of studies, not articles*): 18 studies (at least 6 of the studies used patient fall rate as specified by NQF).

1c.6 Quality of Body of Evidence (*Summarize the certainty or confidence in the estimates of benefits and harms to patients across studies in the body of evidence resulting from study factors. Please address: a) study design/flaws; b) directness/indirectness of the evidence to this measure (e.g., interventions, comparisons, outcomes assessed, population included in the evidence); and c) imprecision/wide confidence intervals due to few patients or events*): **Strengths:** All 18 studies examined patient fall rate and nursing characteristics/staffing at the unit level (as opposed to the hospital level). Most studies used a conceptual framework to guide the testing of the relationships between staffing and fall rate. Most studies used nursing care hours, nursing skill mix, fall rate, and injury fall rate as specified by NQF or very similarly to NQF.

Weaknesses:

Some studies failed to use a hierarchical model of analysis (i.e, patients and nurses nested in units and, in turn, units nested in hospitals). Some studies only examined one aspect of the nursing workforce, for example examining only staffing, rather than examining multiple aspects of such as staffing, experience, education, and certification. Generally, studies are cross-sectional and not experimental.

Process measures (risk assessment and prevention protocol implementation) associated with patient fall rate were not included in any of the studies. Typically patient total fall rate was studied, but not injury fall rate.

1c.7 Consistency of Results across Studies (*Summarize the consistency of the magnitude and direction of the effect*): Seven of the studies (Duffield et al., 2010; Dunton et al. 2004, 2007; Lake et al, 2010; Potter et al., 2003; Sovie & Jawad, 2002; Whitman et al., 2002) found a significant indirect relationship between some aspect of nurse staffing and fall rate or injury fall rate. For example, higher total nursing hours per patient day or higher proportion of hours provided by RNs was related to lower fall rate.

Two of the studies (Bae et al., 2010; Breckenridge-Sproat et al., 2011) found a significant relationship between higher proportion of temporary staff and higher fall rate.

Three studies (Blegen et al., 1998; Dunton et al., 2007; Mark et al., 2003) found a significant relationship between more years of RN

experience and lower fall rates or injury fall rates. Similarly, Kendall-Gallagher & Blegen (2009) found a relationship between the proportion of certified nurses on a unit and lower fall rate.

Five studies (Bolton et al., 2001; Chang et al., 2006; Cho et al., 2003; Donaldson et al., 2005; McGillis et al., 2004) found no relationship between aspects of nurse staffing, nursing characteristics and fall/injury fall rates.

1c.8 Net Benefit (*Provide estimates of effect for benefit/outcome; identify harms addressed and estimates of effect; and net benefit - benefit over harms*):

Two studies provided estimates of the benefit of increasing aspects of staffing or other characteristics of the nursing workforce: Please see section 2b2.3 for these estimates.

Study 1:

Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The relationship of nursing workforce characteristics to patient outcomes. OJIN: The Online Journal of Issues in Nursing, 12(3), Manuscript 4. Retrieved from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume122007/No3Sept07/NursingWorkforceCharacteristics.aspx>

Study 2:

Lake, E. T., Shang, J., Klaus, S., & Dunton, N. E. (2010). Patient falls: Association with hospital Magnet status and nursing unit staffing. Research in Nursing & Health, 33, 413-425. <http://www.ncbi.nlm.nih.gov/pubmed/20824686>

1c.9 Grading of Strength/Quality of the Body of Evidence. Has the body of evidence been graded? **No**

1c.10 If body of evidence graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias: **none**

1c.11 System Used for Grading the Body of Evidence: **Other**

1c.12 If other, identify and describe the grading scale with definitions: **was not graded**

1c.13 Grade Assigned to the Body of Evidence: **not graded**

1c.14 Summary of Controversy/Contradictory Evidence:

1c.15 Citations for Evidence other than Guidelines(*Guidelines addressed below*):

1. Bae, S. H., Mark, B., & Fried, B. (2010). Use of temporary nurses and nurse and patient safety outcomes in acute care hospital units. Health Care Manage Rev, 35(4), 333-344.

2. Blegen, M. A., Goode, C. J., & Reed, L. (1998). Nurse staffing and patient outcomes. Nurs Res, 47(1), 43-50.

3. *Bolton, L. B., Jones, D., Aydin, C. E., Donaldson, N., Brown, D. S., Lowe, M., et al. (2001). A response to California's mandated nursing ratios. J Nurs Scholarsh, 33(2), 179-184.

4. *Breckenridge-Sproat, S., Johantgen, M., & Patrician, P. (2011). Influence of Unit-Level Staffing on Medication Errors and Falls in Military Hospitals. West J Nurs Res.

5. Chang, Y. K., Hughes, L. C., & Mark, B. (2006). Fitting in or standing out: nursing workgroup diversity and unit-level outcomes. Nurs Res, 55(6), 373-380.

6. Cho, S., Ketefian, S., Barkauskas, V.H., & Smith, D. G. (2003). The effects of nurse staffing on adverse events, morbidity, mortality, and medical costs. Nursing Research, 52(2), 71-79.

7. *Donaldson, N., Bolton, L. B., Aydin, C., Brown, D., Elashoff, J. D., & Sandhu, M. (2005). Impact of California's licensed nurse-

patient ratios on unit-level nurse staffing and patient outcomes. Policy Polit Nurs Pract, 6(3), 198-210.

8. *Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The Relationships of Nursing Workforce Characteristics to Patient Outcomes. Online Journal of Issues in Nursing, 12(3) Manuscript 4. Retrieved from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume122007/No3Sep107/NursingWorkforceCharacteristics.aspx>

9. *Dunton, N., Gajewski, B., Taunton, R. L., & Moore, J. (2004). Nurse staffing and patient falls on acute care hospital units. Nurs Outlook, 52(1), 53-59.

10. Duffield, C., Diers, D., O'Brien-Pallas, L., Aisbett, C., Roche, M., King, M., et al. (2010). Nursing staffing, nursing workload, the work environment and patient outcomes. Appl Nurs Res.

11. Kendall-Gallagher, D., & Blegen, M. A. (2009). Competence and certification of registered nurses and safety of patients in intensive care units. Am J Crit Care, 18(2), 106-113; quiz 114.

12. *Lake, E. T., Shang, J., Klaus, S., & Dunton, N. E. (2010). Patient falls: Association with hospital Magnet status and nursing unit staffing. Res Nurs Health, 33(5), 413-425.

13. Mark, B. A., Salyer, J., & Wan, T. T. (2003). Professional nursing practice: impact on organizational and patient outcomes. J Nurs Adm, 33(4), 224-234.

14. McGillis Hall, L., Doran, D., & Pink, G. H. (2004). Nurse staffing models, nursing hours, and patient safety outcomes. Journal of Nursing Administration, 34(1), 41-45.

15. Potter, P., Barr, N., McSweeney, M., & Sledge, J. (2003). Identifying nurse staffing and patient outcome relationships: a guide for change in care delivery. Nurs Econ, 21(4), 158-166.

16. Shuldham, C., Parkin, C., Firouzi, A., Roughton, M., & Lau-Walker, M. (2009). The relationship between nurse staffing and patient outcomes: a case study. Int J Nurs Stud, 46(7), 986-992.

17. Sovie, M. D., & Jawad, A. F. (2001). Hospital restructuring and its impact on outcomes: nursing staff regulations are premature. J Nurs Adm, 31(12), 588-600.

18. Whitman, G. R., Kim, Y., Davidson, L. J., Wolf, G. A., & Wang, S. L. (2002). The impact of staffing on patient outcomes across specialty units. J Nurs Adm, 32(12), 633-639.

*Studies that used the patient fall measure as specified by NQF.

1c.16 Quote verbatim, the specific guideline recommendation (Including guideline # and/or page #):
N/A

1c.17 Clinical Practice Guideline Citation: N/A

1c.18 National Guideline Clearinghouse or other URL: N/A

1c.19 Grading of Strength of Guideline Recommendation. Has the recommendation been graded? No

1c.20 If guideline recommendation graded, identify the entity that graded the evidence including balance of representation and any disclosures regarding bias:

1c.21 System Used for Grading the Strength of Guideline Recommendation: Other

1c.22 If other, identify and describe the grading scale with definitions: was not graded

1c.23 Grade Assigned to the Recommendation: **N/A**

1c.24 Rationale for Using this Guideline Over Others: **N/A**

Based on the NQF descriptions for rating the evidence, what was the developer's assessment of the quantity, quality, and consistency of the body of evidence?

1c.25 Quantity: **High** 1c.26 Quality: **Moderate** 1c.27 Consistency: **Moderate**

1c.28 Attach evidence submission form:

1c.29 Attach appendix for supplemental materials:

Was the threshold criterion, *Importance to Measure and Report*, met?

(1a & 1b must be rated moderate or high and 1c yes) Yes ☐ No ☐

Provide rationale based on specific subcriteria:

For a new measure if the Committee votes NO, then STOP.

For a measure undergoing endorsement maintenance, if the Committee votes NO because of 1b. (no opportunity for improvement), it may be considered for continued endorsement and all criteria need to be evaluated.

2. RELIABILITY & VALIDITY - SCIENTIFIC ACCEPTABILITY OF MEASURE PROPERTIES

Extent to which the measure, as specified, produces consistent (reliable) and credible (valid) results about the quality of care when implemented. (evaluation criteria)

Measure testing must demonstrate adequate reliability and validity in order to be recommended for endorsement. Testing may be conducted for data elements and/or the computed measure score. Testing information and results should be entered in the appropriate field. Supplemental materials may be referenced or attached in item 2.1. See [guidance on measure testing](#).

S.1 Measure Web Page (*In the future, NQF will require measure stewards to provide a URL link to a web page where current detailed specifications can be obtained*). Do you have a web page where current detailed specifications for this measure can be obtained? **Yes**

S.2 If yes, provide web page URL: <http://www.nursingquality.org/>

2a. RELIABILITY. Precise Specifications and Reliability Testing: H ☐ M ☐ L ☐ I ☐

2a1. Precise Measure Specifications. (*The measure specifications precise and unambiguous.*)

2a1.1 Numerator Statement (*Brief, narrative description of the measure focus or what is being measured about the target population, e.g., cases from the target population with the target process, condition, event, or outcome*):

Total number of patient falls of injury level minor or greater (whether or not assisted by a staff member) by eligible hospital unit during the calendar month X 1000.

Included Populations:

- Falls with Fall Injury Level of "minor" or greater, including assisted and repeat falls with an Injury level of minor or greater
- Patient injury falls occurring while on an eligible reporting unit

Target population is adult acute care inpatient and adult rehabilitation patients. Eligible unit types include adult critical care, step-down, medical, surgical, medical-surgical combined, critical access, adult rehabilitation in-patient.

2a1.2 Numerator Time Window (*The time period in which the target process, condition, event, or outcome is eligible for inclusion*):

Calculations are performed to produce monthly injury fall rate per 1000 patient days; then quarterly injury fall rate is calculated as mean of the 3 months.

2a1.3 Numerator Details (*All information required to identify and calculate the cases from the target population with the target process, condition, event, or outcome such as definitions, codes with descriptors, and/or specific data collection items/responses*):

Definition:

A patient injury fall is an unplanned descent to the floor with injury (minor or greater) to the patient, and occurs on an eligible

reporting nursing unit.* Include falls when a patient lands on a surface where you would not expect to find a patient. Unassisted and assisted (see definition below) falls are to be included whether they result from physiological reasons (e.g., fainting) or environmental reasons (slippery floor). Also report patients that roll off a low bed onto a mat as a fall.

Exclude falls:

- By visitors
- By students
- By staff members
- Falls on other units not eligible for reporting
- By patients from eligible reporting units when patient was not on unit at time of the fall (e.g., patient falls in radiology department)

*The nursing unit area includes the hallway, patient room and patient bathroom. A therapy room (e.g., physical therapy gym), even though physically located on the nursing unit, is not considered part of the unit.

Assisted fall is a fall in which any staff member (whether a nursing service employee or not) was with the patient and attempted to minimize the impact of the fall by easing the patient's descent to the floor or in some manner attempting to break the patient's fall, e.g., when a patient who is ambulating becomes weak and the staff lowers the patient to the floor. In this scenario, the staff was using professional judgment to prevent injury to the patient. A fall that is reported to have been assisted by a family member or a visitor counts as a fall, but does not count as an assisted fall. "Assisting" the patient back into a bed or chair after a fall is not an assisted fall.

When the initial fall report is written by the nursing staff, the extent of injury may not yet be known. Hospitals have 24 hours to determine the injury level, e.g., when you are awaiting diagnostic test results or consultation reports.

Injury levels:

None—patient had no injuries (no signs or symptoms) resulting from the fall; if an x-ray, CT scan or other post fall evaluation results in a finding of no injury

Minor—resulted in application of a dressing, ice, cleaning of a wound, limb elevation, topical medication, pain, bruise or abrasion

Moderate—resulted in suturing, application of steri-strips/skin glue, splinting, or muscle/joint strain

Major—resulted in surgery, casting, traction, required consultation for neurological (basilar skull fracture, small subdural hematoma) or internal injury (rib fracture, small liver laceration) or patients with coagulopathy who receive blood products as a result of a fall

Death—the patient died as a result of injuries sustained from the fall (not from physiologic events causing the fall)

Data Elements required: Collected at a patient level

- Month
- Year
- Event Type (injury fall, assisted fall, repeat fall)
- . level of injury
- Type of Unit

Data elements: optional

- . Age
- Gender
- Fall Risk Assessment prior to fall
- Fall Risk score
- . Was patient at fall risk (yes/no)
- . Time since last risk assessment
- Fall Prevention Protocol
- . Whether physical restraints in use at time of fall
- . Prior fall same month

2a1.4 Denominator Statement (*Brief, narrative description of the target population being measured*):

Denominator Statement: Patient days by Type of Unit during the calendar month.

Included Populations:

- Inpatients, short stay patients, observation patients, and same day surgery patients who receive care on eligible inpatient units for all or part of a day.
- Adult critical care, step-down, medical, surgical, medical-surgical combined, critical access and adult rehabilitation inpatient units.
- Patients of any age on an eligible reporting unit are included in the patient day count.

2a1.5 Target Population Category (*Check all the populations for which the measure is specified and tested if any*): **Adult/Elderly Care, Populations at Risk**

2a1.6 Denominator Time Window (*The time period in which cases are eligible for inclusion*):

Calculations are performed to produce monthly patient days; then quarterly patient days are calculated as mean of the 3 months.

2a1.7 Denominator Details (*All information required to identify and calculate the target population/denominator such as definitions, codes with descriptors, and/or specific data collection items/responses*):

Conceptually, a patient day is 24 hours, beginning the hour of admission. The operational definitions of patient day are explained in the section labeled Patient Day Reporting Methods. The total number of patient days for each unit is reported for each calendar month in the quarter.

Short stay patients = Patients who are not classified as in-patients. Variously called short stay, observation, or same day surgery patients who receive care on in-patient units for all or part of a day.

With the growth in the number of short stay patients on in-patient units, the midnight census does not accurately represent the demand for nursing services on many units. Although some facilities have dedicated units for short stay patients, many do not. While the midnight census may be the only measure of patient census available for some facilities, others will have additional information that can be used to produce a patient census that is adjusted to reflect the additional demand for nursing required by short stay patients. Each unit should report patient days using the method that most accurately accounts for the patient work load.

There are five (5) Patient Days reporting methods:

•Method 1-Midnight Census

This is adequate for units that have all in-patient admissions. This method is not appropriate for units that have both in-patient and short stay patients. The daily number should be summed for every day in the month.

•Method 2-Midnight Census + Patient Days from Actual Hours for Short Stay Patients

This is an accurate method for units that have both in-patients and short stay patients. The short stay "days" should be reported separately from midnight census and will be summed by NDNQI to obtain patient days. The total daily hours for short stay patients should be summed for the month and divided by 24.

•Method 3-Midnight Census + Patient Days from Average Hours for Short Stay Patients

This method is the least accurate method for collecting short stay patient hours on units that have both in-patients and short stay patients. The short stay average is to be obtained from a special study documenting the time spent by short stay patients on specific unit types. This pilot study should cover a month of data and should be repeated every year. Average short stay days are reported separately and added by NDNQI with midnight census to obtain patient days. The average daily hours should be multiplied by the number of days in the month and the product divided by 24 to produce average short stay days.

•Method 4-Patient Days from Actual Hours

This is the most accurate method. An increasing number of facilities have accounting systems that track the actual time spent in the facility by each patient. Sum actual hours for all patients, whether in-patient or short stay, and divide by 24.

•Method 5-Patient Days from Multiple Census Reports

Some facilities collect censuses multiple times per day (e.g., every 4 hours or each shift). This method has shown to be almost as accurate as Method 4. Patient days based on midnight and noon census have shown to be sufficient in adjusting for short stay patients. A sum of the daily average censuses can be calculated to determine patient days for the month on the unit.

Data Elements:

- Month
- Year
- Patient Days Reporting method that includes midnight census and short stay patient days
- Type of Unit
- . Patient days
- . Short stay patient days

2a1.8 Denominator Exclusions *(Brief narrative description of exclusions from the target population):*

Excluded Populations: Other unit types (e.g., pediatric, psychiatric, obstetrical, etc.)

2a1.9 Denominator Exclusion Details *(All information required to identify and calculate exclusions from the denominator such as definitions, codes with descriptors, and/or specific data collection items/responses):*

Patient days must be from the same unit as the patient falls.

If unit type is not adult critical care, adult step-down, adult medical, adult surgical, adult medical surgical combined, critical access, or adult rehabilitation inpatient, then unit type is excluded from denominator.

Note: rates are per unit; a hospital total is not calculated.

2a1.10 Stratification Details/Variables *(All information required to stratify the measure results including the stratification variables, codes with descriptors, definitions, and/or specific data collection items/responses):*

Stratification by unit type:

Adult In-patient Patient Population

Limited to units generally caring for patients over 16 years old.

- Critical Care

Highest level of care, includes all types of intensive care units. Optional specialty designations include: Burn, Cardiothoracic, Coronary Care, Medical, Neurology, Pulmonary, Surgical, and Trauma ICU.

- Step-Down

Limited to units that provide care for patients requiring a lower level of care than critical care units and higher level of care than provided on medical/surgical units. Examples include progressive care or intermediate care units. Telemetry is not an indicator of acuity level. Optional specialty designations include: Med-Surg, Medical or Surgical Step-Down units.

- Medical

Units that care for patients admitted to medical services, such as internal medicine, family practice, or cardiology. Optional specialty designations include: BMT, Cardiac, GI, Infectious Disease, Neurology, Oncology, Renal or Respiratory Medical units.

- Surgical

Units that care for patients admitted to surgical services, such as general surgery, neurosurgery, or orthopedics. Optional specialty designations include: Bariatric, Cardiothoracic, Gynecology, Neurosurgery, Orthopedic, Plastic Surgery, Transplant or Trauma Surgical unit.

- Med-Surg Combined

Units that care for patients admitted to either medical or surgical services. Optional specialty designations include: Cardiac, Neuro/Neurosurgery or Oncology Med-Surg combined units.

- Critical Access Unit

Unit located in a Critical Access Hospital that cares for a combination of patients that may include critical care, medical-surgical, skilled nursing (swing bed) and/or obstetrics.

Rehabilitation In-patient Patient Population

Medicare payment policies differentiate rehabilitation from acute care, requiring patients to be discharged from acute care and admitted to a distinct acute rehabilitation unit. Rehabilitation units provide intensive therapy 5 days/week for patients expected to improve.

- Adult

Limited to units generally caring for rehab patients over 16 years old. Optional specialty designations include: Brain Injury/SCI, Cardiopulmonary, Neuro/Stroke and Orthopedic/Amputee Rehab units.

2a1.11 Risk Adjustment Type (Select type. Provide specifications for risk stratification in 2a1.10 and for statistical model in 2a1.13): Other 2a1.12 If "Other," please describe: Stratification is by unit type (e.g., critical care, step down, medical), which is not identical to risk, but may be related.

2a1.13 Statistical Risk Model and Variables (Name the statistical method - e.g., logistic regression and list all the risk factor variables. Note - risk model development should be addressed in 2b4.):

N/A

2a1.14-16 Detailed Risk Model Available at Web page URL (or attachment). Include coefficients, equations, codes with descriptors, definitions, and/or specific data collection items/responses. Attach documents only if they are not available on a webpage and keep attached file to 5 MB or less. NQF strongly prefers you make documents available at a Web page URL. Please supply login/password if needed:

2a1.17-18. Type of Score: Rate/proportion

2a1.19 Interpretation of Score (Classifies interpretation of score according to whether better quality is associated with a higher score, a lower score, a score falling within a defined interval, or a passing score): Better quality = Lower score

2a1.20 Calculation Algorithm/Measure Logic (Describe the calculation of the measure score as an ordered sequence of steps including identifying the target population; exclusions; cases meeting the target process, condition, event, or outcome; aggregating data; risk adjustment; etc.):

Eligible units identified and selected; input patient days (including method) for each respective unit; input number of injury falls for respective unit by month; then perform calculations to produce monthly injury fall rate per 1000 patient days; then calculate quarterly injury fall rate as the mean of the 3 months.

2a1.21-23 Calculation Algorithm/Measure Logic Diagram URL or attachment:

Attachment

Injury Fall Rate Flowchart.pdf

2a1.24 Sampling (Survey) Methodology. If measure is based on a sample (or survey), provide instructions for obtaining the sample, conducting the survey and guidance on minimum sample size (response rate):

N/A

2a1.25 Data Source (Check all the sources for which the measure is specified and tested). If other, please describe:

Electronic Clinical Data, Other, Paper Records

2a1.26 Data Source/Data Collection Instrument (Identify the specific data source/data collection instrument, e.g. name of database, clinical registry, collection instrument, etc.): Database: National Database of Nursing Quality Indicators(R) [NDNQI(R)]; participant hospitals have NDNQI guidelines and Excel spreadsheets to guide data collection; data are provided to NDNQI via a secure web-based data entry portal or XML upload.

Original sources for injury falls are incident reports, patient medical records (including electronic health records).

2a1.27-29 Data Source/data Collection Instrument Reference Web Page URL or Attachment: [URL](http://www.nursingquality.org/)
<http://www.nursingquality.org/>
 none needed - Reference on left-hand side of web page: "ANA's NQF-Endorsed Measure Specifications"

2a1.30-32 Data Dictionary/Code Table Web Page URL or Attachment:
[Attachment](#)
[falls codebook-634488471691406810.pdf](#)

2a1.33 Level of Analysis (*Check the levels of analysis for which the measure is specified and tested*): [Clinician : Team](#)

2a1.34-35 Care Setting (*Check all the settings for which the measure is specified and tested*): [Hospital/Acute Care Facility, Post Acute/Long Term Care Facility : Rehabilitation](#)

2a2. Reliability Testing. (*Reliability testing was conducted with appropriate method, scope, and adequate demonstration of reliability.*)

2a2.1 Data/Sample (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

NOTE: The three studies presented in this section (reliability, 2a2) were designed by NDNQI to test both the reliability AND validity of the patient falls and injury falls measure. Both the reliability and validity are reported together here so the sample description and analytic methods do not have to be repeated in section 2b, validity.

THE FALL RELIABILITY AND VALIDITY TESTING CONSISTED OF THREE STUDIES:

STUDY 1: Site coordinator survey and interviews

Aim: To clarify data collection processes, personnel involved in data collection and reporting, and attitudes towards the collected fall data.

NOTE: The results of Aim 1 are reported in the Feasibility section of this submission.

Method: First, telephone interviews were conducted with a convenience sample of National Database of Nursing Quality Indicators (NDNQI) site coordinators to identify core processes and key personnel involved in fall data collection. Each NDNQI participating hospital has a site coordinator who is the vital link for ensuring that hospital collects and reports data according to NDNQI guidelines.

Second, based on the interview results, an online survey was developed to obtain descriptive information on fall data collection in NDNQI hospitals from all site coordinators. All 1,244 site coordinators (year 2010) of NDNQI facilities received an invitation to participate in the online survey and 727 responded, resulting in a response rate of 58.4%. The comparison of the NDNQI population with the survey respondents found virtually no difference between all NDNQI hospitals and respondent hospitals by hospital type and only limited differences by hospital size and teaching status. These small differences should not produce meaningful bias in the representativeness of the site coordinator survey. Eighty-three percent of the responding site coordinators were RNs and 51% had been in this role for more than two years.

STUDY 2: Online video vignette reliability and validity study

Aim:

1. To assess consistency (reliability) between direct care providers and expert raters on categorization of different fall scenarios at the unit level, and
2. To assess sensitivity and specificity (validity) of fall categorization (fall vs. non-fall).

To assess reliability and validity, we used an online survey that contained 20 fall-related video scenarios that could be rated as fall, non-fall, or unclear scenarios. To determine which of the scenarios entailed a fall, non-fall, or an unclear situation, a group of experts were asked to rate the scenarios (expert judgment) according to the NDNQI data collection guidelines and the NDNQI definition of falls. Although the site coordinator survey indicated that about half of direct care providers received some kind of

training related to NDNQI's definition, we did not imply or provide the NDNQI definition to direct care providers in the online survey. This enabled us to analyze the current performance of direct care provider judgments of fall situations. Therefore, the judgment of direct care providers would not necessarily be expected to align with the expert judgments or the NDNQI fall definition.

Fall Scenarios

The study design was based on a previous Australian study (Haines, Massey, et al. 2009), which let direct care providers rate fall scenarios on a DVD. Videos used by the Australian study were kindly provided to NDNQI. However based on discussions with site coordinators and NDNQI staff, additional scenarios were developed. A set of 24 scenarios were recorded. All online video scenarios were rated as fall or non-fall situations according to NDNQI guidelines by a group of 24 experts. This group of experts consisted of NDNQI staff, staff from the American Nurses Association (ANA), and fall researchers. Fifty-eight percent of the experts were registered nurses, 21% advanced practice nurses, and 20% were researchers with various backgrounds like medicine, biostatistics, or physical therapy. Twenty-five percent of the experts had bachelor's degrees, 29% master's degrees and 46% had doctoral degrees. To identify unambiguous scenarios, we tested whether the rating deviated significantly from 50% based on a Beta distribution. Sixteen out of 24 scenarios were determined to be unambiguous fall or non-fall situations according to NDNQI guidelines; however eight of the scenarios did not achieve an unambiguous rating by the experts.

Three videos referring to falls of personnel, falls of visitors, and falls outside the unit were excluded from the hospital unit personnel survey. The scenarios also included repetitions of certain vignettes to investigate the stability of the rater's judgment. One of these repetitions was excluded from survey because the scenario was rated as unclear by the experts.

See supplemental material for links to each fall scenario.

Haines, T. P., B. Massey, et al. (2009). "Inconsistency in classification and reporting of in-hospital falls." *J Am Geriatr Soc* 57(3): 517-523.

Unit Selection & Eligibility

Data collection for the video survey was focused on the unit level and targeted to the unit types in NDNQI eligible for data collection on falls (Critical Care-Adult, Step Down-Adult, Medical-Adult, Surgical-Adult, Medical-Surgical Adult, and Rehabilitation Adult). Additionally, only units that have reported fall data to NDNQI the previous four quarters were considered eligible.

Sample Size

For the calculation of the sample size with 80% power and alpha-level of .05 we assumed at least 10 fall/non-fall scenarios with a minimum difference of 10% between units. This led to an estimated sample size of 180 units per unit type with at least 5 responses each.

Sample

The initial call to participate in the fall reliability study was sent out by email to a random sample of 1,200 units with 594 site coordinators representing 662 hospitals. A low response resulted in an email inviting all remaining units that met the inclusion criteria to participate. In this second email, 369 site coordinators representing 1,784 units in 396 hospitals were contacted. In summary 910 site coordinators representing 963 hospitals with 2,984 eligible units were invited to participate in the study. In the end, 615 units in 247 hospitals with 206 site coordinators agreed to participate in the study. 8,655 out of 21,043 (41.1%) eligible participants submitted responses to the online survey. Due to a technical error, missing information on the number of eligible participants, or low response rates, unit-level response rates could only be calculated for 404 units. The median response rate for units was 39.3% and the mean response rate was 48.3%.

The sample was focused on units rather than individuals. The unit sample includes only responses from individuals could be unambiguously assigned to units and with at least five respondents per unit, without restrictions regarding missing data across variables (nindiv=6,446; nunit=362; nhospital=170). Multiple imputations through the EMB (expectation maximization with bootstrapping) algorithm of Amelia II (Honaker, King et al. 2010) were used to replace missing values, which were treated as missing at random (MAR). Overall, participating units had characteristics similar to all eligible units. Critical care units were under-represented, while rehabilitation units were over-represented. Participating units were less likely than expected to come from the smallest hospitals and from academic medical centers.

STUDY 3 Online injury fall written scenario reliability and validity study

Aims:

1. To assess consistency (inter-rater reliability) of injury level assignment among raters of the fall injury scenarios.
2. To determine if the fall scenarios could appropriately predict the severity of injury falls. We approached this by conducting a two-step Factor Analysis. First, an Exploratory Factor Analysis (EFA) was conducted to identify the possible latent factor structure of the injury levels. Second, a Confirmatory Factor Analysis (CFA) using structural equation modeling was used to verify the factor structure identified from the previous EFA step.

To assess reliability, we used an online survey that contained 15 fall-related scenarios. Each scenario could be rated as non-injurious fall, minor injury, moderate injury, major injury, or death. Several scenarios for each injury level (none to death) were generated using sample de-identified fall incident reports. As a pilot study, 17 NDNQI staff members and 101 NDNQI site coordinators were invited to rate each scenario on injury level and to provide comments to improve the clarity and 'realism' of the scenarios. Sixty-two persons responded to the survey for a response rate of 52.5%. Each scenario was revised based on injury level assignment and comments.

Next, 1159 NDNQI site coordinators were invited to rate the 15 revised scenarios as non-injurious fall, minor injury, moderate injury, major injury, or death. The site coordinators were instructed to involve other hospital personnel who normally would be responsible for making the final decision about injury category. They also were instructed to classify the injury level according to NDNQI guidelines. There were 461 respondents to the survey for a response rate of 40%. The typical respondent was a registered nurse (91%), held a masters or higher degree (60%), and worked in nursing management (40%) or quality improvement (31%).

Using the general guideline of 10 respondents per item (scenario here) for factor analysis, 461 respondents were more than adequate for analysis.

2a2.2 Analytic Method (*Describe method of reliability testing & rationale*):

STUDY 1

Descriptive analysis was used for the site coordinator survey. Content analysis was employed with the interview data to describe the fall data collection process.

STUDY 2

The reliability analysis employed the following methods. First was to compare the ratings of experts and direct care providers to determine if fall assessments were consistent between groups. The second step explored how common the respective fall scenarios were and if there were differences between different unit types. Based on a single item asking for the occurrence of the fall situation, all scenarios were rank ordered by frequency. Third we employed expert and majority judgments to conduct a rater to standard analysis.

To assess validity, the sensitivity and specificity of assignment of 14 scenarios to the category of fall or non-fall was used. This approach used the expert judgments to define the standard. In this case, respondents answers to the 10 fall scenarios were used to calculate the sensitivity (correctly responding that a scenario was a fall) and to the 4 non-fall scenarios were used to calculate specificity (correctly responding that a situation was a non-fall). Ambiguous scenarios were excluded from the expert judgment analysis.

These analyses were chosen to (a) assess consistency of a standardized rating (NDNQI guidelines) among groups (reliability); and (b) accuracy of categorization to a fall or non-fall (validity).

STUDY 3

Aim 1: To assess consistency (reliability) of responses (assignment to injury category) among respondents, intra-class correlations across the fall scenarios were calculated using ICC(1,k).

Aim 2: To assess validity of responses we employed factor analysis as follows:

First, scenarios were scored as correct (assignment to correct injury category according to NDNQI guidelines) or incorrect.

Second, due to the nature of dichotomous data, tetrachoric correlation was selected to be the most appropriate correlational method to serve as the basis of exploratory factor analysis. Unlike Pearson's correlation for continuous data, tetrachoric correlation

estimates correlations among dichotomously measured variables as if the variables were made on a continuous scale. We conducted an EFA with categorical factor indicators in Mplus software, which conveniently incorporates tetrachoric correlation into the analysis.

Third, we conducted a Confirmatory Factor Analysis with categorical factor indicators using structural equation modeling in Mplus software to confirm the factor structure identified in the EFA.

2a2.3 Testing Results *(Reliability statistics, assessment of adequacy in the context of norms for the test conducted):*

STUDY 1 RESULTS -- see Feasibility section of this submission.

STUDY 2 RESULTS

RELIABILITY RESULTS

Consistency of expert and direct care provider judgment

The consistency between the expert ratings and the ratings of the direct care providers showed high agreement for almost all scenarios within a range of -9% to +7% differences. However, two scenarios were less often judged as fall situations by direct care providers than by the experts (-25% and -32%). Both scenarios are fall situations that would be rated as "assisted falls" according to NDNQI guidelines. However, because NDNQI did not collect data on assisted falls, this could explain, to some extent, the difference between experts and direct care providers. NOTE: NDNQI has begun collecting assisted fall rates. See the Release Notes section of the NQF online submission form.

Rater to Standard Analysis

Two different approaches (one a reliability approach described here and one a validity approach described in the validity section of this submission form) were used to determine the standard according to which a scenario was judged to be a fall, non-fall, or an unclear situation. For reliability the majority judgment was the category with the highest percentage of direct care provider ratings. This approach allowed us to include all scenarios in the analysis. The overall agreement was expressed by a binary variable (0=deviating from majority rating, 1= consistent with majority rating). Based on this approach a generalized linear mixed model including random effects for individuals, scenarios, units and hospitals (four levels) and unit type as a fixed effect was specified to produce an estimate for overall rater-to-standard agreement.

Majority Judgment

The overall agreement in the model was 85%. Except for rehabilitation units (86.3%) no significant differences were found by unit type. Empirical Bayes analysis with a unit level random effect showed that no units deviated from the grand mean. Just 8 out of 170 hospitals (4.7%) deviated from the mean.

Scenario Frequency

To assess how common each fall scenario was, respondents were asked to rate how recently they had seen each scenario. One item ("Have you experienced this scenario in your clinical practice?") offered four response options ("Yes, not long ago (up to four weeks)", "Yes, some time ago (1-12 months)", "Yes, but I cannot remember when (more than 12 months)", "No, never seen this"). Two approaches were considered to rank the scenarios by frequency: (1) by calculating the mean based on all four response options or (2) by dichotomizing the variable in two groups (1="Yes, not long ago (up to four weeks)"; 0=all other response options) and then calculating the mean. While both approaches correlate very highly ($r=0.81$) the latter approach permits a clear interpretation in terms of the percentage of respondents that have seen a fall in the last four weeks. Therefore the second option was chosen. Based on this definition, unconditional generalized random effects models were calculated with unit type as group factor. The means calculated through this method were adjusted for the unbalanced sample sizes in each group. Furthermore, the random coefficients with prediction intervals permits the determination of whether unit type means deviate from the grand mean (see Appendix B for unit type differences).

On average, a scenario had been "experienced" by 3.5% of the respondents during the last four weeks (Table 7). The most common scenario (patient found on the floor) was experienced by 9.4% of the respondents; the least common scenario (patient A runs over patient B) was experienced only by 0.6% of the cases. The unclear scenarios were ranked in terms of "seen recently" or "very rare". Four unclear scenarios are relatively common and are apparently difficult to judge as a fall by direct care providers.

VALIDITY RESULTS

Based on the expert judgment, ten vignettes were determined to be falls, while four were judged to be non-falls. Identified fall and

non-fall scenarios were used to calculate sensitivity and specificity. Sensitivity describes the rate of correctly identified fall situations, while specificity expresses the rate of correctly identified non-fall situations. Sensitivity from the expert judgment model was 91.4 % with significantly higher sensitivity for Medical-Surgical (93.1%) and Rehabilitation units (94.7%). Empirical Bayes for the unit level random effect showed no units deviated from the grand mean. Twelve out of 170 hospitals (7.1%) deviated from the mean.

Specificity from the expert judgment model was 95.7 %, with lower specificity for Medical-Surgical units (93.1%). Empirical Bayes for the unit level random effect showed four units deviated from the grand mean, representing 1.1% of the units included in the model (Figure 6). Two out of 170 hospitals (1.2%) deviated from the mean.

STUDY 3 RESULTS

Two of the scenarios were determined to be complex, which resulted in a wide variance of injury category assignment. In one of these scenarios the sequence of events was unclear (fall caused death? or death caused fall?), and in the second scenario the patient fell and then was dropped by staff as they were assisting the patient back to bed-- leading to confusion about injury category assignment. These scenarios were discarded, leaving 13 scenarios (items) for analysis.

RELIABILITY RESULTS

Across the remaining 13 scenarios, intra-class correlation [ICC(1,k)] was .85, indicating high inter-rater reliability.

VALIDITY RESULTS (see supplemental materials for tables and diagrams, and scenarios)

Exploratory Factor Analysis (EFA)

Based on Kaiser's criterion (retaining factors with Eigenvalues greater than 1), four factors were considered. Upon further examination of the factor loadings with Promax rotation, the majority of items (scenarios) loaded high on the first two factors with the exception of scenario 10. Scenario 10 loaded high on the fourth factor and none of the scenarios loaded on the third factor. Based on the initial assessment, a two factor structure was deemed the best solution and theoretically relevant.

The EFA was repeated on a two factor model with Promax rotation (RMSEA = 0.051). The aim of the EFA is to identify underlying factor structure that could be used to predict the severity of injury falls. The results clearly indicate two latent factors: None/Minor Injuries and Moderate/Major Injuries). Scenarios that met a criterion of .40 for factor loading were retained for the confirmatory factor analysis (CFA) in step 2. Scenario 5 (0.161) and scenario 11 (0.247) both loaded higher on the second factor; however, they were excluded from further analysis for failing to meet the 0.40 loading criterion. Both scenario 5 and 11 were self-reported falls by patients.

Confirmatory Factor Analysis

We next conducted a CFA with categorical factor indicators using structural equation modeling in Mplus to confirm the factor structure identified in the EFA. We began the analysis by first identifying the model through a CFA diagram (Figure 1 in supplemental materials). The model was specified using the two factors measured by the 11 scenarios, with each item assigned to the relevant factor.

CFA utilizes several statistical indices to determine the adequacy of model fit to the data. The results from the initial CFA procedure did not indicate a good model fit (CFI = 0.883, TLI = 0.878, RMSEA = 0.06). In order to improve the fit of the measurement model, we repeated the CFA procedure by removing scenario 13 from the model (Figure 2 in supplemental materials). The final CFA assessment confirmed a good model fit and our hypothesis that a relationship between the 10 observed items and the two underlying latent factors exist (CFI = 0.95, TLI = 0.945, RMSEA = 0.042).

Findings from step 2 confirm that the 10 scenarios from the injury falls survey resulted in latent structures that are appropriate for predicting the severity of the injury falls, and thus supporting the validity (accuracy) of survey respondents categorization of fall scenarios.

OVERALL CONCLUSIONS

1. NDNQI is doing well in obtaining standardized classifications of injury and non-injury falls.
2. Continue to encourage site coordinators to call NDNQI to get help with classifying complex injury falls situations.

See supplemental materials for more detailed tables and figures on all aspects of this study.

2b. VALIDITY. Validity, Testing, including all Threats to Validity: H ☐ M ☐ L ☐ I ☐

2b1.1 Describe how the measure specifications (*measure focus, target population, and exclusions*) are consistent with the evidence cited in support of the measure focus (*criterion 1c*) and identify any differences from the evidence:

Criterion 1c states that for an outcome measure, rationale and evidence supports the relationship of the outcome (injury falls) with processes or structures of care (or SPO relationships). As an outcome measure, rationale would support that workforce elements (structure) such as nurse staffing, skill mix, RN education, and RN experience would impact patient fall rate and/or injury fall rate. Two studies are described below that provide support for the relationship of structure (nurse staffing and other nursing workforce characteristics) with outcome (patient injury fall rate). The support of these relationships provides evidence of construct validity for the patient injury falls measure. Study 1 was conducted by NDNQI staff and Study 2 used NDNQI data and included NDNQI staff as investigators.

Study 1:

Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The relationship of nursing workforce characteristics to patient outcomes. OJIN: The Online Journal of Issues in Nursing, 12(3), Manuscript 4. Retrieved from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume122007/No3Sept07/NursingWorkforceCharacteristics.aspx>

Study 2:

Lake, E. T., Shang, J., Klaus, S., & Dunton, N. E. (2010). Patient falls: Association with hospital Magnet status and nursing unit staffing. Research in Nursing & Health, 33, 413-425. <http://www.ncbi.nlm.nih.gov/pubmed/20824686>

Both of these publications are provided in the attached supplemental materials.

2b2. Validity Testing. (*Validity testing was conducted with appropriate method, scope, and adequate demonstration of validity.*)

2b2.1 Data/Sample (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

Study 1:

Annualized measures were calculated from NDNQI quarterly data for the period from July 1, 2005, through June 30, 2006. RN characteristics from the RN survey were matched to quarterly data on staffing and outcomes on the basis of the quarter in which the survey month occurred. The hospital unit was the unit of analysis and included 1,610 critical care, step down, medical, surgical, combined medical-surgical, and rehabilitation units.

Study 2:

This was a retrospective cross-sectional observational study using 2004 NDNQI data. These data were obtained in 2006. The sample contained 5,388 nursing units (intensive care, stepdown, medical, surgical, medical-surgical, and rehabilitation) in 636 hospitals. Data external to the NDNQI included hospital characteristics from the American Hospital Association (AHA) 2004 Annual Hospital Survey, the Medicare Case-Mix Index (CMI), and the hospital's Magnet status.

NOTE: The three studies presented in the Reliability Section above, 2a2 were designed by NDNQI to test both the reliability AND validity of the patient falls measure. Both the reliability and validity were reported together above so the sample description and analytic methods would not have to be repeated in the current section 2b, Validity. Please refer to these three studies as evidence of validity as well.

2b2.2 Analytic Method (*Describe method of validity testing and rationale; if face validity, describe systematic assessment*):

Study 1:

The analysis proceeded in two phases. First, an exploratory analysis using regression trees examined the relationship between several nursing workforce characteristics and the adverse events of patient falls. The models included five hospital characteristics (staffed bed size, teaching status, metropolitan location, Magnet status, and ownership), six unit types, and 20 nursing workforce

attributes. Regression trees sequentially identified independent variables most highly related to the dependent variable, in this case the fall rate. The regression trees were used to narrow the number of indicators to be included in the formal modeling, comprising the second phase of the analysis. The formal modeling was conducted using mixed linear models, which are hierarchical and account for the dependencies among units within the same hospital. Each patient outcome was related to three hospital characteristics, six unit types, and eight nursing workforce characteristics.

Study 2:

Descriptive statistics were used to summarize the data. To explore staffing patterns in greater depth, the distribution of hours for each type of nursing staff was examined. Bivariate associations between all nursing factors (RN, LPN, and NA Hppd, RN education, certification, and employment status) and the patient fall rate were examined. Nursing factors found to be statistically significant were analyzed as independent variables in multivariate models. The independent variables were specified at two different levels consistent with their multilevel effects. The Magnet/non-Magnet comparison was at the hospital level. The staffing and RN composition variables' effects were at the nursing unit level.

2b2.3 Testing Results *(Statistical results, assessment of adequacy in the context of norms for the test conducted; if face validity, describe results of systematic assessment):*

Study 1:

The results indicated that lower fall rates were related to higher total nursing hours (including RN, LPN/LVN, and unlicensed nursing assistants) per patient day, a higher percentage of nursing hours supplied by RNs, and a higher percentage of nurses on a unit with more than 10 years experience in nursing.

- For every increase of one hour in total nursing hours per patient day, fall rates were 1.9% lower.
- For every increase of 1 percentage point in the percent of nursing hours supplied by RNs, the fall rate was 0.7% lower.
- For every increase of a year in average RN experience, the fall rate was 1% lower.
- Fall rates were highest on rehabilitation units and lowest on critical care units.
- Fall rates in Magnet facilities were 10.3% lower than rates in non-Magnet facilities.

To promote the lowest fall rates, nurse managers could simultaneously optimize total nursing hours and both percentage of hours supplied by RNs and RNs with longer experience in nursing. For example, by increasing nursing hours from 6 to 7 hours per patient day, increasing the percentage of hours supplied by RNs from 60% to 70%, and increasing the average experience of RNs by 5 years, the fall rate would, on average, be reduced by 7.7%.

Study 2.

The fall rate was 5% lower in Magnet than non-Magnet hospitals. An additional registered nurse (RN) hour per patient day was associated with a 3% lower fall rate in ICUs. An additional licensed practical nurse (LPN) or nursing assistant (NA) hour was associated with a 2–4% higher fall rate in non-ICUs. Patient safety may be improved by creating environments consistent with Magnet hospital standards.

The results of Study 1 and Study 2 are in alignment with the evidence cited in section 1c.4 to section 1c.8 and section 1c.15. The studies cited in the evidence section also found significant relationships between higher total nursing hours per patient day, higher percent of nursing hours supplied by RNs, and higher RN years of experience with lower falls rates. Results in all studies varied by unit type and Magnet status.

POTENTIAL THREATS TO VALIDITY. *(All potential threats to validity were appropriately tested with adequate results.)*

2b3. Measure Exclusions. *(Exclusions were supported by the clinical evidence in 1c or appropriately tested with results demonstrating the need to specify them.)*

2b3.1 Data/Sample for analysis of exclusions *(Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):*

Exclusions to injury falls are: exclude falls by visitors, students, staff members. These exclusions are to clarify that the measure is only applicable to patients. We have not analyzed these exclusions because they are not patients (i.e., not necessary to analyze).

This measure is a nursing unit level measure. The other exclusion is falls on types of units not eligible for reporting -- for example obstetrics, post-anesthesia care units, psychiatric units, etc. We are currently in the process of 'rolling out' the injury fall rate measure to these other types of units. Note: When this roll out is accomplished, we will report this through annual updates.

2b3.2 Analytic Method (*Describe type of analysis and rationale for examining exclusions, including exclusion related to patient preference*):

N/A

2b3.3 Results (*Provide statistical results for analysis of exclusions, e.g., frequency, variability, sensitivity analyses*):

N/A

2b4. Risk Adjustment Strategy. (*For outcome measures, adjustment for differences in case mix (severity) across measured entities was appropriately tested with adequate results.*)

2b4.1 Data/Sample (*Description of the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included*):

Our main stratification is by unit type (adult critical care, step down, medical, surgical, combined medical surgical, critical access, and rehabilitation in-patient).

In addition to unit type, other stratifications can be done by facility bed size, teaching status, Magnet(R) Designation, Metropolitan status, census division, state, all NDNQI hospitals, case mix index, hospital type (e.g. pediatric, psychiatric), and all adult specialty hospitals.

At this time we do not have a statistical risk model.

2b4.2 Analytic Method (*Describe methods and rationale for development and testing of risk model or risk stratification including selection of factors/variables*):

We provide a descriptive analysis: Mean, standard deviation, median, and percentiles for patient injury fall rate by unit type across all NDNQI member hospitals who submitted fall data in the first quarter (Jan, Feb, Mar) 2011.

2b4.3 Testing Results (*Statistical risk model: Provide quantitative assessment of relative contribution of model risk factors; risk model performance metrics including cross-validation discrimination and calibration statistics, calibration curve and risk decile plot, and assessment of adequacy in the context of norms for risk models. Risk stratification: Provide quantitative assessment of relationship of risk factors to the outcome and differences in outcomes among the strata*):

The following are mean total injury fall rates per 1000 patient days, standard deviations, median, 25th and 75th percentiles for NDNQI units by type for first quarter 2011.

Unit	Mean(SD),25th percentile, median, 75th percentile
Adult critical care:	0.28(0.79), 0.00, 0.00, 0.00
Adult step down:	0.76(0.84), 0.00, 0.58, 1.23
Adult medical:	0.92(0.96), 0.00, 0.72, 1.33
Adult surgical:	0.63(0.79), 0.00, 0.45, 0.98
Adult med-surg combined:	0.82(0.93), 0.00, 0.60, 1.23
Adult rehabilitation:	1.19(1.36), 0.00, 0.93, 1.69
Adult critical access:	1.33(2.27), 0.00, 0.65, 1.67

Results are as one would expect clinically: rates are highest in adult rehabilitation units, medical units, and critical access units -- and lowest in critical care.

Descriptive statistics are from:

National Database of Nursing Quality Indicators. (2011). 2011 Quarterly Report: Staffing and Outcome Indicators, National Summary Statistics. Kansas City, KS: Author

2b4.4 If outcome or resource use measure is not risk adjusted, provide rationale and analyses to justify lack of adjustment: N/A

2b5. Identification of Meaningful Differences in Performance. (*The performance measure scores were appropriately analyzed and discriminated meaningful differences in quality.*)

2b5.1 Data/Sample (Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

Note: This is same study that we conducted and was provided for validity evidence. It is also evidence of meaningful differences in performance.

Study:

Dunton, N., Gajewski, B., Klaus, S., & Pierson, B. (2007). The relationship of nursing workforce characteristics to patient outcomes. OJIN: The Online Journal of Issues in Nursing, 12(3), Manuscript 4. Retrieved from <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TableofContents/Volume122007/No3Sept07/NursingWorkforceCharacteristics.aspx>

2b5.2 Analytic Method (Describe methods and rationale to identify statistically significant and practically/meaningfully differences in performance):

Annualized measures were calculated from NDNQI quarterly data for the period from July 1, 2005, through June 30, 2006. RN characteristics from the RN survey were matched to quarterly data on staffing and outcomes on the basis of the quarter in which the survey month occurred. The hospital unit was the unit of analysis and included 1,610 critical care, step down, medical, surgical, combined medical-surgical, and rehabilitation units.

2b5.3 Results (Provide measure performance results/scores, e.g., distribution by quartile, mean, median, SD, etc.; identification of statistically significant and meaningful differences in performance):

The results indicated that lower fall rates were related to higher total nursing hours (including RN, LPN/LVN, and unlicensed nursing assistants) per patient day, a higher percentage of nursing hours supplied by RNs, and a higher percentage of nurses on a unit with more than 10 years experience in nursing.

- For every increase of one hour in total nursing hours per patient day, fall rates were 1.9% lower.
- For every increase of 1 percentage point in the percent of nursing hours supplied by RNs, the fall rate was 0.7% lower.
- For every increase of a year in average RN experience, the fall rate was 1% lower.
- Fall rates were highest on rehabilitation units and lowest on critical care units.
- Fall rates in Magnet facilities were 10.3% lower than rates in non-Magnet facilities.

To promote the lowest fall rates, nurse managers could simultaneously optimize total nursing hours and both percentage of hours supplied by RNs and RNs with longer experience in nursing. For example, by increasing nursing hours from 6 to 7 hours per patient day, increasing the percentage of hours supplied by RNs from 60% to 70%, and increasing the average experience of RNs by 5 years, the fall rate would be, on average, reduced by 7.7%, which is a CLINICALLY MEANINGFUL result. Also demonstrating the criteria required for a hospital to be designated a Magnet facility produces, on average, a clinically meaningful result: 10.3% lower in Magnet facilities.

2b6. Comparability of Multiple Data Sources/Methods. (If specified for more than one data source, the various approaches result in comparable scores.)

2b6.1 Data/Sample (Describe the data or sample including number of measured entities; number of patients; dates of data; if a sample, characteristics of the entities included):

N/A

2b6.2 Analytic Method (Describe methods and rationale for testing comparability of scores produced by the different data sources specified in the measure):

N/A

2b6.3 Testing Results (Provide statistical results, e.g., correlation statistics, comparison of rankings; assessment of adequacy in the context of norms for the test conducted):

N/A

2c. Disparities in Care: H ☐ M ☐ L ☐ I ☐ NA ☐ (If applicable, the measure specifications allow identification of disparities.)

2c.1 If measure is stratified for disparities, provide stratified results (Scores by stratified categories/cohorts): N/A

2c.2 If disparities have been reported/identified (e.g., in 1b), but measure is not specified to detect disparities, please explain:

N/A

2.1-2.3 Supplemental Testing Methodology Information:

Attachment

FinalScientificSupplementNQF.pdf

Steering Committee: Overall, was the criterion, *Scientific Acceptability of Measure Properties*, met? (Reliability and Validity must be rated moderate or high) Yes ☐ No ☐

Provide rationale based on specific subcriteria:

If the Committee votes No, STOP

3. USABILITY

Extent to which intended audiences (e.g., consumers, purchasers, providers, policy makers) can understand the results of the measure and are likely to find them useful for decision making. (evaluation criteria)

C.1 Intended Actual/Planned Use (Check all the planned uses for which the measure is intended): Payment Program, Public Reporting, Quality Improvement (Internal to the specific organization), Quality Improvement with Benchmarking (external benchmarking to multiple organizations), Regulatory and Accreditation Programs

3.1 Current Use (Check all that apply; for any that are checked, provide the specific program information in the following questions): Public Reporting, Payment Program, Regulatory and Accreditation Programs, Quality Improvement with Benchmarking (external benchmarking to multiple organizations), Quality Improvement (Internal to the specific organization)

3a. Usefulness for Public Reporting: H ☐ M ☐ L ☐ I ☐

(The measure is meaningful, understandable and useful for public reporting.)

3a.1. Use in Public Reporting - disclosure of performance results to the public at large (If used in a public reporting program, provide name of program(s), locations, Web page URL(s)). If not publicly reported in a national or community program, state the reason AND plans to achieve public reporting, potential reporting programs or commitments, and timeline, e.g., within 3 years of endorsement: [For Maintenance – If not publicly reported, describe progress made toward achieving disclosure of performance results to the public at large and expected date for public reporting; provide rationale why continued endorsement should be considered.]

Patient death or serious injury associated with a fall while being cared for in a health care setting has been considered a Serious Reportable Event by the NQF since 2002. Public reporting of these measures is encouraged to provide uniform comparisons across states. Also, injury falls are considered "non-reimbursable serious hospital-acquired conditions" by CMS in order to motivate hospitals to accelerate improvement of patient safety by implementation of standardized protocols. These "never events" limit the ability of the hospitals to bill Medicare for adverse events and complications.

The following states or entities provide public reporting of falls and injury falls:

Colorado Hospital Report Card
<http://www.cohospitalquality.org/>

Falls and Falls with Injury as specified by NQF can be accessed directly through this link:
http://www.cohospitalquality.org/corda/dashboards/COLORADO_REPORT_CARD_BY_MEASURE/main.dashxml#cordaDash=1039

Massachusetts Public Reporting – Patient Care Link
Falls and Falls with Injury as specified by NQF can be accessed through this link:
http://www.patientcarelink.org/nqf/NQF_Hospitals.cfm

Norton Healthcare Public Reporting
Falls and Falls with Injury as specified by NQF can be accessed through this link:

<http://www.nortonhealthcare.com/PatientSafetyIndicators>

Falls are reported by unit type.

Norton Healthcare won the 2011 NQF Quality Healthcare Award for achievement in quality improvement. Norton Healthcare is one of the first healthcare organizations in the nation to publicly report its performance on hundreds of NQF-endorsed quality indicators. A monthly report on the Norton public website displays side-by-side numeric results for each hospital in the system. The report highlights in green or red any result that is significantly better or worse than the national average.

Leapfrog

Leapfrog, which now operates in 38 states, reports the NQF serious reportable events including falls with injury. It's not clear whether the fall rates are the NQF endorsed measure. Currently, approximately 1,300 hospitals participate in the Leapfrog Survey. To view hospitals ratings, visit <http://www.leapfroggroup.org/cp>.

To view the 39 states participating in Leapfrog, visit:

http://www.leapfroggroup.org/for_members/members_resources/regional_roll_outs/1277465

Other Plans for Public Reporting of Falls and Falls with Injury

Ohio plans for hospital performance measure reporting.

In Ohio, the Hospital Measures Advisory Council (HMAC) and a group of data collection and analysis experts, known at the Data Expert Group (DEG) are engaged in focused discussion measures weighing each of them against the "Hospital Performance Measures Criteria for Consideration" document. The criteria considered are; importance, preventability, genuine quality improvement, data integrity, ability to publicly report, burden, evidence-based, variance and NQF endorsement. Both groups believe that, among other measures, falls and falls with injury directly reflect a hospital's performance and are appropriate for public reporting. Additionally, the HMAC asks that hospitals having reported this data to the National Database of Nursing Quality Indicators (NDNQI) during the 2011 calendar year begin reporting these measures to Ohio Department of Health (ODH) in April 2012 for the 2011 calendar year. Hospitals not already reporting these measures to NDNQI would be required to report their data to ODH using the NDNQI specifications, but reporting would not commence until April 2014. Data for both falls and falls with injury would be broken out by units and specialty units.

MAP – Core Safety Data Elements Plan

In the NQF convened Measure Application Partnership (MAP), there is an Ad Hoc Patient Safety Workgroup (focus are hospital acquired conditions [HACs] and readmissions). The draft Patient Safety report has been out for public comment. The MAP is suggesting a core set of patient safety data elements across settings represented by the MAP workgroups (including Hospital, Clinician Office, and Post Acute/Long Term care) and populations (e.g., Medicare, dual eligible, and private pay). The core safety data elements would be used to efficiently calculate quality measures chosen for public reporting and value based purchasing. The NQF-endorsed® measures that address readmissions and the nine HACs emphasized (e.g., injuries from falls and immobility) in the Partnership for Patients safety initiative were identified. The NQF-endorsed ANA falls and falls with injury measures were included in the table of existing NQF-endorsed measures for healthcare acquired conditions.

3a.2. Provide a rationale for why the measure performance results are meaningful, understandable, and useful for public reporting. If usefulness was demonstrated (e.g., focus group, cognitive testing), describe the data, method, and results:

3.2 Use for other Accountability Functions (payment, certification, accreditation). If used in a public accountability program, provide name of program(s), locations, Web page URL(s): [Fall rates are used in credentialing programs such as the Magnet Recognition Program, http://www.nursecredentialing.org/Magnet.aspx](http://www.nursecredentialing.org/Magnet.aspx).

Magnet applicant hospitals are required to provide unit-based, nationally benchmarked nurse-sensitive clinical indicator data related to patient outcomes for the most recent two- year period, including providing quarterly data for every unit for which patient injury falls are applicable.

3b. Usefulness for Quality Improvement: H ☐ M ☐ L ☐ I ☐

(The measure is meaningful, understandable and useful for quality improvement.)

3b.1. Use in QI. If used in quality improvement program, provide name of program(s), locations, Web page URL(s):
[For Maintenance – If not used for QI, indicate the reasons and describe progress toward using performance results for improvement].

The injury falls measure (as specified for NQF) is one of the outcome indicators in the National Database of Nursing Quality Indicators (NDNQI). NDNQI's mission is to aid the nurse in patient safety and quality improvement efforts by providing research-based, national, comparative data on nursing care and the relationship of this care to patient outcomes. Currently there are over 1800 participating hospitals in NDNQI. Website url is: www.nursingquality.org

3b.2. Provide rationale for why the measure performance results are meaningful, understandable, and useful for quality improvement. If usefulness was demonstrated (e.g., QI initiative), describe the data, method and results:

Participating NDNQI hospitals download quarterly reports electronically from the NDNQI website. Reports provide the most current eight quarters of data and a rolling average of those eight quarters with national comparisons at the unit level based on unit type, hospital bed size, teaching status, and other hospital characteristics. For example, injury fall rate is reported for each adult medical unit of a 100-199 bed facility. The means, medians, and percentiles for all medical units in that facility can be compared with national standards for injury fall rate in the same size facilities. The process measures associated with injury falls (e.g., risk assessment, prevention protocols in place) are collected and reported as well as the outcome measure of unit injury fall rate.

The significance of offering the reports at the unit level is that reports provide data regarding the specific site where the care occurs and provides a better comparison among like units. Nurses at participating facilities are also able to identify whether their performance improved after they intervened in an area needing improvement, e.g., a decrease in the injury fall rate due to implementation of a new protocol.

In an online survey in fall 2010, 575 NDNQI site coordinators responded (48% response rate) to questions about usability of NDNQI fall and injury fall reports and 93% strongly agreed or tended to agree that the reports were important for their hospital quality improvement efforts on patient falls.

The percent of site coordinators who reported the following users of NDNQI fall reports was:

User of report (% of site coordinators reporting usage)

Chief Executive Officer (51%)

Chief Nursing Officer (95%)

Quality Improvement personnel (92%)

Risk Management (78%)

Nurse Managers (96%)

Staff Nurses (84%)

NDNQI Site Coordinators (97%)

Here's how the site coordinators said their hospitals used NDNQI Fall and Injury Fall reports:

- 87% identified units with higher than desired fall and injury fall rates.
- 80% set goals for fall and injury fall rates on units.
- 65% created a quality improvement strategy.
- 72% monitored their quality improvement plans.
- About 50% drilled down to proportion of patients who fell who had a prior risk assessment, what proportion of patients were at risk, and what proportion of at risk patients had a prevention protocol in place.

Once hospitals put a fall prevention program in place based on NDNQI fall reports, site coordinators reported the following success at reducing falls:

- 60% reduced total fall rates,
- 55% reduced injury fall rates, and
- 38% reduced the severity of injuries.

In addition, three monographs that demonstrate quality improvement initiatives using the injury fall measure have been published by the American Nurses Association. These monographs are:

Duncan, J., Montalvo, I., & Dunton, N. (2011). NDNQI Case Studies in Nursing Quality Improvement. Silver Spring, MD: American Nurses Association.

Dunton, N., & Montalvo, I. (2009). Sustained Improvement in Nursing Quality: Hospital Performance on NDNQI Indicators, 2007-2008. Silver Spring, MD: American Nurses Association.

Montalvo, I., & Dunton, N. (2007). Transforming Nursing Data into Quality Care: Profiles of Quality Improvement in U.S. Healthcare Facilities. Washington, DC: American Nurses Association.

One example of a quality improvement program is the program at St. Luke's Episcopal Hospital in Houston, TX (Duncan et al, 2011, pp 69-74). To reduce patient falls and injury falls, several strategies were implemented, such as the Patient Falls Prevention Best Practice Team (interdisciplinary), a 3-part fall prevention protocol (visual cues, safety huddles, immediate debriefings), new equipment, additional staff, training, accountability, and monitoring NDNQI patient fall data and comparison data. Outcomes demonstrated a progressive decrease in total and injury falls. In particular, rates on medical and rehabilitation units fell below the NDNQI median.

Overall, to what extent was the criterion, *Usability*, met? H ☐ M ☐ L ☐ I ☐
Provide rationale based on specific subcriteria:

4. FEASIBILITY

Extent to which the required data are readily available, retrievable without undue burden, and can be implemented for performance measurement. (evaluation criteria)

4a. Data Generated as a Byproduct of Care Processes: H ☐ M ☐ L ☐ I ☐

4a.1-2 How are the data elements needed to compute measure scores generated? (Check all that apply).

Data used in the measure are:

generated by and used by healthcare personnel during the provision of care, e.g., blood pressure, lab value, medical condition, Coded by someone other than person obtaining original information (e.g., DRG, ICD-9 codes on claims), Abstracted from a record by someone other than person obtaining original information (e.g., chart abstraction for quality measure or registry)

4b. Electronic Sources: H ☐ M ☐ L ☐ I ☐

4b.1 Are the data elements needed for the measure as specified available electronically (Elements that are needed to compute measure scores are in defined, computer-readable fields): Some data elements are in electronic sources

4b.2 If ALL data elements are not from electronic sources, specify a credible, near-term path to electronic capture, OR provide a rationale for using other than electronic sources:

4c. Susceptibility to Inaccuracies, Errors, or Unintended Consequences: H ☐ M ☐ L ☐ I ☐

4c.1 Identify susceptibility to inaccuracies, errors, or unintended consequences of the measurement identified during testing and/or operational use and strategies to prevent, minimize, or detect. If audited, provide results:

FALL DATA COLLECTION PROCESS

Based on the telephone interviews and online survey results an outline of the fall data collection process was developed. The outline describes the variety of players and components involved in the process, which was used to guide the development of the site coordinator survey. The fall data collection process can be depicted in three phases that involve different groups of staff with diverse roles and requirements. In the INPUT phase direct care providers, with various roles and professional backgrounds, submit a fall incident report. Incident reports are either submitted electronically or on paper with multiple requirements based on the intra- and extra organizational requirements. In the VERIFICATION phase the initial report is checked by the organizational group with fall surveillance responsibility. This group determines if the reported incident is an actual fall and assigns an injury level. In some, organizations incident reports could be processed by more than one department. In the OUTPUT stage, fall data are prepared for

submission to NDNQI. The process is similar to the process underlying the common format initiative of the Agency for Healthcare Research and Quality (2010). The approach of the common format differentiates between the initial "Healthcare Event Reporting Form" (HERF), which represents the input phase and the Summary of Initial Report (SIR), which represents the verification phase described here.

INCIDENT REPORT SYSTEMS

A large majority of NDNQI site coordinators (77%) say their incident reports contain the information needed for reporting patient falls to NDNQI. Twenty-two percent said they have to get additional information (e.g., from the patient record) to complete the NDNQI data requirements. The most commonly missing piece of information in the incident report was whether the fall was a repeat fall.

In 72% of the hospitals, electronic incident report systems were in place. Sixty seven percent of these electronic systems collected all information required by NDNQI. Half of all NDNQI hospital site coordinators have to get additional information from the electronic record in at least 10% of the fall cases.

REPORTING ACCURACY

Fifty-five percent of site coordinators said staff members always do incident reports on non-injurious falls and an additional 30% said reports on non-injurious falls are filed most of the time. Only about 25% of the respondents reported that injury levels were checked again after 24 hours (which is required according to NDNQI guidelines). Another 32% checked only injured or x-rayed patients again within the 24 hour period, while the remaining 44% of respondents relied on the injury level as identified by the initial fall report. However 62% described the accuracy of the fall injury level data as excellent and 36% as good. Seventy-nine percent of site coordinators reported using at least one mechanism (check by nurse or risk managers, comparison to previous quarters or other reports) to verify data before it is submitted to NDNQI.

TRAINING

Almost 70% of site coordinators refer to NDNQI guidelines at least once a year and about a third uses the guidelines once a quarter or more often. Seventy-five percent of the hospitals provide a written tutorial or some sort of in-house training for fall incident reporting, while the remaining hospitals give general information about incident reporting during orientation or no training at all. About two thirds of those facilities that provide training for fall incident reports provide also the NDNQI definition of falls.

In summary site coordinators often refer to NDNQI guidelines and generally follow the guidelines. However the 24 hour check on the injury level of a patient who fell is often not reported. While this likely points to a feasibility issue, it remains unclear how often injury levels change after the 24 hour check. Further investigation is required to explore the impact of this.

4d. Data Collection Strategy/Implementation: H ☐ M ☐ L ☐ I ☐

A.2 Please check if either of the following apply (regarding proprietary measures): [Proprietary measure](#)

4d.1 Describe what you have learned/modified as a result of testing and/or operational use of the measure regarding data collection, availability of data, missing data, timing and frequency of data collection, sampling, patient confidentiality, time and cost of data collection, other feasibility/implementation issues (e.g., fees for use of proprietary measures):

NDNQI has learned/modified the patient falls measure in a variety of ways.

First, our data collection guidelines: The definition of a fall has been recently clarified to better define what surfaces where a patient may land (during a fall) count as an extension of the floor.

Old fall definition: A patient fall is an unplanned descent to the floor (or extension of the floor, e.g., trash can or other equipment) with or without injury to the patient, and occurs on an eligible reporting nursing unit. All types of falls are to be included whether they result from physiological reasons (fainting) or environmental reasons (slippery floor). Include assisted falls – when a staff member attempts to minimize the impact of the fall.

New fall definition: A patient fall is an unplanned descent to the floor with or without injury to the patient, and occurs on an eligible reporting nursing unit.* Include falls when a patient lands on a surface where you wouldn't expect to find a patient. All unassisted and assisted (see definition below) falls are to be included whether they result from physiological reasons (fainting) or environmental reasons (slippery floor). Also report patients that roll off a low bed onto a mat as a fall.

*The nursing unit area includes the hallway, patient room and patient bathroom. A therapy room (e.g., physical therapy gym), even though physically located on the nursing unit is not considered part of the unit.

The definition of 'assisted fall' was clarified:

Old assisted fall definition: A fall in which any staff member (whether a nursing service employee or not) was with the patient and attempted to minimize the impact of the fall by easing the patient's descent to the floor or in some manner attempting to break the patient's fall. "Assisting" the patient back into a bed or chair after a fall is not an assisted fall. A fall that is reported to have been assisted by a family member or visitor counts as a fall, but does not count as an assisted fall.

New assisted fall definition: A fall in which any staff member (whether a nursing service employee or not) was with the patient and attempted to minimize the impact of the fall by easing the patient's descent to the floor or in some manner attempting to break the patient's fall, e.g., when a patient who is ambulating becomes weak and the staff lowers the patient to the floor. In this scenario, the staff was using professional judgment to prevent injury to the patient. A fall that is reported to have been assisted by a family member or a visitor counts as a fall, but does not count as an assisted fall. "Assisting" the patient back into a bed or chair after a fall is not an assisted fall.

The definitions for fall injury levels have changed:

Old definitions:

When the initial fall report is written by the nursing staff, the extent of injury may not yet be known. A method to follow up on the patient's condition 24 hours after the fall should be established as level of injury is a required data element. If the patient is discharged from the hospital within 24 hours of the fall, determine injury level at the time of discharge.

Injury level guidelines:

- None—patient had no injuries (no signs or symptoms) resulting from the fall; if an x-ray, CT scan or other post fall evaluation results in a finding of no injury
- Minor—resulted in application of a dressing, ice, cleaning of a wound, limb elevation, topical medication, pain, bruise or abrasion
- Moderate—resulted in suturing, application of steri-strips/skin glue, splinting, or muscle/joint strain
- Major—resulted in surgery, casting, traction, required consultation for neurological (basilar skull fracture, small subdural hematoma) or internal injury (rib fracture, small liver laceration) or patients with coagulopathy who receive blood products as a result of a fall
- Death—the patient died as a result of injuries sustained from the fall (not from physiologic events causing the fall)

New definitions:

When the initial fall report is written by the nursing staff, the extent of injury may not yet be known. Hospitals have 24 hours to determine the injury level, e.g., when you are awaiting diagnostic test results or consultation reports.

- None—patient had no injuries (no signs or symptoms) resulting from the fall; if an x-ray, CT scan or other post fall evaluation results in a finding of no injury
- Minor—resulted in application of a dressing, ice, cleaning of a wound, limb elevation, topical medication, pain, bruise or abrasion
- Moderate—resulted in suturing, application of steri-strips/skin glue, splinting, or muscle/joint strain
- Major—resulted in surgery, casting, traction, required consultation for neurological (basilar skull fracture, small subdural hematoma) or internal injury (rib fracture, small liver laceration) or patients with coagulopathy who receive blood products as a result of a fall
- Death—the patient died as a result of injuries sustained from the fall (not from physiologic events causing the fall)

NDNQI collects patient fall data through a website. We recently added more error messages to assist in accurate and complete data collection. An example is "Missing patient days for fall rate report". We also modified data entry field validations to reduce out of range data

Overall, to what extent was the criterion, *Feasibility*, met? H ☐ M ☐ L ☐ I ☐

Provide rationale based on specific subcriteria:

OVERALL SUITABILITY FOR ENDORSEMENT

Does the measure meet all the NQF criteria for endorsement? Yes ☐ No ☐

Rationale:

If the Committee votes No, STOP.

If the Committee votes Yes, the final recommendation is contingent on comparison to related and competing measures.

5. COMPARISON TO RELATED AND COMPETING MEASURES

If a measure meets the above criteria and there are endorsed or new related measures (either the same measure focus or the same target population) or competing measures (both the same measure focus and the same target population), the measures are compared to address harmonization and/or selection of the best measure before a final recommendation is made.

5.1 If there are related measures (*either same measure focus or target population*) or competing measures (*both the same measure focus and same target population*), list the NQF # and title of all related and/or competing measures:

0141 : Patient Fall Rate

5a. Harmonization

5a.1 If this measure has EITHER the same measure focus OR the same target population as [NQF-endorsed measure\(s\)](#): Are the measure specifications completely harmonized? Yes

5a.2 If the measure specifications are not completely harmonized, identify the differences, rationale, and impact on interpretability and data collection burden:

5b. Competing Measure(s)

5b.1 If this measure has both the same measure focus and the same target population as NQF-endorsed measure(s): Describe why this measure is superior to competing measures (*e.g., a more valid or efficient way to measure quality*); OR provide a rationale for the additive value of endorsing an additional measure. (*Provide analyses when possible*):

Patient falls is also a measure for which the American Nurses Association is the measure steward. Falls with injury is not a competing measure with patient falls, but rather a subset of falls. Both measures are completely harmonized.

CONTACT INFORMATION

Co.1 Measure Steward (Intellectual Property Owner): [American Nurses Association, 8515 Georgia Avenue, Suite 400, Silver Spring, Maryland, 20910](#)

Co.2 Point of Contact: [Isis, Montalvo, MBA, MS, RN, isis.montalvo@ana.org, 301-628-5047-](#)

Co.3 Measure Developer if different from Measure Steward: [American Nurses Association, 8515 Georgia Avenue, Suite 400, Silver Spring, Maryland, 20910](#)

Co.4 Point of Contact: [Isis, Montalvo, MBA, MS, RN, isis.montalvo@ana.org, 301-628-5047-](#)

Co.5 Submitter: [Isis, Montalvo, MBA, MS, RN, isis.montalvo@ana.org, 301-628-5047-, American Nurses Association](#)

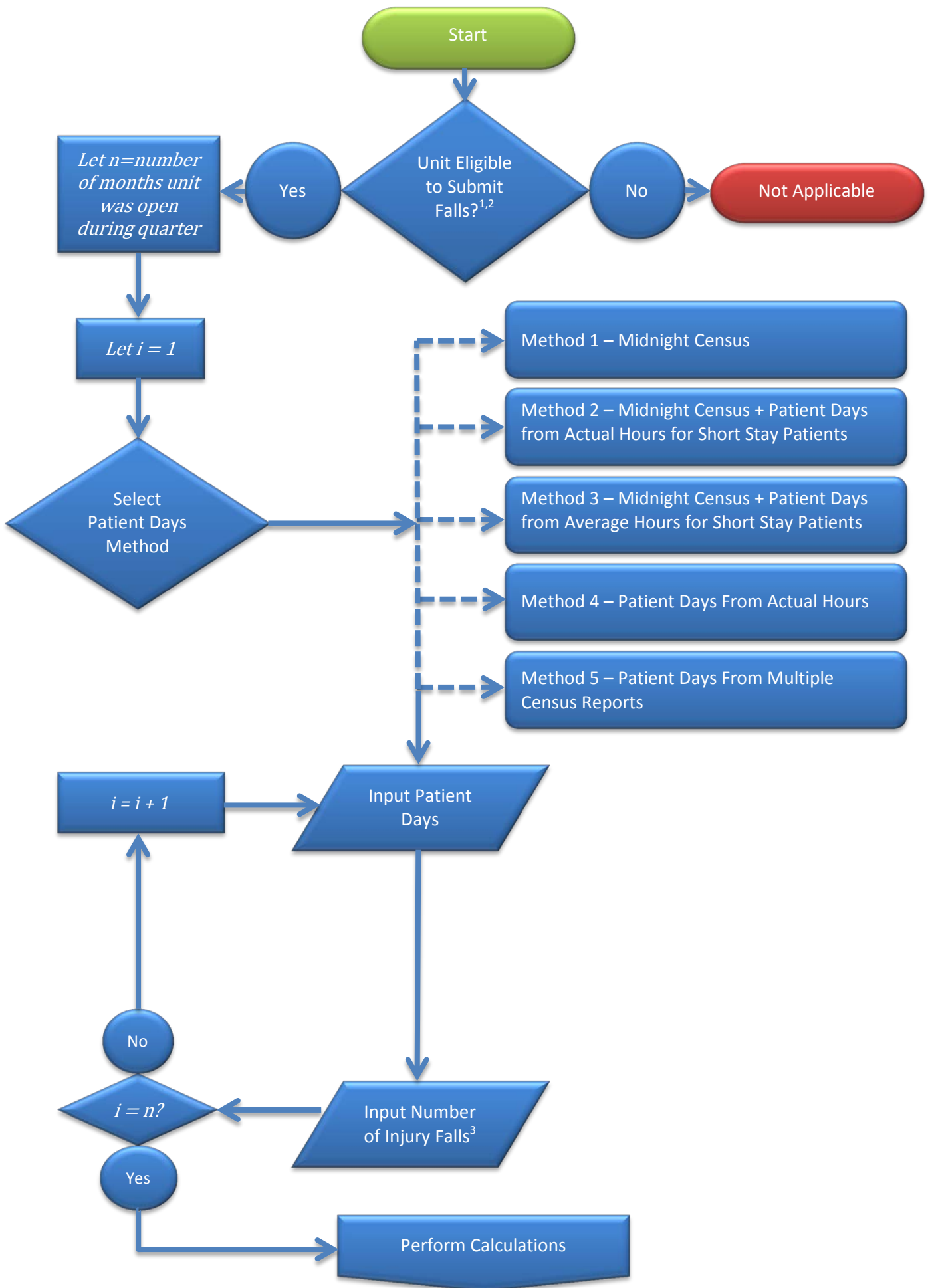
Co.6 Additional organizations that sponsored/participated in measure development:

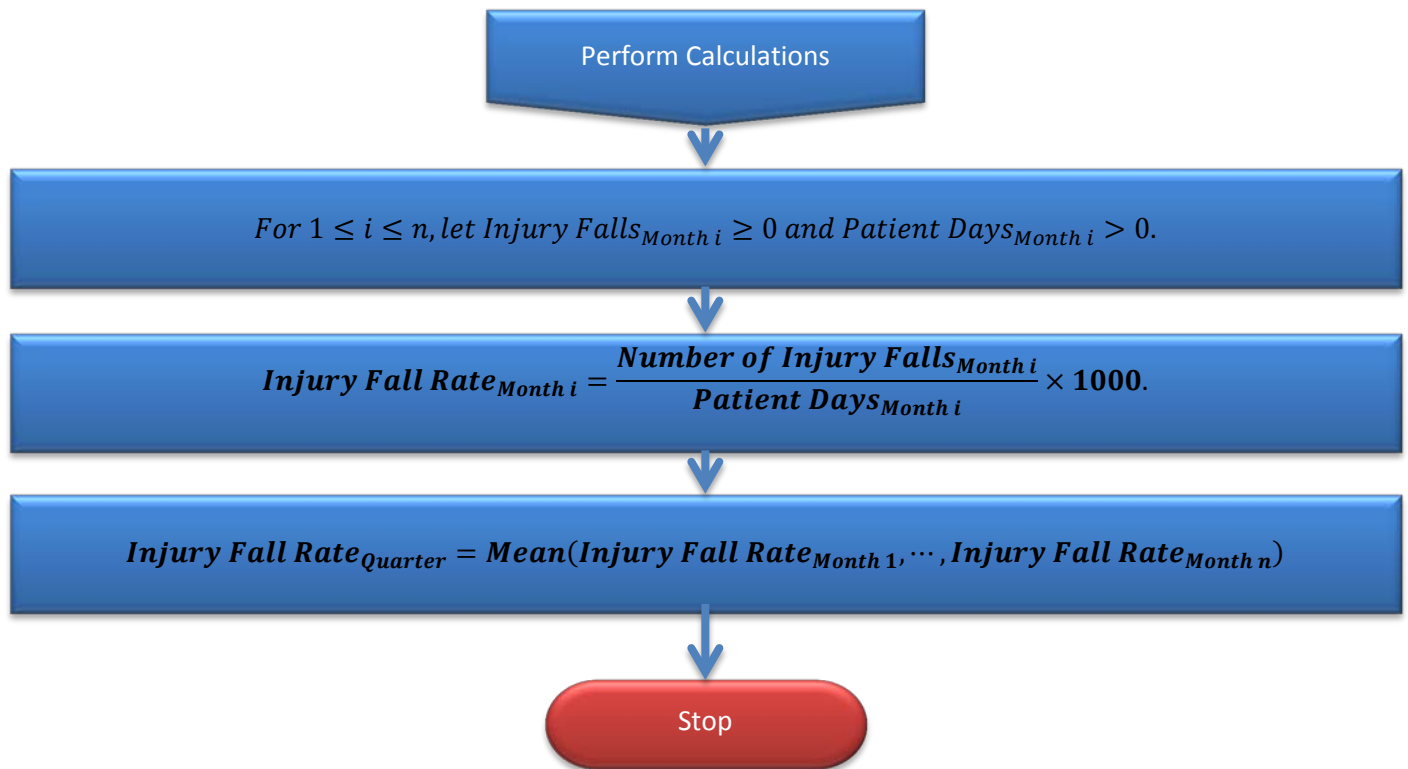
Co.7 Public Contact: [Isis, Montalvo, MBA, MS, RN, isis.montalvo@ana.org, 301-628-5047-, American Nurses Association](#)

ADDITIONAL INFORMATION

<p>Workgroup/Expert Panel involved in measure development</p> <p>Ad.1 Provide a list of sponsoring organizations and workgroup/panel members' names and organizations. Describe the members' role in measure development.</p> <p>The American Nurses Association sponsored the development of the patient falls and falls with injury measures. The Lewin Group was hired by ANA to identify measures that likely were nurse-sensitive. An interview guide was developed and various institutions were selected based on their geographical location and organizational characteristics to provide a nation-wide sample that would include an academic medical center, private hospital, public hospital, urban hospitals, rural hospitals and hospital system. JCAHO, Catholic Health Association, AHA and AHCPR were also contacted to provide broader context. The interviews were conducted with nursing executives, quality specialists and other experts identified by each organization between August 1995 and October 1995. ANA's advisory committee was Rhonda Anderson RN, FAAN, Joanne Disch, PhD, RN FAAN, Gwendolyn Johnson, MA, RN,C, Clair B. Jordan, MSN, RN, Norma Lang, PhD, RN, FAAN, Pamela Mitchell, PhD, CNRN, FAAN, Margaret Sovie PhD, RN, FAAN, and Mary K. Walker, PhD, RN, FAAN.</p>
<p>Ad.2 If adapted, provide title of original measure, NQF # if endorsed, and measure steward. Briefly describe the reasons for adapting the original measure and any work with the original measure steward:</p>
<p>Measure Developer/Steward Updates and Ongoing Maintenance</p> <p>Ad.3 Year the measure was first released: 2004</p> <p>Ad.4 Month and Year of most recent revision: 03, 2009</p> <p>Ad.5 What is your frequency for review/update of this measure? annual updates, with every 3 year re-endorsement</p> <p>Ad.6 When is the next scheduled review/update for this measure? 12, 2012</p>
<p>Ad.7 Copyright statement: Copyright 2011, American Nurses Association. All Rights Reserved.</p>
<p>Ad.8 Disclaimers:</p>
<p>Ad.9 Additional Information/Comments:</p>
<p>Date of Submission (MM/DD/YY): 10/05/2011</p>

Injury Fall Rate Algorithm/Measure Logic Flowchart





¹Unit eligibility depends on NDNQI unit type designations. Eligible unit type designations are:

- Critical Care – Adult
- Step Down – Adult
- Medical – Adult
- Surgical – Adult
- Med-Surg Combined – Adult
- Critical Access
- Rehab – Adult

²Unit must have been open (patients present) at least 1 month during reporting period.

³An injury fall is any fall in which physical injury occurs, regardless of severity. NDNQI injury levels are defined as:

None—patient had no injuries (no signs or symptoms) resulting from the fall; if an x-ray, CT scan or other post fall evaluation results in a finding of no injury

Minor—resulted in application of a dressing, ice, cleaning of a wound, limb elevation, topical medication, pain, bruise or abrasion

Moderate—resulted in suturing, application of steri-strips/skin glue, splinting, or muscle/joint strain

Major—resulted in surgery, casting, traction, required consultation for neurological (basilar skull fracture, small subdural hematoma) or internal injury (rib fracture, small liver laceration) or patients with coagulopathy who receive blood products as a result of a fall

Death—the patient died as a result of injuries sustained from the fall (not from physiologic events causing the fall)

Variable Name	Variable Name Label	Value	NOTES
Hospid	hospital identification number		
HospCode	hospital alpha numeric code		
HospName	hospital name		
Active	active membership	0 = NO -1 = Yes	
HTypID	hospital type		
HTypeDesc	hospital type description		
CSystID	current system name		
CSystDes	current system description		
MediNum	Medicare Provider Number		
Address	Address of hospital		
Address2	Address of hospital		
City	City		
State	State		
Zip	Zip		
Created	date record was created		
AHANum	AHA identification number		
HCFANum		retired variable	
BillID	Billing identification number		
Dept	Department		
ADCensus	Average Daily Census		
HYrQID	hospital year quarter		
HYEAR	Year		
HQTR	Quarter		
YQMagnet	Magnet Status	0=non-Magnet 1=applicant 2=Magnet	
YQCalnoc	CalNoc Hospital Flag	0 = Not a CalNoc hospital 1 = CalNoc hospital	
BedID	Bedsizes	see demographics tab	
BedDesc	Bedsizes: character	see demographics tab	
BedCatID	Bedsizes category	see demographics tab	
BedCatDs	Bedsizes category character	see demographics tab	
OwnID	hospital ownership	see demographics tab	
OwnDesc	hospital ownership: character	see demographics tab	
CitySzID		retired variable	
CitySize		retired variable	
TeachID	teaching status	see demographics tab	
TeachDes	teaching status: character	see demographics tab	

RuralID	metropolitan status	see demographics tab	
RuralDes	metropolitan status: character	see demographics tab	
VendrID	vendor identification		
VendrDes	vendor identification: character		
SubmsID	data submission method		
SubmsDes	data submission method:		
UnitID	unit identification number		
CUName	current unit name		
CPPopID	current unit population	see demographics tab	
CPPopDes	current unit population:	see demographics tab	
CDesgID	current unit type designation	see demographics tab	
CDesgDes	current unit type designation:	see demographics tab	
CPPopDesgSpclID	current adult unit specialty	see demographics tab	
CSSpcDes	current adult unit specialty:	see demographics tab	
CUBdCnt		retired variable	
NotActiv		retired variable	
OldRNID		retired variable	
UYrQtrID	unit year quarter identification		
UYear	year		
UQtr	quarter	1 - 4	
QUName	quarter unit name		
QPPopID	quarter unit population		
QPPopDes	quarter unit population:		
QDesgID	quarter unit type designation		
QDesgDes	quarter unit type designation:		
QPPopDesgSpclID	quarter adult unit specialty		
QSspcDes	quarter adult unit speciality:		
ResNoCnt		retired variable	
UBedCnt		retired variable	
RNCount	Number of RNs		
DiplCnt	number of nurses with diploma		
AscCnt	number of nurses with associates degree in nursing		
AscNNCnt		retired variable	
BacCnt	number of nurses with bachelors degree in nursing		
BacNNCnt		retired variable	
MaCnt	number of nurses with masters degree in nursing		
MasNNCnt		retired variable	

DocCnt	number of nurses with		
DocNNCnt		retired variable	
UnkCnt	number of nurses where		
UnkNNCnt		retired variable	
CrtRnCnt	number of RNs with national		
RICrtCnt		retired variable	
ULPatCnt	unit census on day of ulcer		
PTAsdCnt	number of patients assessed		
ULRAsID	ulcer risk assessment scale	1=Braden	
		2=Norton	
		4=Other	
		5= Braden Q (pediatrics only)	
		6 = NSRAS	
		7=multiple scales	
UIRAsDes	ulcer risk asesssment scale: character	Braden	
		Norton	
		Other	
		Braden Q	
		NSRAS	
		multiple scales	
UMonthID	month identification number		
PtDayID	patient day methodology	1 = Method 1	
		2 = Method 2	
		3 =Method 3	
		4 = Method 4	
		5 = Method 5	
PtDayDes	patient day methodology: character	Method 1	
		Method 2	
		Method 3	
		Method 4	
		Method 5	
PtDayTot	Patient Days Total	retired variable	
PDMNCens	Patient Days from Midnight	continuous	
PDActHrs	Patient Days from Actual	continuous	
PDAvgHrs	Patient Days from Average	continuous	
FRAsmID	fall risk asesment scale	1= Morse	
		2=Schmid	
		3=Other	
		0 = blank	
		Morse	

FRASmDes	falls risk assessment scale: character	Schmid	
FallCnt	fall count per month	Other	
AdmitCnt		retired variable	
DischCnt		retired variable	
RNCnt		retired variable	
InPtHrs		retired variable	
OutPtHrs		retired variable	
TotPtHrs		retired variable	
ObsvBeds		retired variable	
RHospHrs	rn employee hours		
RCntrHrs	rn contract/agency hours		
LHospHrs	lpn employee hours		
LCntrHrs	lpn contract/agency hours		
UHospHrs	UAP employee hours		
UCntrHrs	UAP contract/agency hours		
UFallID	identification number of each		
MHospHrs	mental health technician		psych units only
MCntrHrs	mental health technician		psych units only
PtAge	patient age in years		
GendrID	patient gender	1 = Female	
		2 = Male	
GendrDes	patient gender: character	Female	
		Male	
InjLvID	fall injury level	1=None	
		2=Minor	
		3=Moderate	
		4=Major	
		5=Death	
InjLVDes	fall injury level: character	None	
		Minor	
		Moderate	
		Major	
		Death	
PRAsmID	prior risk assessment	1 = Yes	
		2 = No	
PRAsmDes	prior risk assessment: character	Yes	
		No	
		1=>0 to 12 hours	
		2= > 12 to 24 hours	

RcHrsID	time since last assessment	3 = >24 to 48 hours	
		4= >48 to 72 hours	
		5= > 72 hours to 1 week	
		6 = > 1 week	
RcHrsDes	time since last assessment: character	>0 to 12 hours	
		> 12 to 24 hours	
		>24 to 48 hours	
		>48 to 72 hours	
		> 72 hours to 1 week	
		> 1 week	
AtRskID	patient at fall risk	1 = Yes	
		2 = No	
AtRskDes	patient at fall risk: character	Yes	
		No	
FRAsmScr	Prior risk assessment score		
ORAsmID	Other FallRisk Assessment	1=Low	RETIRED used Q2 2006 thru Q3 2006
		2=Med	
		4=No Documentation	
ORAsmDes	Other FallRisk Assessment: cha	Low	
		Med	
		No Documentation	
FAsstID	fall assisted by employee	1 = Yes	
		2 = No	
		3 = No documentation	
FAsstDes	fall assisted by employee: character	Yes	
		No	
		No documentation	
PRestID	physical restraints in use	1 = Yes	
		2 = No	
		3=No documentation	
PRestDes	physical restraints in use: character	Yes	
		No	
		No documentation	
FProtID	fall prevention protocol in place	1 = Yes	
		2 = No	
		3 = No documentation	
		4 = Not applicable	
	fall prevention protocol in	Yes	
		No	
		No documentation	

FProtDes	place: character	Not applicable	
PrevID	fall id of previous fall		value present if this fall was a repeat fall

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I agree it is a challenge to change the image of nurses from that of 'angels' or 'physicians' handmaidens' to that of a 'member of a challenging discipline.'

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The Relationship of Nursing Workforce Characteristics to Patient Outcomes

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Abstract

Three reports from the Institute of Medicine found that errors in hospital care were more common than previously thought; that health care delivery should be reorganized to improve the quality of care; and that, operationally, nurses have a critical role in securing patient safety. Now the contribution of nursing to the reduction of adverse events must be established empirically, so that nursing-sensitive indicators can be incorporated in such health care-improvement strategies as public reporting of hospital quality and performance-based payment systems. This article reviews what is known from previous nursing outcomes research and identifies gaps in the current state of knowledge. It then describes the contribution to research that can be made through the National Database of Nursing Quality Indicators™ (NDNQI®). Next it reports an NDNQI study that found three nursing workforce characteristics to be related significantly to patient outcomes: total nursing hours per patient day, percentage of hours supplied by RNs, and years of experience in nursing, and concludes with a discussion of the implications of these findings for both for nursing administrators and outcomes-based, quality-improvement initiatives.

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Key words: fall rate, health care quality, National Database of Nursing Quality Indicators, (NDNQI), nurse experience, nurse staffing, nursing hours, nursing outcomes, nursing-sensitive indicators, nursing workforce, outcome indicators, pay for performance, performance measures, pressure ulcer rate, skill mix, staffing ratios, value-based payment

The release of two reports from the National Institute of Medicine (1999, 2001) focused the nation's attention on the quality of hospital care and the problem of patient safety. These reports found that errors in hospital care were more common than the public had realized and recommended that health care delivery be reorganized to improve the quality of care. In response to the reports, federal and state governments, insurers, regulators, and health care providers are implementing health care-indicator initiatives to promote improvement in health care quality. Public reporting of quality indicators can help guide consumer choice among hospitals and assist businesses and insurers make purchasing and reimbursement decisions. However, most of the indicators included in public reporting initiatives reflect medical processes. Moreover, quality incentive programs for hospitals, generally known as pay-for-performance or value-based purchasing, are focused exclusively on physician-driven activities and medical outcomes ([Centers for Medicare & Medicaid Services \[CMS\], 2007a](#)). Under these programs, hospitals demonstrating good outcomes and efficient health care practices receive incentives, such as higher reimbursement rates, than hospitals with lesser performance. Recently, CMS announced that it will not provide reimbursement for care related to hospital-acquired complications ([Centers for Medicare & Medicaid Services, 2007b](#)).

A third report from the Institute of Medicine (2004) stated that, operationally, nurses have a critical role in securing patient safety. With 2.4 million practicing registered nurses (RNs) in the United States, nursing is the largest of the health care professions. Although nurse staffing and indicators of nursing-sensitive outcomes (patient outcomes that vary in

response to changes in nurse staffing) are included in some public reporting initiatives, nursing indicators represent a small proportion of the pool of quality indicators. They are absent altogether from value-based purchasing initiatives. Because nurses are the most prevalent care providers in hospitals, the promotion of health care quality through public reporting and value-based purchasing cannot be comprehensive unless nursing's contributions are incorporated.

Mandating nurse-to-patient staffing ratios is one alternative public policy approach to promoting nursing quality that has been considered by several states and adopted by at least one. The focus on staffing ratios for nursing is consistent with research literature that shows an influence of nursing hours of care on various patient outcomes. However, use of staffing ratios may be an insufficient policy response as to date, literature has been limited in terms of the number of nursing workforce characteristics or attributes available for the study of quality of care. There may be other workforce characteristics that are as influential in promoting quality of care as nurse staffing ratios.

This article reviews what is known from previous nursing outcomes research and identifies gaps in the current state of knowledge. It then describes the contribution to outcomes research that can be made through the extensive data on nursing workforce characteristics available in the National Database of Nursing Quality Indicators (NDNQI). Next it presents findings from a NDNQI study describing the relationship of nursing workforce characteristics to patient fall rates and the rate of hospital-acquired pressure ulcers. The article concludes with a discussion of implications from this study for both nurse administrators and health policy officials involved in outcomes-based, quality-improvement initiatives.

Review of Previous Nursing Outcomes Studies

This section will present the growing body of evidence that describes the relationship between hospital nursing workforce attributes, such as nurse staffing levels, and patient outcomes. Because many of these studies have had significant limitations in conceptual framework, design, and nursing workforce attributes, this section will also discuss the limitations of these studies.

Previous Studies Relating to Workforce Characteristics and Patient Outcomes

The Agency for Healthcare Research and Quality (AHRQ) recently published a comprehensive and systematic review of the literature on the relationship between workforce characteristics, such as nursing hours and ratios, and patient outcomes ([Kane, Shamliyan, Mueller, Duvai, & Witt, 2007](#)). The AHRQ review identified 97 observational studies published between 1990 and 2006 and included 94 of these reports in a meta-analysis. This meta-analysis found strong and consistent evidence that higher registered nurse (RN) hours were related to lower patient mortality rates, lower rates of failure to rescue, and lower rates of hospital-acquired pneumonia. There was evidence that higher, direct care RN hours was related to shorter lengths of stay. Higher total nursing hours also were found to result in lower hospital mortality and failure to rescue rates, and in shorter lengths of stay. Based on fewer studies, the review found evidence that the prevalence of baccalaureate-prepared RNs was related to lower hospital mortality rates, that higher RN job satisfaction and satisfaction with workplace autonomy were related to lower hospital mortality rates, and that higher rates of nurse turnover were related to higher rates of patient falls. The conclusion of the meta-analysis was that higher nurse staffing was associated with better patient outcomes, but that the association was not necessarily causal. Further, the associations varied by service line and unit type.

A recent study by Needleman, Buerhaus, Stewart, Zelevinsky, and Soeren ([2006](#)) demonstrated the business case, i.e. the cost effectiveness, for increasing the proportion of nursing hours supplied by RNs, without increasing total nursing hours. The cost of increasing RN's proportion of nursing hours was **less** than the **cost** that would have resulted from adverse events, such as failure to rescue, urinary tract infections, hospital-acquired pneumonia, upper gastrointestinal bleeding, shock, and cardiac arrest. More than 90 percent of the cost savings was associated with reduced length of stay.

Limitations of Previous Studies

Significant gaps remain in nursing outcomes research literature. These gaps need to be addressed to strengthen the case for including nursing quality indicators in public reporting and value-based purchasing initiatives and to provide guidance to nurse executives regarding staffing models. Work is needed in the specification of theoretical or conceptual models, including the analysis of unit-level, rather than hospital-level, data. A number of authors have also noted the need to examine additional work-related, structure measures. Finally appropriate data sets for the analysis are also needed. These limitations are addressed in the following sections.

Conceptual framework limitations. Nursing outcomes research typically is based on Donabedian's ([1988, 1992](#)) conceptual framework, or derivations thereof, in which the structure of care influences the processes of care, and both in turn influence the outcomes of care. Because this framework supports many variations in actual model specification, many different organizational characteristics have been investigated. For

example, different nursing workforce characteristics have been used as measures of the structure of hospital care; and the outcomes of a variety of different health conditions have been studied.

The Donabedian framework implies a hierarchical analysis model, in which patients are embedded in hospital units that have both structural characteristics and processes, and units are embedded within hospitals that have both structural characteristics and processes. Only a few studies, particularly studies published since the 1990s, had access to datasets that supported a hierarchical analysis. Failure to use a hierarchical model of analysis results in mis-estimation of the relationship between nursing workforce characteristics and patient outcomes. Harless & Mark (2006) demonstrated that relationships in many previous research studies may have been attenuated by having access only to hospital-level nurse staffing data and not unit level data.

It is important to note that some valuable studies have used the hospital service line (e.g., medical or surgical patients) as the unit of analysis (Needleman et al. 2001). In a different approach Whitman, Kim, Davidson, Wolf, and Wang (2002) have argued for the patient care unit, including unit specialty, as the unit of analysis because it is the operational level with the responsibility for care. A few authors have actually used the patient care unit as the unit of analysis (e.g., Blegen, Goode & Reed, 1998; Dunton, Gajewski, Taunton & Moore, 2004). Studies with data for service lines or unit types have demonstrated that specific aspects of the nursing workforce may be significant for some service lines or unit patient outcomes and not for others (e.g. Needleman et al., 2006).

Nursing workforce characteristic limitations. Although most previous research on the relationship between nursing workforce characteristics and patient outcomes has used nursing hours or patient-to-nurse ratios, a few studies have examined other characteristics, such as education, job satisfaction, or turnover. Work-related structure measures for which researchers have recommended further research include organizational factors, such as those affecting nursing processes (Mick & Mark, 2005), measures of hospital commitment to quality (Kane, et al., 2007), measures of longer-term organizational strategies and processes (Covaleski, 2005), and measures of hospital leadership (Bradley et al., 2006).

Data quality limitations. Additional measures of characteristics of the nursing workforce, such as measures of nursing processes, are needed, as are improvements in data quality, including larger sample size, reduced bias, and reduced measurement error. However, the nursing workforce should simultaneously be characterized in terms of supply (hours); knowledge, expertise, and experience; job satisfaction; and fitness (fatigue). Theoretically based measures of nursing processes, such as assessment, surveillance and monitoring, nursing interventions, communication with other health care providers, and patient education, should also be included in analyses.

The data available for nursing outcomes research have generally come from three types of sources. First, analysts have used large national data sets, such as hospital discharge abstracts or Medicaid costs reports, and matched those with nurse staffing data from selected states. Generally, such data sets are limited to information for the largest states and do not have data at the unit level. As a consequence, measures of the nursing workforce cannot distinguish between nurses in direct patient care or those involved in administrative or outpatient activities. While these data sets have information on a large number of patient outcomes, the nursing workforce indicators are quite limited. Second, analysts have obtained data from individual states or subsets of hospital surveys, administrative data, or hospital primary data collections. The California Nursing Outcomes Coalition Database and the Veterans Administration Nursing Outcomes Database are good examples of datasets that have unit-level information on both a variety of nursing workforce characteristic and patient outcomes for a subset of the nation's hospitals. Third, some analysts have collected data from convenience samples of a small number of hospitals to which they have access. It is questionable whether findings from these convenience-sample studies can be generalized to larger populations.

Finally, most studies are based on cross-sectional data sets. These data sets do not allow the analyst to study trends or estimate lagged effects. Understanding these trends or lagged effects could contribute to a causal understanding of the relationship between nursing indicators and patient outcomes.

In summary, advancing our knowledge of the relationship between nursing workforce attributes and patient outcomes will come from the use of data sets which support hierarchical analyses; additional attributes of the nursing workforce; unit-level data; and large, representative, longitudinal data sets.

NDNQI as a Data Resource for Nursing Outcomes Research

The American Nurses Association (ANA) established the National Database of Nursing Quality Indicators (NDNQI) in 1998 with the twin goals of (a) providing acute care hospitals with comparative information on nursing indicators that could be used in quality improvement projects, and (b) developing a database that could be used to examine the relationship between aspects of the nursing workforce and nursing-sensitive patient

outcomes ([National Database of Nursing Quality Indicators, n.d.](#)). The NDNQI was developed in a way that addresses many of the limitations encountered by researchers working with other data sets as described above. The NDNQI will support hierarchical models of multiple nursing workforce indicators and patient outcomes. It is a large, longitudinal database, with unit-level data and national, although not representative, coverage. The next section will discuss strengths, limitations, and data collection methods of the NDNQI.

Strengths of NDNQI

NDNQI is a large database. Over 1,100 hospital report quarterly data on nursing workforce characteristics, including process measures, and patient outcomes. NDNQI also conducts an annual RN survey, which collects additional information on nursing workforce characteristics. In 2006, over 175,000 RNs responded to the survey.

NDNQI is a longitudinal database. Data were first reported to NDNQI for the third quarter of 1999 by 23 hospitals, and the number of reporting hospitals has grown steadily over the ensuing 31 quarters. The RN Survey data have been collected annually since 2002.

Data are collected for eight unit types: critical care, step down, medical, surgical, combined medical-surgical, rehabilitation, pediatric, and psychiatric. RN Survey data are collected for all hospital unit types, including outpatient and interventional units.

NDNQI contains many structure, process, and outcomes indicators. Measures of hospital structure include staffed-bed size, ownership, metropolitan/rural location, teaching status, and Magnet status. Measures of unit structure include unit type and over two dozen characteristics of the nursing workforce, including but not limited to: nursing hours per patient day (total, RN); skill mix; contract staff nursing hours; RN education; certification; years of experience in nursing; percent of RNs that float; shift type; intent to stay on the job; opinion on quality of care provided on the unit; RN satisfaction with RN to RN communication, with RN to MD communication, and with professional development; and RN age. Measures of nursing process include percent of patients with a risk assessment and, for those at risk, whether a prevention protocol was in place. Outcome measures include the patient fall rate, injury fall rate, hospital-acquired pressure ulcer rate, psychiatric patient injury assault rate, prevalence of pediatric IV infiltration, completeness of the pain assessment cycle for pediatric patients, and restraint prevalence.

Measures of hospital structure include staffed-bed size, ownership, metropolitan/rural location, teaching status, and Magnet status.

Indicators included in NDNQI have good measurement properties. Data are collected on 8 of the 15 National Quality Forum Consensus measures, which have demonstrated reliability and validity. NDNQI conducts a reliability study on an indicator each year; the most recent study on pressure ulcers supported the reliability of NDNQI hospital identification and staging of pressure ulcers ([Gajewski, Hart, Bergquist & Dunton, 2007](#); [Hart, Bergquist, Gajewski, & Dunton, 2006](#)). The reliability of satisfaction data from the RN survey is confirmed annually. The average response rate is 64 percent.

Limitations of NDNQI

Hospitals in every state and the District of Columbia participate in NDNQI, but participation is voluntary. Hospitals choose to participate in NDNQI because of their interest in the quality of nursing care and because they have the staff, data, and economic resources to participate. Therefore, NDNQI hospitals are a self-selected sample, and are not representative of all hospitals in the United States.

To better understand the limitations on representativeness of the NDNQI sample, NDNQI hospital characteristics were compared with data from the American Hospital Association's (AHA) Annual Survey. Due to differences in variable definitions and reference time period, however, the comparisons are not definitive. As with the NDNQI, the AHA database relies on self-reported data.

When compared to all hospitals in AHA's 2005 survey, NDNQI hospitals are significantly different on a number of characteristics ([Table 1](#)). Although the large sample sizes result in even minor differences achieving statistical significance, many of the characteristics are substantively different as well.

Hospitals of various sizes participate in NDNQI, with 12% having less than 100 staffed beds and 18% having more than 500 beds. On average, NDNQI hospitals were significantly larger than all hospitals in the AHA database. Over 80% of NDNQI hospitals were non-governmental, not-for profit facilities. Fewer NDNQI hospitals were for-profit than all hospitals in the AHA database. Approximately 15% of NDNQI hospitals were recognized as American Nurses Credentialing Center (ANCC) Magnet facilities, a higher percentage than for all AHA hospitals.

Table 1 NDNQI Hospital Characteristics (2005) Compared With Characteristics of All Hospitals from the American Hospital Association's Annual Survey (2003)					
	Percent				
Characteristic	NDNQI	AHA	X 2	df	p-value
Staffed Bed Size			1001.624	7	<.0001
6-24	0.6	7.3			
25-49	2.4	19.2			
50-99	8.7	22.2			
199-199	21.4	23.7			
200-299	21.8	12.3			
300-399	16.9	6.6			
400-499	10.0	3.3			
500+	18.3	5.4			
Total	100.1	100.0			
Hospital Ownership			352.22	3	<.0001
Government, Non-Federal	10.5	23.8			
Government, Federal	1.6	4.0			
Private, Not for Profit	82.6	53.6			
Investor Owned, For Profit	5.3	18.6			
Total	100.0	100.0			
American Nurses					
Credentiailling Center					
Magnet Status			739.221	1	<.0001
Magnet	15.7	2.5			
Non-Magnet	84.3	97.5			
Total	100.0	100.0			
Source: National data come from the American Hospital Association Annual Survey Database, 2003.					

NDNQI Data Collection Methods

After a hospital joins the NDNQI, the facility is assisted by NDNQI staff in correctly classifying its units into unit types. After taking an on-line tutorial and passing quizzes on the key aspects of standardized data collection guidelines, hospital staff may enter their

quarterly nurse staffing and patient outcomes data into web-based forms or submit their data through an XML batch upload. NDNQI quarterly data are collected via a secure website. Each hospital uses a code and password for access to the NDNQI system. Permissions for all hospital users except the site coordinator are reset quarterly. The website provides hospitals with data review tools, error reports, and immediate feedback on a number of common data entry errors. Submitted data are reviewed each quarter by NDNQI statisticians for outliers or significant changes across months in the quarter. Suspected errors are reviewed by hospitals and corrected. If suspected errors are not corrected, the data are deleted. Reports are downloaded from the NDNQI website in PDF and Excel files. Site coordinators in each facility are asked to review their reports for accuracy and completeness and notify NDNQI if they find errors, which are then corrected.

The RN survey data, the source of many nursing workforce characteristics, are collected primarily via a web interface. Each facility is guided through a two month preparation period and given materials, such as announcements and reminder cards, to promote a satisfactory response rate. Hospital survey coordinators have access to a live, web-based, unit-specific response rate, so they can tailor efforts to reach out to collect data from all units. From 2002 through 2006, a few hospitals (<50 per year) in which staff who had limited access to web-linked computers were allowed to collect survey data using paper surveys and Scantron sheets. However, this form of data collection activity was discontinued in 2007. Data are cleaned for illogical and out of range responses prior to report production. For privacy reasons, data are reported only for units with at least five responses and a 50% response rate. Survey reports are downloaded by hospitals via a secure web-connection and survey coordinators are asked to review their reports for apparent errors and report such to NDNQI.

A Study to Assess the Economic Value of Nursing Staff and RNs

A recent study was conducted using NDNQI data to assess the value of nurses in terms of averting patient falls and hospital-acquired pressure ulcers. The analysis file, the analytic approach, and the findings of this study will be described and discussed below. This study was the first NDNQI study to include the workforce characteristic of RN experience. All data were collected under protocols approved by the University of Kansas Medical Center's institutional review board.

Analysis File

Annualized measures were calculated from the quarterly data for the period from July 1, 2005, through June 30, 2006. RN characteristics from the RN survey were matched to quarterly data on staffing and outcomes on the basis of the quarter in which the survey month occurred. The hospital unit was the unit of analysis and included 1,610 critical care, step down, medical, surgical, combined medical-surgical, and rehabilitation units.

Analytic Approach

The analysis proceeded in two phases. First, an exploratory analysis using regression trees examined the relationship between several nursing workforce characteristics and the adverse events of patient falls and hospital-acquired pressure ulcers (HAPUs). The models included five hospital characteristics (staffed bed size, teaching status, metropolitan location, Magnet status, and ownership), six unit types, and 20 nursing workforce attributes. Regression trees sequentially identified independent variables most highly related to the dependent variable, in this case the fall rate or HAPU rate. The regression trees were used to narrow the number of indicators to be included in the formal modeling, comprising the second phase of the analysis. The formal modeling was conducted using mixed linear models, which are hierarchical and account for the dependencies among units within the same hospital. Each patient outcome was related to three hospital characteristics, six unit types, and eight nursing workforce characteristics ([Table 2](#)).

Table 2 Hospital and Unit Structure Variables Included in the Analysis of Patient Fall and Hospital Acquired Pressure Ulcer Rates		
Hospital Structure	Unit Structure	Patient Outcomes
Staffed Beds <ul style="list-style-type: none"><100100-499500+	Total Nursing Hours per Patient Day	Total Falls per 1,000 Patient Days
Teaching Status <ul style="list-style-type: none">Academic Medical Center	RN Hours Per Patient Day	HAPU Rate <ul style="list-style-type: none">Patients with HAPUs per Total Patients

<ul style="list-style-type: none">• Other Teaching• Non-Teaching		Assessed
Magnet Hospital	Skill Mix	
<ul style="list-style-type: none">• Yes• No	<ul style="list-style-type: none">• Percent of Hours Supplied by RNs	
	Percent of Total Nursing Hours Supplied by Agency Staff	
	Percent of RNs with a National Certification	
	% of RNs with a BSN or Higher Degree	
	Years of Experience in Nursing	
	Mean Job Enjoyment Scale Score	
	Unit Type	
	<ul style="list-style-type: none">• Critical Care• Floor combination (step down, medical, surgical and combined medical-surgical)• Rehabilitation	

Findings: Evidence of the Value of Nursing from NDNQI Data

The results indicated that lower fall rates were related to higher total nursing hours (including RN, LPN/LVN, and unlicensed nursing assistants) per patient day, a higher percentage of nursing hours supplied by RNs, and a higher percentage of nurses on a unit with more than 10 years experience in nursing.

- For every increase of one hour in total nursing hours per patient day, fall rates were 1.9% lower.
- For every increase of 1 percentage point in the percent of nursing hours supplied by RNs, the fall rate was 0.7% lower.
- For every increase of a year in average RN experience, the fall rate was 1% lower.
- Fall rates were highest on rehabilitation units and lowest on critical care units.
- Fall rates in Magnet facilities were 10.3% lower than rates in non-Magnet facilities.

To promote the lowest fall rates, nurse managers could simultaneously optimize total nursing hours and both percentage of hours supplied by RNs and RNs with longer experience in nursing. For example, by increasing nursing hours from 6 to 7 hours per patient day, increasing the percentage of hours supplied by RNs from 60% to 70%, and increasing the average experience of RNs by 5 years, the fall rate would, on average, be reduced by 7.7%.

Lower HAPU rates were related to fewer total nursing hours per patient day, a higher percentage of hours supplied by RNs, and a higher percentage of RNs with 10 or more years of experience in nursing.

- For every increase of 1 hour in total nursing hours per patient day, HAPU rates were 4.4% higher. Although the analysis controlled for unit type, which is accepted as a proxy for patient acuity, this anomalous result may indicate inadequate risk adjustment or acuity adjustment. That is, net of hospital size, teaching status, Magnet status, and unit type, units with sicker patients at risk of pressure ulcers may have higher levels of nurse staffing.
- For every percentage point increase in the percentage of nursing hours supplied by RNs, HAPU rates were 0.7% lower.
- For every increase of a year in average RN experience, the HAPU rate was 1.9% lower.
- HAPU rates are highest on critical care units and lowest on the combined floor units, i.e. step down, medical, surgical, and combined medical-surgical units.

Nurse managers could promote the lowest HAPU rates if they would simultaneously increase the percentage of hours supplied by RNs from 60% to 70% and increase the

average experience of RNs by 5 years. If managers arranged the staffing in this way, the HAPU rate could be reduced by an average of 11.4%.

Limitations

The findings from this study are limited in two ways. First, the results are generalizeable only to NDNQI facilities, which are self-selected for their interest in nursing quality indicators and their ability to participate in a national database. These facilities are larger, less likely to be for-profit, and more likely to be Magnet facilities than all hospitals in the AHA database. Second, the anomalous relationship between total nursing hours per patient day and HAPU rates suggests that more specific controls for patient acuity or risk should be included in the formal models.

Discussion of Study Implications

The findings from this analysis of the relationship between nursing workforce characteristics and the two patient outcomes of patient fall rates and HAPU rates not only confirmed, but also expanded, previous research insights regarding the importance of nurses in achieving safe patient outcomes. The significant relationship between nursing hours and skill mix and observed fall rates had been established previously. This analysis expanded the list of influential nursing workforce characteristics to include RN experience. Having a higher percentage of experienced RNs on the unit was related both to lower fall rates and lower HAPU rates. The effect sizes of experience were larger than those for skill mix. This particular finding provides salience to the argument that retaining experienced nurses on patient care units is paramount in the provision of high quality nursing care. The significance of RN experience demonstrates the importance of looking beyond nursing hours or patient-to-nurse ratios in the promotion of safe patient outcomes.

The results of this study underscore the importance of including multiple characteristics of the nursing workforce in public reporting of the quality of nursing care. Nursing administrators and managers can apply the results of this study to promote quality of care by incorporating all three characteristics, i.e., nursing hours, skill mix, and experience in hiring and unit staffing decisions. In addition, businesses, insurers, and governments engaged in the design and implementation of value-based purchasing programs can use these findings by enhancing the proportion of nursing staff having greater skill and experience and by increasing the number of nursing hours.

...retaining experienced nurses on patient care units is paramount in the provision of high quality nursing care.

This study also emphasizes the importance of assessing and tracking the quality of nursing care at the patient care unit level.

This study also emphasizes the importance of assessing and tracking the quality of nursing care at the patient care unit level. The odds of an adverse event occurring vary by unit type, reflecting differing patient populations. Future research is needed to determine if the relationships between nursing workforce characteristics and patient outcomes vary across unit type-patient outcome combinations.

Data from NDNQI will be a valuable tool for researchers interested in nursing systems research. The large sample size, unit detail, longitudinal scope, and array of nursing workforce measures will support the examination of many and varied research questions.

Data from NDNQI will be a valuable tool for researchers interesting in nursing systems research.

Conclusion

Characteristics of the nursing workforce have been shown in this article to be important factors promoting the quality of safe and effective hospital care.To be comprehensive, quality improvement initiatives, such as public reporting and value-based purchasing, should incorporate nursing workforce measures. Previous

To be comprehensive, quality improvement initiative...should incorporate nursing workforce measures.

research has demonstrated that nursing hours and RN hours of care are important factors. The study reported in this article has demonstrated that additional characteristics, such as years of experience, also are influential. The broad array

of nursing workforce characteristics in the NDNQI database will support many future analyses of the role of nursing in achieving high quality patient care.

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Patient Falls: Association With Hospital Magnet Status and Nursing Unit Staffing

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Abstract: The relationships between hospital Magnet[®] status, nursing unit staffing, and patient falls were examined in a cross-sectional study using 2004 National Database of Nursing Quality Indicators (NDNQI[®]) data from 5,388 units in 108 Magnet and 528 non-Magnet hospitals. In multivariate models, the fall rate was 5% lower in Magnet than non-Magnet hospitals. An additional registered nurse (RN) hour per patient day was associated with a 3% lower fall rate in ICUs. An additional licensed practical nurse (LPN) or nursing assistant (NA) hour was associated with a 2–4% higher fall rate in non-ICUs. Patient safety may be improved by creating environments consistent with Magnet hospital standards. © 2010 Wiley Periodicals, Inc. *Res Nurs Health* 33:413–425, 2010

Keywords: patient safety; staffing; hospitals; magnet hospitals; nursing units; patient falls

Despite staff efforts to keep patients safe, some patients fall during their hospital stay. From one to eight patients fall per 1,000 inpatient days depending upon the type of nursing unit (Enloe et al., 2005). Patient falls are one of the eight patient outcomes included in the nursing care performance measures adopted by the National Quality Forum (NQF, 2004, 2009). We theorized that adequate evaluation, support, and supervision of patients by hospital staff can minimize the fall rate. The capacity for staff to evaluate, support,

and supervise patients may depend on how a nursing unit is staffed with registered nurses (RNs), licensed practical nurses (LPNs), and nursing assistants (NAs), as well as the proportion of RNs with bachelor's degrees in nursing, specialty certification, or who are hospital employees. We therefore expected that patient fall rates on similar units would differ based on their nurse staffing and their RN composition (i.e., education, certification, and employment status).

The National Database of Nursing Quality Indicators data were supplied by the American Nurses Association. The ANA specifically disclaims responsibility for any analyses, interpretations or conclusions. This study was supported by the National Institute of Nursing Research (R01-NR09068; T32-NR007104; P30-NR005043).

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The association between staffing and falls has been examined in several studies with scant evidence of a significant relationship. Few researchers evaluating falls have examined all types of nursing staff, the RN composition or considered the hospital's Magnet[®] status. Better understanding of the multiple factors that influence patient safety may assist hospital managers in making evidence-based recruitment and staffing decisions and encourage consideration of the potential benefits of Magnet recognition.

The purpose of this study was to examine the relationships among nurse staffing, RN composition, hospitals' Magnet status, and patient falls. We studied general acute-care hospitals, hereafter referred to as "general hospitals." Our results may advance the understanding of how to staff nursing units better and support nurses to promote patient safety.

BACKGROUND

This study builds on a theoretical foundation, a decade of empirical literature, and a unique national database—the National Database of Nursing Quality Indicators (NDNQI[®])—designed to measure nursing quality and patient safety. We outline these components before describing our methods.

Theoretical Framework

Our research was guided by a theoretical framework first presented by Aiken, Sochalski, and Lake (1997) that linked organizational forms such as Magnet hospitals and dedicated AIDS units through operant mechanisms including nurse autonomy, control, and nurse-physician relationships, to nurse and patient outcomes. Lake (1999) modified the framework to specify two dimensions of nursing organization: nurse staffing (i.e., the human resources available) and the nursing practice environment (i.e., the social organization of nursing work). In terms of nurse staffing, Lake hypothesized that more registered nurses (RNs), both per patient and as a proportion of all nursing staff, would result in better outcomes for both nurses and patients. The nurse staffing dimension has evolved to detail the composition of the RN staff such as level of education and specialty certification.

The two organizational factors examined in this study are nurse staffing and Magnet status. The American Nurses Credentialing Center developed

the Magnet Recognition Program[®] in 1994 to recognize health care organizations that provide nursing excellence (American Nurses Credentialing Center, 2009). Currently, of roughly 5,000 general hospitals in the U.S., over 350 or 7% have Magnet recognition.

We theorized that adequate evaluation, support, and supervision of patients to prevent falls depend on having a sufficient number of well-educated and prepared RNs as well as sufficient numbers of LPNs and NAs (we use NA to refer to all nursing assistants and unlicensed assistive personnel). The relationships between staffing and Magnet status with patient falls are presumed to operate through evaluation, support, and supervision, which were not measured in this study. We considered the evaluation component to pertain principally to the RN role. Adequate patient evaluation would be influenced by nurse knowledge, judgment, and assessment skills, which may vary according to nurse education, experience, certification, and expertise. We attributed the supervision role predominantly to RNs and LPNs, and the support role to NAs. Patient supervision and support would be directly influenced by staff availability, measured here as hours per patient day (Hppd).

To explore multiple aspects of staffing for this study we considered all nurse staffing measures available in the NDNQI. The database did not contain measures of nurse experience or expertise. Because the relative importance of nursing evaluation, support, and supervision in the prevention of falls is unknown, and because different types of staff may play different roles in fall prevention, we examined Hppd for RNs, LPNs, and NAs separately.

Literature Review

Patient falls in hospitals have been a focus of outcomes research to assess the variation in patient safety across hospitals and explore whether nurse staffing may be associated with safety. Lake and Cheung (2006) reviewed published literature through mid-2005 and concluded that evidence of an effect of nursing hours or skill mix on patient falls was equivocal. Subsequently, six studies of nursing factors and patient falls were published using data from California (Burnes Bolton et al., 2007; Donaldson et al., 2005), the US (Dunton, Gajewski, Klaus, & Pierson, 2007; Mark et al., 2008), Switzerland (Schubert et al., 2008), and England (Shuldham, Parkin, Firouzi, Roughton, & Lau-Walker, 2009).

In the US, Donaldson et al. (2005) and Burnes Bolton et al. (2007) investigated whether staffing

improvements following the California staffing mandate were associated with improved patient outcomes in 252 medical-surgical and stepdown nursing units in 102 hospitals. The nursing factors studied were total nurse staffing, RN and licensed staffing levels, and skill mix. No significant changes in falls were found for the period 2002–2006. In cross-sectional data they detected non-significant trends linking staffing level to falls with injury on medical-surgical units and falls on step-down units. Dunton et al. (2007) studied a subset of units in hospitals who reported data to NDNQI ($n = 1,610$) from July 2005 to June 2006. Calculating annualized measures from quarterly data and controlling for hospital size, teaching status, and six nursing unit types, Dunton et al. found a statistically significantly lower patient fall rate (10.3% lower) in Magnet hospitals. They also found negative associations between the fall rate and three nursing factors: total nursing hours, RN skill mix, and RN experience. Negative associations are consistent with the theoretical assumption that more nursing hours, a greater fraction of RN hours of total hours, and more RN experience could minimize the fall rate. Mark et al. (2008) studied unit organizational structure, safety climate, and falls in 2003 and 2004 data from 278 medical-surgical units from a nationally representative sample of 143 hospitals. They controlled for the nursing unit's average patient age, sex, and health status and found that units with a high capacity (i.e., a high proportion of RNs among total nursing staff and a high proportion of RNs with nursing baccalaureate degrees) and higher levels of safety climate had higher fall rates. They did not find significant direct effects of unit capacity or safety climate on the fall rate. They speculated that higher unit capacity may mean fewer support personnel are available to assist patients with toileting or other daily activities.

In Europe, findings from Schubert et al.'s (2008) study of 118 Swiss nursing units in 2003–2004 showed that rationing of care, the principal independent variable, was positively associated with falls. Staffing and the practice environment were not significant predictors, perhaps because they operate through rationing. Shulldham et al. (2009) studied staffing, the proportion of staff who was permanent employees, and patient falls in two English hospitals in 2006–2007. They reported null findings and noted that the study may not have been sufficiently robust to detect significant associations.

In summary, recent findings reveal a lack of association between staffing and falls in data from California, Switzerland, and England with the exception of Dunton et al. (2007) who identified

significant negative relationships in a U.S. sample. In each of these studies, RN-only hours or total nursing hours combining RN, LPN, and NA were used. The influence of nursing hours from LPN or NA staff on patient falls has not been studied separately.

NDNQI Database Overview

The NDNQI, a unique database that was well-suited to our study aims, is part of the American Nurses Association's (ANA) Safety and Quality Initiative. This initiative started in 1994 with information gathering from an expert panel and focus groups to specify a set of 10 nurse-sensitive indicators to be used in the database (ANA, 1995, 1996, 1999). The database was pilot tested in 1996 and 1997 and was established in 1998 with 35 hospitals. Use of the NDNQI has grown rapidly (Montalvo, 2007). In 2009 1,450 hospitals—one out of every four general hospitals in the U.S.—participated in it.

The NDNQI has served as a unit-level benchmarking resource, but research from this data repository has been limited. NDNQI researchers have published two studies on the association between characteristics of the nursing workforce and fall rates (Dunton et al., 2007; Dunton, Gajewski, Taunton, & Moore, 2004). Their more recent study was described earlier. Their earlier study of step-down, medical, surgical, and medical-surgical units in 2002 showed that higher fall rates were associated with fewer total nursing hours per patient day and a lower percentage of RN hours for most unit types. The scope of work on this topic was extended in the current study by: (a) specifying nurse staffing separately for RNs, LPNs, and NAs, (b) using the entire NDNQI database, (c) selecting the most detailed level of observation (month), and (d) applying more extensive patient risk adjustment than had been evaluated previously.

METHODS

Design, Sample, and Data Sources

This was a retrospective cross-sectional observational study using 2004 NDNQI data. These data were obtained in 2006. NDNQI data pertain to selected nursing units in participating hospitals. In conjunction with NDNQI staff, participating hospitals identify units by type of patient population and primary service: intensive care, step-

down, medical, surgical, medical-surgical, and rehabilitation. Our sample contained 5,388 nursing units in 636 hospitals.

Data are submitted to the NDNQI from multiple hospital departments (e.g., human resources, utilization management) either monthly or quarterly. We assembled an analytic file of monthly observations for all nursing units that submitted data for any calendar quarters for the year 2004. Each observation had RN, LPN, and NA nursing care hours, patient days, RN education and certification, a count of the number of reported falls, average patient age, and proportion of male patients. The RN education and certification data were submitted quarterly and assigned to each month in that quarter. Missing quarters of RN education and certification data or months of nursing care hours and patient days data were filled with data from a quarter or month just before or after the missing data. In compliance with the contractual agreement between the NDNQI and participating hospitals, no hospital identifiers (i.e., hospital ID, name, address, or zip code) were included with the data.

Data external to the NDNQI included hospital characteristics from the American Hospital Association (AHA) 2004 Annual Hospital Survey, the Medicare Case-Mix Index (CMI), and the hospital's Magnet status. The AHA has surveyed hospitals annually since 1946. The Annual Hospital Survey is the only survey that details the structural, utilization, and staffing characteristics of hospitals nationwide. Presently the AHA survey database contains 800 data fields on 6,500 hospitals of all types. Missing data are noted as missing, and estimation fields are filled in with estimates based on the previous year or information from hospitals of similar size and orientation (AHA, 2010). The CMI database, a public use file, is released by Medicare annually as part of the rules governing the inpatient prospective payment system (Centers for Medicare and Medicaid Services, 2010). NDNQI staff obtained information from the Magnet website (<http://www.nursecredentialing.org/Magnet/facilities.html>) on hospital Magnet status. Hospital characteristics, CMI, and Magnet status were merged by NDNQI staff and provided with the de-identified dataset.

Variables

The dependent variable, a patient fall, is defined by the NDNQI as an unplanned descent to the floor, with or without an injury to the patient. The

NDNQI data contain the number of falls in a unit during the month, including multiple falls by the same patient in the same month. Only falls that occurred while the patient was present on the unit were counted. Nursing unit fall rates were calculated as falls per 1,000 patient days. A patient day is defined as 24 hours beginning the day of admission and excluding the day of discharge.

The independent variables studied were nurse staffing, RN staff composition, and hospital Magnet status. Nurse staffing was measured as nursing care Hppd. Nursing care hours were defined as the number of productive hours worked by RNs, LPNs, or NAs assigned to the unit who had direct patient care responsibilities for greater than 50% of their shift. Nursing Hppd was calculated as nursing care hours divided by patient days. The nursing Hppd measure is the accepted standard in the nurse staffing and patient outcomes literature, receiving the highest consensus score from a panel of international experts when asked to rate the importance and usefulness of staffing variables (Van den Heede, Clarke, Sermeus, Vleugels, & Aiken, 2007). Hppd by RNs, LPNs, and NAs and fall rates are NQF-endorsed standards.

Measures of RN composition included nurse educational level, national specialty certification, and proportion of hours supplied by agency employee nurses. Nursing educational level was measured as the proportion of unit nurses who have a Bachelor of Science degree in Nursing (BSN) or higher degree. Certification was measured as the proportion of unit nurses who have obtained certification granted by a national nursing organization. Agency staff was measured as the proportion of nursing hours on a unit that were supplied by contract or agency nurses.

Magnet recognition was used to measure a hospital's adherence to standards of nursing excellence, which may translate into greater safety and quality. In the study a hospital was defined as a Magnet if it had been recognized as such for the year 2004.

The control variables were selected to address the differential risk of falling across patients, a major consideration in analysis of falls. Our principal approach was to control for nursing unit type, which clusters patients by case mix and acuity. Additional control variables were the nursing unit's patient age and gender mix, the hospital's Medicare CMI, and hospital structural characteristics. The risk of falling varies by both age and gender—older people and women have a higher likelihood of falling (Chelly et al., 2009;

Hendrich, Bender, & Nyhuis, 2003). To better account for differences in patient characteristics across units, we computed the nursing unit's average patient age and proportion of male patients. These demographic data were obtained from NDNQI quarterly prevalence studies of pressure ulcers. The 2004 CMI was used to measure a hospital's patient illness severity. Measuring the relative illness severity of a hospital's patients is only possible with patient-level data on many hospitals. The only national patient-level hospital data are from hospitals that participate in Medicare. The CMI is the average Diagnosis-Related Group (DRG) weight for a hospital's Medicare discharges. Each DRG's weight is based on the resources consumed by patients grouped into it. Thus, the CMI measures the resources used and implies severity of a hospital's Medicare patients relative to the national average. The nationwide average CMI across 4,111 hospitals in 2006, the earliest year downloadable online, was 1.32 and ranged from 0.36 to 3.14.

Prior researcher have found that both nurse staffing and patient outcomes vary by structural characteristics of hospitals such as ownership, size, teaching status and urban versus rural location (Blegen, Vaughn, & Vojir, 2008; Jiang, Stocks, & Wong, 2006; Mark & Harless, 2007). This variation in staffing and outcomes may be due to variation in patient acuity. If so, models linking staffing to outcomes should control for hospital characteristics as an additional measure of patient acuity. If the staffing variation is unrelated to patient acuity and is instead due to other factors, such as nurse supply in the market area, including these characteristics in multivariate models will not add to variance explained or improve estimation of the independent variable. We included hospital size, teaching intensity, and ownership as control variables. We specified hospital size as less or greater than 300 beds, as this size divided our sample in half. Teaching intensity was specified as non-teaching, minor teaching (less than 1 medical resident per 4 beds), and major teaching (more than 1 medical resident per 4 beds). We classified hospitals as non-profit, for profit, and public. We classified the three Veterans Administration hospitals in the sample as public hospitals because they are government owned.

Analysis

Descriptive statistics were used to summarize the data. To explore staffing patterns in greater

depth, we examined the distribution of hours for each type of nursing staff. We evaluated bivariate associations between all nursing factors (RN, LPN, and NA Hppd, RN education, certification, and employment status) and the patient fall rate. Nursing factors found to be statistically significant were analyzed as independent variables in multivariate models. The independent variables were specified at two different levels consistent with their multilevel effects. The Magnet/non-Magnet comparison was at the hospital level. The staffing and RN composition variables' effects were at the nursing unit level.

The dependent variable was fall count, and patient days was the exposure on the right side of the equation. This approach is equivalent to a model with the fall *rate* as the dependent variable. The advantage of analyzing the actual fall count and patient days is that all available information in the data is used for estimation. Because the fall count follows a negative binomial distribution (i.e., its variance exceeds its mean) a negative binomial model was used. Coefficients were estimated using Generalized Estimating Equations (GEE), which take into account repeated measures and clustering (Hanley, Negassa, Edwardes, & Forrester, 2003). GEE corrects the standard errors for the within-hospital clustering in the NDNQI.

We ran four multivariate models. Model 1 used only independent variables. Model 2 added all control variables. Model 1 revealed the initial effect sizes of the independent variables alone. Model 2 showed the final effect sizes accounting for control variables. Four percent of the observations were missing AHA hospital characteristics or Medicare CMI. These observations were included in all models by adding flag variables that excluded them from the estimation of variables they were missing but used their non-missing data otherwise.

Models 3 and 4 were for ICUs and non-ICUs separately. Fundamental differences between ICUs and non-ICUs may result in different patterns of relationships among nursing factors and falls. ICUs have a high level of RN hours and a nearly all RN-level staff. ICU patients may be at lower risk for falling because they are critically ill and frequently sedated. In contrast, non-ICU units (stepdown, medical, surgical, medical-surgical, and rehabilitation) staff with RNs, LPNs, and NAs, and they care for less critically ill patients who are physically able to move enough to fall. Based on Dunton et al. (2004), who found a shift in the relationship direction linking staffing to falls,

we tested for a shift in direction at a certain level of nursing hours; we found a consistent slope across nursing hours.

Because the NDNQI is a benchmarking database, we speculated that the overall nurse staffing may differ from typical general hospitals. Different staffing levels might influence the relationships we detect within the NDNQI vs. those that may be observed in a more typical sample. To explore this sampling implication, we analyzed AHA staffing data to compare US general hospitals to NDNQI hospitals by using *t*-tests.

We followed the recommendations of experts based on recent empirical work to evaluate nurse staffing measures calculated from AHA data (Harless & Mark, 2006; Jiang et al., 2006; Spetz, Donaldson, Aydin, & Brown, 2008). We calculated RN staffing as RN hours per *adjusted* patient day (Hpapd; note the difference in this abbreviation, which indicates that these are adjusted patient days). For the numerator we calculated RN hours for the year from the AHA full time equivalent RNs (RN FTE) multiplied by 2,080, which is the number of work hours in 1 year (40 hours per week × 52 weeks). The RN FTE variable includes RNs in acute, ambulatory, and long-term care. For the denominator we chose adjusted patient days to match the service areas of the numerator. To incorporate outpatient services, the AHA adjusts patient days by the ratio of outpatient to inpatient revenue. There are limitations in these AHA data, and results should be interpreted with caution. Harless and Mark (2006) found that the adjusted patient days method was less biased than alternatives but still led to deflated coefficients in multivariate models. Our use was to compare overall staffing across hospital groups. Jiang et al. (2006) compared this staffing measure in a California hospital sample using AHA data and state data, which are considered more accurate. They found greater than 20% difference in nurse staffing values for small, rural, nonteaching, public, and for-profit hospitals. These discrepancies imply that the AHA staffing estimates for NDNQI hospitals would be more accurate than the estimates for hospitals throughout the US because the NDNQI database contains more large, urban, nonprofit, and teaching hospitals.

We speculated further that NDNQI Magnet hospitals may staff at higher levels than NDNQI non-Magnet hospitals. We compared staffing levels at the hospital level using AHA Hpapd data and at the nursing unit level using NDNQI Hppd data.

RESULTS

Descriptive Results

As shown in Table 1, the NDNQI and US general hospitals had similar geographic and teaching status distributions. Compared with general hospitals NDNQI hospitals were more often not-for-profit and had more than 300 beds. Seventeen percent of NDNQI hospitals had achieved Magnet recognition. The average CMI for NDNQI hospitals was 1.65, indicating that NDNQI hospitals cared for more complex Medicare patients than the average hospital. Fifty-seven percent of nursing units were either medical, surgical or medical-surgical units, 24% were intensive care, 15% were stepdown, and 4% were rehabilitation. The average age of patients in these nursing units was 50, and 41% of patients were male.

In 2004, the sample nursing units reported 113,067 patient falls. The observed fall rate across all nursing units was 3.32 per 1,000 patient days (1,000PD). Table 2 shows that falls were most common in rehabilitation units and least common in intensive care units. Most patients (72%) had no

Table 1. Characteristics of NDNQI Hospitals and General Acute Care Hospitals in the US

	NDNQI Hospitals ^a (<i>n</i> = 636), %	General Acute Care Hospitals ^b (<i>n</i> = 4,919), %
Ownership		
Non-profit	82	60
For-profit	6	17
Public	12	23
Bed size		
< 100	8	48
100–299	41	36
300–499	30	11
500+	21	5
Teaching status		
Academic medical center	19	7
Region		
Northeast	21	13
Midwest	31	29
West	14	18
South	34	40

NDNQI, National Database of Nursing Quality Indicators; AHA, American Hospital Association. Of the 636 NDNQI hospitals, 32 could not be matched to AHA for ownership and bed size. These hospitals are omitted from the percent distribution.
^a2004 NDNQI Database.
^b2004 AHA Annual Hospital Survey Database.

injury from their falls; most of the others (23%) suffered a minor injury from the fall. Five percent had a moderate or major fall-related injury.

Overall, most nursing staff hours were provided by RNs: 88% of hours in intensive care (15 out of 17 hours) and 63% of hours in non-intensive care (5 out of 8 hours). NAs provided 2–3 hours of care per patient day; LPNs provided less than an hour of care per patient day. Forty-four percent of RNs had a BSN or higher degree, and 11% of RNs had national specialty certification. Of the six types of units, intensive care units had the highest proportions of nurses with a BSN or higher degree (52%) and certification (15%). Four percent of RN hours were provided by agency staff.

Table 2 also displays the nursing hours for different unit types. RN Hppd ranged from 14.8 for intensive care to 4.0 for rehabilitation. Conversely, average LPN and NA Hppd were highest for intensive care and lowest for rehabilitation. Both LPN and NA Hppd were normally distributed. RN Hppd exhibited a bimodal distribution.

Figure 1 shows that most units were staffed so that RN Hppd were either about 5 hours or about 15 hours. The units with over 10 RN Hppd were primarily ICUs (84%). As shown in Table 2, units with more RN hours had fewer LPN and NA hours. This relationship changes direction at the point of 2 NA Hppd (see Fig. 2), which reflects the ICU and non-ICU patterns observed in Table 2. The line superimposed on the scatter plot of Figure 2 is a locally weighted regression line of NA Hppd on RN Hppd.

Bivariate Results

Nursing staff hours and hospital Magnet status were significantly associated with the fall rate. RN

Hppd were negatively associated with the fall rate; conversely, LPN and NA Hppd were positively associated with the fall rate: $r = -.29$ for RN Hppd, $.12$ for LPN Hppd, and $.10$ for NA Hppd ($p < .001$). The average fall rates were 8.3% lower in Magnet hospitals as compared to non-Magnet hospitals: 3.11 and 3.39 per 1,000PD, respectively ($t = 7.99$; $p < .001$). These rates were aggregated from the participating nursing units, and may reflect differing subsets of unit types in the Magnet and non-Magnet hospital subgroups. Elements of RN staff composition—proportions of BSNs, specialty-certified nurses, and agency nurse hours—were not significantly associated with the fall rate. These RN staff composition elements were excluded from multivariate analyses.

Multivariate Results

Table 3 displays incident rate ratios (IRRs) estimated from the negative binomial model using GEE. The IRR is the expected change in the incidence of the dependent variable with one unit change in the independent variable holding all other model variables constant. Hospital Magnet recognition was negatively associated with patient falls. The likelihood of falls was 5% lower in Magnet hospitals ($IRR = 0.95$), which is equivalent to a 5% lower fall rate. At the nursing unit level, all types of nursing staff hours were significantly associated with patient falls, but in different directions; the directions were consistent with their bivariate patterns. RN hours were negatively associated with falls; an additional hour of RN care per patient day reduced the fall rate by 2%. LPN and NA hours had positive relationships with falls; an additional hour of LPN care increased the fall rate by 2.9% and an

Table 2. Nursing Staff Hours Per Patient Day (Hppd) and Fall Rate by Nursing Unit Type

Nursing Unit Type	%	RN, Mean (SD)	Staff Hppd		Falls per 1,000PD ^a , Mean (SD)
			LPN, Mean (SD)	NA, Mean (SD)	
ICU	24	14.84 (3.06)	0.13 (0.51)	1.67 (1.47)	1.38 (2.79)
Stepdown	15	7.03 (2.29)	0.39 (0.68)	2.51 (1.24)	3.35 (3.32)
Medical	19	5.11 (1.65)	0.55 (0.76)	2.39 (0.98)	4.51 (3.45)
Surgical	14	5.22 (1.50)	0.58 (0.74)	2.38 (1.01)	2.79 (2.71)
Med-surg	24	5.04 (1.68)	0.65 (0.87)	2.39 (1.06)	3.93 (3.42)
Rehab	4	4.02 (1.47)	0.75 (0.85)	2.87 (1.29)	7.33 (6.62)

Data Source: 2004 NDNQI Database.

ICU, intensive care unit; Med-Surg, medical-surgical; Rehab, rehabilitation; Hppd, hours per patient day; RN, registered nurse; LPN, licensed practical nurse; NA, nursing assistant.

^aPer 1,000 patient days.

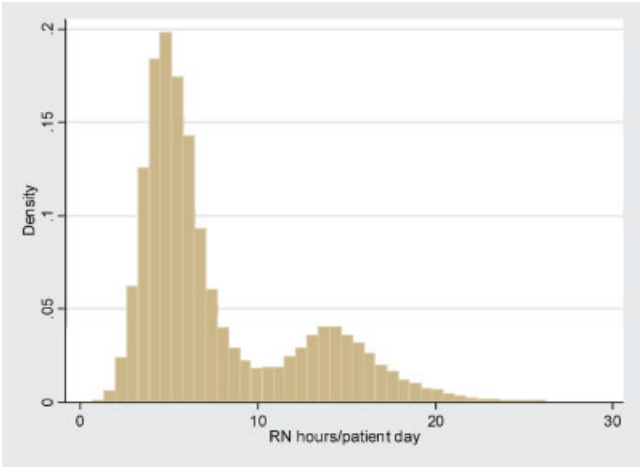


FIGURE 1. Distribution of RN hours per patient day.

additional hour of NA care increased the fall rate by 1.5%. Note that the increment of 1 hour of care per patient day has different implications across types of nursing staff and nursing units due to differing standard deviations. One RN hour is only a third of a standard deviation in ICUs (SD for RN Hppd = 3.06). At the other extreme, one LPN hour is two standard deviations in ICUs (SD for LPN Hppd = 0.51).

Because ICUs were at the extreme ends of the nursing hours and falls distributions, we duplicated our analyses in ICUs and non-ICUs (Models 3 and 4 in Table 3). We found that the effect of RN hours was slightly larger in ICUs than

in all units combined (Model 2; IRRs of 0.967 and 0.984, respectively) and became nonsignificant in non-ICUs. Conversely, the LPN hours effect was larger in non-ICUs than ICUs, while the NA hours effect became nonsignificant in ICUs. The standard deviation of NA Hppd is about 1 hour in non-ICUs. Therefore, the association between NA Hppd and falls in non-ICUs can readily be interpreted as a one standard deviation increase (i.e., 1 hour) is associated with a 1.5% higher fall rate. Although the coefficient for LPN Hppd in ICUs was the highest among the different models (IRR = 1.098) its clinical significance is trivial due to the minimal Hppd of

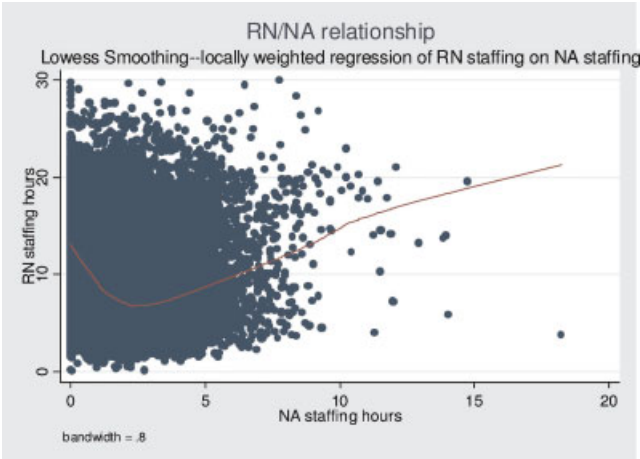


FIGURE 2. Scatter plot of the relationship between RN and NA hours per patient day. RN, registered nurse; NA, nursing assistant; Note: Line on plot is the locally weighted regression line.

Table 3. Incident Rate Ratios of Patient Falls Based on Negative Binomial Regressions

	Model 1, IRR (<i>n</i> = 50,810)	Model 2, IRR (<i>n</i> = 50,810)	Model 3 (ICU), IRR (<i>n</i> = 11,520)	Model 4 (non-ICU), IRR (<i>n</i> = 39,290)
Nurse staffing				
RN Hppd	0.910***	0.984***	0.967***	0.994
LPN Hppd	1.015	1.030**	1.098*	1.035**
NA Hppd	1.043***	1.011*	0.989	1.015*
Magnet hospital	0.948***	0.947***	0.860***	0.960**
Nursing unit type			N/A	
ICU		0.211***		
Stepdown		0.484***		0.471***
Medical		0.632***		0.627***
Surgical		0.397***		0.396***
Med-surg		0.545***		0.544***
Rehab		Reference		Reference
<i>R</i> ²	0.030	0.049	0.008	0.019

Notes: ****p* < .001, ***p* < .01, **p* < .05. Observations are nursing unit months.

Incident rate ratios are from generalized estimating equations models that clustered observations within nursing units. Models 2, 3, and 4 controlled for the hospital's 2004 Medicare Case Mix Index, teaching status, bedsize, and ownership, and the nursing unit's average patient age and sex.

RN, registered nurse; LPN, licensed practical nurse; NA, nursing assistant; Hppd, hours per patient day; ICU, intensive care unit; Med-Surg, medical-surgical; Rehab, rehabilitation.

LPNs in ICUs, which was on average 0.13 hours (i.e., 8 minutes).

To translate our findings into scenarios that may be useful from policy and management perspectives, predicted fall rates for each nursing unit type by Magnet status are presented in Table 4. The predicted fall rate was calculated from Models 3 and 4 by entering the nursing unit type and Magnet status into the relevant model depending on the scenario. The sample mean was used for all other variables. Table 5 displays the annual number of falls expected by unit type in Magnet and non-Magnet hospitals. Here we multiplied the respective predicted fall rate from Table 4 by the number of patient days on average for that unit type. For example, in an average medical-surgical unit, which had 8,282 patient days in 2004, we would have expected 1.4 fewer falls per year in Magnet ($3.75/1,000 \times 8,282 = 31.1$ falls per year) as compared to non-Magnet hospitals (3.92/

$1,000 \times 8,282 = 32.5$ falls per year; $32.5 - 31.1 = 1.4$).

Nurse Staffing Comparisons Across Hospital Groups

Using AHA data, we found that NDNQI hospitals had nearly 2 hours higher RN Hppd than US general hospitals (means = 7.86 and 6.06 respectively, $t = 11.52$, $p < .001$). Among NDNQI hospitals, at the hospital level, the RN Hppd in Magnet hospitals was nearly 1 hour higher than non-Magnet hospitals (mean = 8.50 and 7.70 respectively, $t = 2.92$, $p < .01$). At the nursing unit level, NDNQI data showed the RN Hppd in Magnet hospitals was significantly higher for every unit type. This difference ranged from 0.20 to 0.80 Hppd (12–48 minutes). The LPN Hppd in Magnet hospitals was 0.07 to 0.30 (4–18 minutes)

Table 4. Predicted Patient Fall Rate per 1,000 Patient Days on Different Types of Nursing Units by Hospital Magnet Status

	Unit Type					
	ICU	Stepdown	Medical	Surgical	Med-Surg	Rehab
Magnet	1.12	3.29	4.35	2.67	3.75	6.84
Non-magnet	1.30	3.44	4.54	2.79	3.92	7.15

ICU, intensive care unit; Med-surg, medical-surgical; Rehab, rehabilitation.

Table 5. Estimated Number of Patient Falls Per Year in Magnet and Non-Magnet Hospitals by Nursing Unit Type

	Unit Type					
	ICU	Stepdown	Medical	Surgical	Med-Surg	Rehab
Magnet	4.5	24.0	23.1	34.8	31.1	43.3
Non-magnet	5.2	25.1	24.2	36.3	32.5	45.3

ICU, intensive care unit; Med-Surg, medical-surgical; Rehab, rehabilitation.

lower for five unit types; the exception was rehabilitation units where the difference was not statistically significant. The NA Hppd did not exhibit consistent patterns across unit types between Magnet and non-Magnet hospitals.

DISCUSSION

Key Findings

Using a sample of 5,388 units in 636 hospitals, we investigated the relationships among nurse staffing (i.e., RNs, LPNs, NAs), RN staff composition, hospital Magnet status, and patient falls to develop evidence about how the distribution of nursing resources and achievement of nursing excellence contribute to patient safety. Our principal findings suggest that staffing levels have small effects on patient falls, that RN hours are negatively associated with falls in ICUs, LPN, and NA hours are positively associated with falls principally in non-ICUs, and that fall rates are lower in Magnet hospitals. This evidence suggests there are potentially two mechanisms for enhancing patient safety: becoming or emulating a Magnet hospital, or adjusting staffing patterns at the unit level.

Our reported fall rate of 3.3 falls per 1,000 patient days is similar to the rate of 3.73 from the analysis of the 2002 NDNQI database (Dunton et al., 2004). We found higher fall rates on medical units compared to surgical units. Typical medical, surgical, and medical-surgical units in this sample had about 693 patient days per month, meaning about 2–3 patients fell each month on the most common acute care units.

We separated nursing staff hours into RN, LPN, and NA hours, a new approach in the staffing literature. We identified statistically significant opposite effects of RN hours as compared to LPN and NA hours. RN education level and certification did not appear to be associated with falls in a meaningful way. Our insignificant finding regard-

ing agency RN hours and falls may be due to the small percentage of RN hours by agency nurses, which would not be expected to have a substantial influence. We did not analyze skill mix (i.e., the RN proportion of total nursing staff) due to its high correlation with all types of nursing hours per patient day.

The negative association between RN hours and falls in the ICU may reflect the causal explanation that providing more RN hours will lead to fewer falls. The alternative explanation is that ICUs with higher RN hours have patients who are too ill to move and accordingly have a lower fall risk. In this case, the lower risk, rather than the better staffing, accounts for the fewer falls. We cannot rule out this explanation with the data at hand. We note that given the extremely low risk of falls in ICUs, they may not be a productive focus for future research.

The positive association between NA hours and falls in non-ICUs was not expected. Because NAs provide toileting assistance and would seem to have a greater opportunity to prevent falls, we expected this relationship to be negative. Because cross-sectional regression models cannot determine causality, one possibility for this unexpected positive relationship between NA Hppd and falls is that nursing units attempted to address high fall rates by increasing their least expensive staffing component, NAs, rather than higher NA staff causing a higher fall rate.

The fall rate was substantially higher on rehabilitation units than on medical units, the nursing unit type with the next highest fall rate (7.33 vs. 4.51 per 1,000PD). The high rate of falls in rehabilitation settings is likely due to people learning to walk again post-surgery. How to reduce falls on rehabilitation units is a compelling topic for future study. Research questions could include the role of physical therapy or the effectiveness of alternative fall prevention protocols.

Our multivariate results show that patients in Magnet hospitals had a 5% lower fall rate. This difference is important to identify as it controls for multiple factors influencing fall risk, principally

nursing unit type, which may differ across the Magnet and non-Magnet hospitals in this sample. This is the second study to analyze Magnet status and patient falls. The first study using NDNQI data from July 2005 to June 2006 (Dunton et al., 2007) identified a 10.3% lower fall rate in Magnet hospitals. The difference between the Dunton et al. (2007) report and our findings may be due to sampling differences: Dunton et al. evaluated only the 1,610 NDNQI nursing units that participated in the NDNQI RN survey. By contrast our findings reflect the entire 2004 NDNQI database of 5,388 nursing units.

The beneficial finding of Magnet status is consistent with the limited literature showing better patient outcomes such as lower mortality and higher patient satisfaction in Magnet hospitals (Aiken, 2002), although the earlier empirical evidence is from the cohort of Magnet hospitals identified by reputation and predates the Magnet Recognition Program era. We confirmed in two different data sources that Magnet hospitals in this sample had higher RN staffing levels than non-Magnet hospitals. In multivariate regression analyses we identified a Magnet hospital effect independent of the RN staffing level. Therefore, higher RN staffing was not the reason for the lower fall rates identified in Magnet hospitals. The basis for lower fall rates in Magnet hospitals remains an open question for future research.

Using the NDNQI for Research

The NDNQI database granted us the benefits of its unprecedented national scope. However, the NDNQI database is a benchmarking database that may not represent all general hospitals. In particular, the NDNQI has more not-for-profit and large hospitals than the national profile. Therefore, our results will generalize best to not-for-profit and larger hospitals. The disproportionate share of Magnet hospitals in the NDNQI database (17% in this sample vs. 7% nationally in 2004) likely reflects the Magnet recognition requirement that a hospital participate in a quality benchmarking system as well as the interest in quality improvement that is common to the Magnet hospital ethos.

Two aspects of the NDNQI sample may yield effect sizes that differ from those that might be estimated in a representative sample of general hospitals. First, the benchmarking purpose of the NDNQI attracts hospitals oriented towards quality improvement through nursing systems decisions. The feedback provided through benchmarking

reports may lead these hospitals to implement similar staffing patterns. The result could be less variability in nursing hours than would be observed typically in general hospitals. This possibility was reflected in AHA staffing statistics for the entire hospitals by a lower standard deviation for RN Hpad in the NDNQI cohort as compared to all U.S. general hospitals ($SD = 0.50$ vs. 0.75 respectively).

In addition, we detected significantly higher RN staffing in NDNQI hospitals as compared to US general hospitals, suggesting that our multivariate model results apply to hospitals at the high end of the staffing range. Moreover, the Magnet hospital effect identified here may underestimate the “true” Magnet effect were we to compare Magnets with all general hospitals. That is, the “comparison” hospitals in this sample already participate in a quality benchmarking initiative and may therefore differ from hospitals not involved in nursing benchmarking. Lastly, the “non-Magnet” group includes some “Magnet applicants” in various stages of implementing Magnet standards.

The NDNQI remains useful for research questions that incorporate new measures including other nursing workforce characteristics (e.g., expertise, experience), a survey measure of the nursing practice environment, nursing unit types (psychiatric), and outcomes (restraint use). The NDNQI also can be useful to test fall-prevention interventions by comparing the pre- and post-intervention fall rate.

Limitations

Our study is limited by a cross-sectional design, the limited data to adjust for patient characteristics, and the age of the data. Another limitation discussed previously is the convenience sample.

The classic weakness of the cross-sectional study design is the inability to establish causality. One hypothesized causal sequence is that providing more nursing hours will lead to fewer falls. Our results showing the opposite, that more LPN and NA hours are associated with more falls, may reflect this design weakness. Another hypothesized causal sequence is that the nursing excellence acknowledged by Magnet Recognition translates into safer practice and fewer patient falls. However, the converse may be plausible: hospitals with fewer falls happen to become Magnet hospitals. Future research on patient falls before and after hospital Magnet Recognition may illuminate this question.

Outcomes studies must control for differences in patients to discern the effects of nursing variables. In this study we controlled for nursing unit type and each nursing unit's average patient age and gender, thus the control variables were limited. At the hospital level we controlled for patient differences that may be reflected in the Medicare CMI and hospital structural characteristics. This set of control variables exceeds those of most earlier studies of falls by including average patient demographics and hospital CMI. Mark et al. (2008) included average health status but not CMI in their analysis of falls. In fact our additions of the nursing unit's average patient demographics and hospital CMI contributed minimally to explained variance (not shown). The diminished effect sizes of the independent variables and the increased variance explained in Model 2 was due predominantly to nursing unit type; the other control variables had minimal influence. The NDNQI data do not contain patient diagnosis, cognitive impairment, time or shift of the fall, or acuity mix within nursing unit types. Better risk adjustment may yield other findings.

The age of the data (2004) limits the results in two ways. Several national initiatives since 2004 have heightened attention to the prevention of patient falls. In 2005, the Joint Commission implemented a new National Patient Safety Goal to reduce the risk of patient harm resulting from falls with a requirement of fall risk assessment and action (Joint Commission, 2010). By 2009, the requirement had evolved to implement and evaluate a falls reduction program. In October 2008, Medicare stopped reimbursing hospitals for care due to preventable falls (Centers for Medicare and Medicaid Services, 2008). These changes may have altered the roles of nursing staff, the incidence of patient falls, and the associations between them. The age of the data also limit how well the results generalize to NDNQI hospitals presently. The database has more than doubled in the past 5 years and hospitals under 100 beds are now a larger share of the participants. The study variables have been stable during the years 2004–2010, except for a few clarifications in the data collection guidelines. The changes were minor and would be unlikely to influence the findings reported herein.

CONCLUSION

This study stands apart from previous staffing/fall literature due to the measurement of three different categories of nursing staff hours,

the national scope of the hospital sample, the range of nursing unit types, as well as analysis of count data at the unit-months level, the most detailed level of observation. An additional noteworthy feature was risk adjustment for the nursing unit's average patient characteristics (age, gender) and the hospital's Medicare CMI. This study provided a thorough presentation of staffing patterns across unit types. We used a national data source, the AHA's Annual Hospital Survey, to provide a national context for the RN staffing levels in NDNQI hospitals and to compare RN staffing levels in hospitals with and without Magnet recognition within the NDNQI.

Our study findings have implications for management, research, and policy. At the highest management level, hospital executives can improve patient safety by creating environments consistent with Magnet hospital standards. Fewer falls can yield cost savings and prevent patients' pain and suffering. Nursing unit managers can use these nursing hours and falls statistics for their nursing unit type as reference values to support their staffing decisions. The current study strengthens the evidence base on how nurse staffing patterns and practice environments support patient safety.

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FALLS RELIABILITY AND VALIDITY STUDY

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Final report

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1. INTRODUCTION

Falls are a serious health care quality concern and are endorsed as a nurse-sensitive patient outcome measure of the National Quality Forum (NQF). While there is no doubt about the importance of falls as a safety outcome, the measurement of falls has been relatively unstandardized in the research literature (Hauer, Lamb et al. 2006). So far little research has been conducted to assess the reliability of fall measurement. Haines, Massey et al (Haines, Massey et al. 2009) investigated the consistency of fall classifications of direct care providers while others (Sari, Sheldon et al. 2007; Shorr, Mion et al. 2008) researched the reliability of incident report systems, clinical fall notes or fall evaluation services.

The National Database of Nursing Quality Indicators[®] (NDNQI) provides member hospitals the following definition(National Database of Nursing Quality Indicators (NDNQI) July 2009):

A patient fall is an unplanned descent to the floor (or extension of the floor, e.g., trash can or other equipment) with or without injury to the patient, and occurs on an eligible reporting nursing unit. All types of falls are to be included whether they result from physiological reasons (fainting) or environmental reasons (slippery floor).

Furthermore the data collection guidelines describe assisted falls as:

“A fall in which any staff member (whether a nursing service employee or not) was with the patient and attempted to minimize the impact of the fall by easing the patient’s descent to the floor or in some manner attempting to break the patient’s fall. “Assisting” the patient back into a bed or chair after a fall is not an assisted fall. A fall that is reported to have been assisted by a family member or visitor also does not count as an assisted fall.”

Incident reports are the source for fall data provided by hospitals to NDNQI. Although the definition is available to all NDNQI member facilities it is not clear to what extent this definition is provided to direct care providers who submit incident reports. Therefore the fall reliability study is focused on the data collection procedures of hospitals and units within hospitals, the fall classification of direct care providers, and the consistency of the fall classification between units.

The fall reliability study consisted of two studies:

Study 1: Site coordinator survey

Aim: To clarify data collection processes, personnel involved in data collection and reporting, and attitudes towards the collected fall data.

Method: Brief telephone interviews were conducted with a convenience sample of NDNQI site coordinators to identify core processes and key personnel involved in fall data collection. Based on the interviews an online survey was developed to obtain basic descriptive information on fall data collection in NDNQI hospitals.

Study 2: Online video vignette study

Aim:

1. To assess consistency (reliability) of rater to standard ratings of different fall scenarios at the unit level; and
2. To assess sensitivity and specificity (validity) of fall categorization (fall vs. non-fall).

Method: The study investigated how direct care providers rate certain fall situations. The scenarios exemplified situations that cover typical fall situations and some that challenge fall classification. The scenarios were based on a previous Australian study (Haines, Massey et al. 2009) and supplemented by scenarios that emerged from discussion with NDNQI liaisons and site coordinators.

Other questions of interest in connection with fall data reliability, such as the determination of fall injury levels after 24 hrs or if all falls are captured by the incident report system, were not addressed in this study.

2. BACKGROUND

FALL DEFINITIONS

Fall definitions and classifications vary widely between published research studies. In order to develop a framework for the investigation of fall reliability, the definition of a fall needs to be elucidated. Previous fall definitions have produced a range of dimensions by which to classify situations as falls: the *cause*, *intention*, *location*, the *point of rest*, the *injury level* and the *assistance* with the fall.

Table 1 (p. 8) summarizes eight common definitions from diverse data collection groups according to these dimensions.

Falls can be classified by the *cause*. This refers to the physiological condition that lead to the fall or if the fall occurred accidentally. For her risk assessment instrument Morse (Morse 2009) differentiated between three types of falls. The *anticipated physiologic fall* refers to situations where the fall occurred because of the patient's frailty due to illness or age. In a situation where the patient does not carry the risks attached to frailty, but falls because of an acute physiological event like a stroke or fainting is referred to as an *unanticipated physiologic fall*. *Accidental falls* happen in situations when patients with no risk and no physiological reason fall, e.g. because they trip over something. Other researchers sometimes classify falls to be *intrinsic* (physiological) or *extrinsic* (accidental) (Masud and Morris 2001).

While the cause of the fall maybe related to certain risk factors, the *intention of the patient* plays a crucial role in the judgment of the fall situation. A core attribute of many definitions is that the fall needs to be unintentional, unplanned or involuntary. However this distinction is challenged by fall situations in psychiatric settings in which patient "falls" occur because of attention seeking behaviors.

The *location* where the fall occurs is considered less often in fall definitions. The World Health Organization (WHO) definition is based on the ICD classification system and is very specific in terms of the location where the fall has occurred (e.g. from transport vehicle, into water)(World Health Organization). However this classification of locations is mainly relevant for non-institutional fall situations. NDNQI data collection guidelines specify that falls be submitted to the database only if they occur on a reporting unit (vs. in the radiology department).

Another core attribute of fall definitions is the *point of rest*, which is often specified as "rest on" the floor, ground, lower level or extension of the floor. This is unambiguous in situations where the patient comes to rest on the ground or the floor. However, in situations in which the patient comes to rest on a chair or bed (lower level), the determination of whether a fall has occurred is less clear.

Falls can cause injuries, which are also used to classify falls as injurious or non-injurious.

Furthermore injurious falls can be classified by the *injury levels*. The current NDNQI guideline uses five levels: None, Minor, Moderate, Major and Death. The NDNQI criterion for an injurious fall is that some kind of treatment or consultation (e.g., by neurology) has occurred.

Finally sometimes falls are *assisted* by direct care providers, for instance, in situations where patients faint and a health care provider slowly lowers the patient to ground level. This action represents an appropriate and often desirable behavior of direct care providers.

In summary fall definitions can be described along a range of dimensions. While the fall cause, the intention and the point of rest are almost always mentioned in fall definitions, the location, injury levels, and assistance by a health care provider are only included in some definitions.

Table 1: Selected fall definitions by presence or absence of fall dimensions
Dimension included/referred=y. Dimension not included=n.

Definition	Cause	Intention	Location	Point of Rest	Injury	Assistance
<p>National Database of Nursing Quality Indicators (National Database of Nursing Quality Indicators (NDNQI) July 2009)</p> <p>A patient fall is an unplanned descent to the floor (or extension of the floor, e.g., trash can or other equipment) with or without injury to the patient, and occurs on an eligible reporting nursing unit. All types of falls are to be included whether they result from physiological reasons (fainting) or environmental reasons (slippery floor).</p> <p>“A fall in which any staff member (whether a nursing service employee or not) was with the patient and attempted to minimize the impact of the fall by easing the patient’s descent to the floor or in some manner attempting to break the patient’s fall. “Assisting” the patient back into a bed or chair after a fall is not an assisted fall. A fall that is reported to have been assisted by a family member or visitor also does not count as an assisted fall.”</p>	y	y	y	y	y	y

Definition	Cause	Intention	Location	Point of Rest	Injury	Assistance
<p>World Health Organization (World Health Organization)</p> <p>A fall is an event which results in a person coming to rest inadvertently on the ground or floor or other lower level. Within the WHO database fall-related deaths and non-fatal injuries exclude those due to assault and intentional self-harm. Falls from animals, burning buildings and transport vehicles, and falls into fire, water and machinery are also excluded.</p>	y	y	y	y	n	
<p>Kellogg International Work Group on the Prevention of Falls by the Elderly (Kellogg International Work Group on the Prevention of Falls by the Elderly 1987)</p> <p>A fall is an event which results in a person coming to rest inadvertently on the ground or other lower level and other than as a consequence of the following: Sustaining a violent blow; Loss of consciousness; Sudden onset of paralysis, as in a stroke; An epileptic seizure.</p>	y	n	n	y	n	n

Definition	Cause	Intention	Location	Point of Rest	Injury	Assistance
<p>PSO Privacy Protection Center (PSO Privacy Protection Center 2010) A fall is a sudden, unintended, uncontrolled, downward displacement of a patient's body to the ground or other object.</p> <p>Inclusions:</p> <ul style="list-style-type: none"> • A fall not known to be assisted • Assisted fall - when patient begins to fall and is assisted to the ground by another person <p>Exclusions:</p> <ul style="list-style-type: none"> • A fall resulting from a purposeful action or violent blow • Near fall – loss of balance that does not result in a fall 	y	y	n	y	n	y
<p>Lamb, Jørstad-Stein et al. (Lamb, Jørstad-Stein et al. 2005)</p> <p>An unexpected event in which the participants come to rest on the ground, floor, or lower level.</p>	n	y	n	y	n	n
<p>Tinetti, Speechley et al. (Tinetti, Speechley et al. 1988)</p> <p>A fall was defined as a subject's unintentionally coming to rest on the ground or at some other lower level, not as a result of a major intrinsic event (e.g., stroke or syncope) or overwhelming hazard. An overwhelming hazard was defined as a hazard that would result in a fall by most young, healthy persons, on the basis of a consensus of three physicians and three physical therapists.</p>	y	y	n	y	n	n
Definition	Cause	Intention	Location	Point of Rest	Injury	Assistance

<p>Nevitt, Cummings et al. (Nevitt, Cummings et al. 1991)</p> <p>A fall was defined for participants as "falling all the way down to the floor or ground, or falling and hitting an object like a chair or stair. We reviewed the circumstances of each reported "fall" to determine if it was consistent with a standard definition of a fall. Of the 593 reported "falls," 54 (9%) were excluded because the participant caught him- or herself before landing on the floor, ground, or other lower level, moved intentionally to a chair, bed, or other lower level, or was knocked down by a substantial external force, like a moving vehicle. If the subject unintentionally landed on an object or lower level other than the floor or ground, we considered this a fall.</p>	y	y	n	y	n	y
<p>Buchner, Hornbrook et al. (Buchner, Hornbrook et al. 1993)</p> <p>Falls: Unintentionally coming to rest on ground, floor, or other lower level; excludes coming to rest against furniture, wall, or other structure.</p> <p>Fall injury events: Fractures; head injuries requiring hospitalization; joint dislocations; sprains, defined as injury to a ligament when joint carried through ROM greater than normal; other non-specified serious joint injuries; lacerations requiring sutures. Injury must have resulted from fall.</p>	n	y	n	y	y	n

3. PHASE I: SURVEY OF SITE COORDINATORS

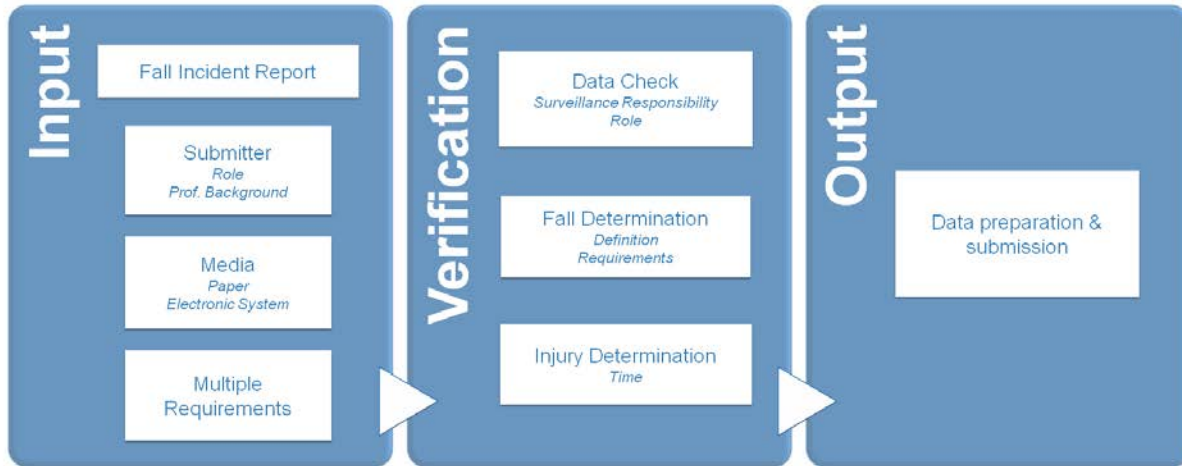
Site coordinators are vital links for ensuring that hospitals' collect and report data according to NDNQI guidelines. NDNQI conducted a survey of site coordinators to assess their compliance with data collection guidelines. The study consisted of two parts: a) telephone interviews were conducted with a small convenience sample of site coordinators to identify data collection

processes and issues and b) an online survey of all site coordinators about fall data collection and reporting practices.

RESULTS TELEPHONE INTERVIEWS

The purpose of the unstructured interviews was to identify issues to be included in development of the online survey. Since there was high agreement between the reports of the site coordinators, only five interviews were conducted. Based on the interviews an outline of the fall data collection process was developed. The outline describes the variety of players and components involved in the process, which was used to guide the development of the site coordinator survey. The fall data collection process (Figure 1) can be depicted in three phases which involve different groups of staff with diverse roles and requirements. In the INPUT phase direct care providers, with various roles and professional backgrounds, submit a fall incident report. Incident reports are either submitted electronically or on paper with multiple requirements based on the intra- and extra organizational requirements. In the VERIFICATION phase the initial report is checked by the organizational group with fall surveillance responsibility. This group determines if the reported incident is an actual fall and assigns an injury level. In some, organizations incident reports could be processed by more than one department. In the OUTPUT stage, fall data is prepared for the submission to NDNQI. The depicted process is similar to the process underlying the common format initiative of the Agency of Healthcare Research and Quality (2010). The approach of the common format differentiates between the initial “Healthcare Event Reporting Form” (HERF), which represents the input phase and the Summary of Initial Report (SIR), which refers to the verification phase described here.

Figure 1: Fall data collection process



RESULTS SITE COORDINATOR ONLINE SURVEY

All 1,244 site coordinators of NDNQI facilities received an invitation to participate in the online survey and 727 responded, resulting in a response rate of 58.4%. The comparison of the NDNQI population with the survey respondents (Table 2) found virtually no difference between all NDNQI hospitals and respondent hospitals by hospital type and only limited differences by hospital size and teaching status. These small differences should not produce meaningful bias in the representativeness of the site coordinator survey. Tabulated data of the entire site coordinator survey are attached in Appendix D: Survey Data on page 54.

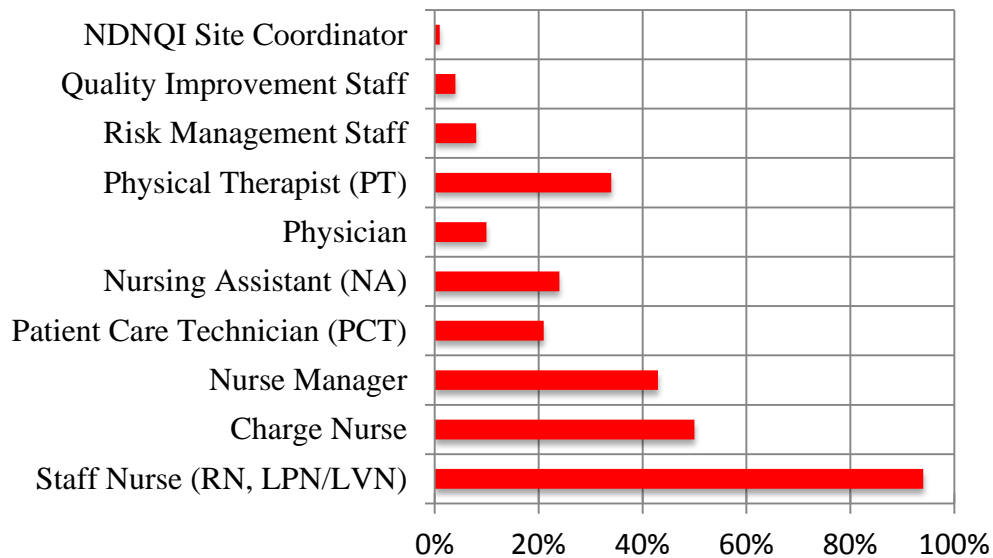
Table 2: Comparison NDNQI population and site coordinator survey by hospital type, size, and teaching status

	All NDNQI Hospitals		Survey Respondents	
<i>Hospital Type</i>	n	%	n	%
General	1259	88	631	87
Pediatric	60	4	25	3
Critical Access	29	1	25	3
Psychiatric	17	1	1	0
Rehabilitation	25	2	13	2
Other	48	3	32	4
<i>Hospital size</i>				
0-24	55	4	14	2
25-49	69	5	22	3
50-74	89	6	41	6
75-99	108	8	46	6
100-199	407	28	193	27
200-299	298	21	142	20
300-399	189	13	120	16
400-499	97	7	58	8
500+	126	9	92	13
<i>Hospital Teaching Status</i>				
Academic Medical Center	160	11	118	16
Teaching	522	36	287	40
Non-Teaching	756	52	321	44

ROLES AND DEPARTMENTS

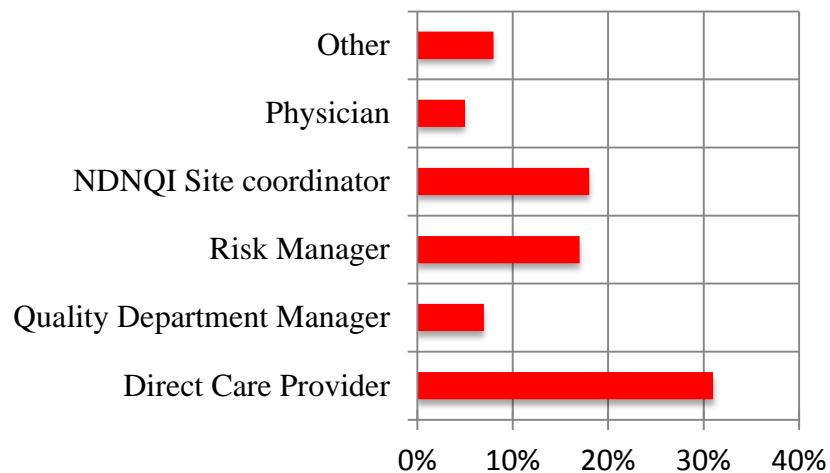
Eighty-three percent of the responding site coordinators were RNs and 51% had been in this role for more than two years. Nurses in a variety of roles (staff, charge, and management) were most often the initial incident reporters, followed by physical therapists, nursing assistants and patient care technicians (Figure 2). Most often, a designated interprofessional group is responsible for fall event surveillance (40%), followed by risk management (22%), quality improvement (15%), nursing management (14%) and other departments (10%).

**Figure 2: When a patient fall occurs, who initiates the incident/event report?
(%, multiple responses allowed)**



While direct care providers were the dominant group in initiating incident reports, they played a lesser role in the determination of fall injury levels (Figure 3). Depending on the hospital's organizational structure, injury levels were determined by diverse departments and roles.

Figure 3: Percentage of staff group determining injury level



INCIDENT REPORT SYSTEMS

A large majority of site coordinators (77%) say their incident reports contain the information needed for reporting to NDNQI. Twenty-two percent said they have to get additional information to complete the NDNQI data requirements. The most commonly missing piece of information was whether the fall was a repeat fall.

In 72% of the hospitals, electronic incident report systems were in place. Sixty seven percent of these electronic systems collected all information required by NDNQI. Half of all hospital site coordinators have to get additional information from the electronic record in at least 10% of the fall cases, and in 23% of the hospitals and additional information is required for more than half the cases.

REPORTING ACCURACY

Fifty-five percent of site coordinators said staff always do incident reports on non-injurious falls and an additional 30% said reports on non-injurious falls are filed most of the time.

Only about 25% of the respondents reported that injury levels were checked again after 24 hours (which is required according to NDNQI guidelines). Another 32% checked only injured or x-rayed patients again within the 24 hour period, while the remaining 44% of respondents relied on the injury level as identified by the initial fall report. However 62% described the accuracy of the fall injury level data as excellent and 36% as good. Seventy-nine percent of site coordinators reported using at least one mechanism (check by nurse or risk managers, comparison to previous quarters or other reports) to verify data before it is submitted to NDNQI.

TRAINING

Almost 70% of site coordinators refer to NDNQI guidelines at least once a year and about a third uses the guidelines once a quarter or more often. Seventy-five percent of the hospitals provide a written tutorial or some sort of in-house training for fall incident reporting, while the remaining hospitals give general information about incident reporting during orientation or no training at

all. About two thirds of those facilities that provide training for fall incident reports provide also the NDNQI definition of falls.

In summary site coordinators often refer to NDNQI guidelines and generally follow the guidelines. However the 24 hour check on the injury level of a patient who fell is often ignored. While this likely points to a feasibility issue, it remains unclear how often injury levels change after the 24 hour check. Further investigation is required to explore the impact of this.

The format and inclusion of NDNQI materials in training provided by hospitals varies widely. Further standardization efforts should focus on harmonized training of fall incident reporting.

4. PHASE II: ONLINE VIDEO SURVEY

The aim of the online video survey was to assess the rater-to-standard agreement of fall identification on the unit level. The agreement was tested with an online survey that contained 20 fall-related video scenarios that were rated as fall, non-fall or unclear scenarios. To determine which of the scenarios entailed a fall, non-fall, or an unclear situation, a group of experts were asked to rate the scenarios (expert judgment) according to the NDNQI data collection guideline and the NDNQI definition of falls. Although the site coordinator survey indicated that about half of direct care providers received some kind of training related to NDNQI's definition, we did not imply or provide the NDNQI definition to direct care providers in the online survey. This enabled us to analyze the current performance of direct care provider judgments of fall situations. Therefore, the judgment of direct care providers would not necessarily be expected to align with the expert judgments or the NDNQI fall definition.

METHODS

The study design was based on a previous Australian study (Haines, Massey et al. 2009) which let direct care providers rate fall scenarios on a DVD. The video presentations were done manually and therefore only a small number of facilities could be reached. In order to represent the NDNQI fall reporter population, we developed an online video survey that would allow direct care providers in a range of unit types and hospitals to rate fall scenarios.

FALL SCENARIOS

Videos used by the Australian study were kindly provided by the corresponding author. However based on discussions with site coordinators and NDNQI liaisons, additional scenarios were developed. A set of 24 videos was recorded at the University of Kansas School of Nursing learning lab (Table 4). All online video scenarios were rated as fall or non-fall situations according to NDNQI guidelines by a group of 24 experts. This group of experts consisted of NDNQI staff, staff from the American Nurses Association (ANA), and fall researchers. Fifty-eight percent of the experts were registered nurses, 21% advanced practice nurses, and 20% were researchers with various backgrounds like medicine, biostatistics or physical therapy. Twenty-five percent of the experts had bachelor's degrees, 29% master's degrees and 46% had doctoral

degrees. To identify unambiguous scenarios, we tested if the rating deviated significantly from 50% based on a Beta distribution. Sixteen out of 24 scenarios were determined to be unambiguous fall or non-fall situations according to NDNQI guidelines; however eight of the scenarios did not achieve an unambiguous rating by the experts (3).

Three videos referring specifically to NDNQI guidelines (falls of personnel, falls of visitors, and falls outside the unit) were excluded from the hospital unit personnel survey. The scenarios also included repetitions (#8, #14, #21) of certain vignettes to investigate the stability of the rater's judgment. One of these repetitions (#21) was excluded from survey because the scenario was rated as unclear by the experts.

Table 4. Fall scenario expert ratings.
(Grey shading indicates "unclear" scenarios.
Scenarios stricken through were not included in the study.)

Experts (n=24) % of most used answer	Scenario	
100% (Y)	1	Patient slides from chair to ground level http://www.screencast.com/t/EReKjtQ7g
96% (Y)	2	Patient found lying on floor http://www.screencast.com/t/yHixM4QmqW4
54% (N)	3	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward, landing on arm of chair (without control) before finally coming to rest in seated position on seat of chair http://www.screencast.com/t/0LIJnbhC
100% (Y)	4	Patient A (mobilizing with single-point cane) turns around and blocks Patient B (mobilizing with walking frame), who overbalances sideways to ground level. http://www.screencast.com/t/ddgoMAJza4
75% (Y)	5	Patient lowers himself unsteadily and, without control, lands heavily on one wrist and knees, then pulls shoes out from under bed http://www.screencast.com/t/ZDJiZWM1
100% (N)	6	Patient steadily lowers himself to kneeling position on floor with one hand support to pull shoes out from under bed http://www.screencast.com/t/4mtXT9gGg
100% (Y)	7	Patient stands from sitting in chair mobilizes forward using walking frame to wash his hands, and then overbalances sideways to ground level

		http://www.screencast.com/t/an4VOKRmX
54% (Y)	8	Repetition of scenario 16 http://www.screencast.com/t/XScDv2WABvFn
83% (N)	9	Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant facilitates patient to regain balance in the upright position http://www.screencast.com/t/aCU1BsmwdBTv
71% (N)	10	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward onto seat of chair http://www.screencast.com/t/jE9frxg9X8o7
62% (N)	11	Physical therapy. Patient feels shaky. PT grabs chair for patient to sit down. http://www.screencast.com/t/gaOgo8fX57B
92% (Y)	12	Patient walks with family member. Patient falls assisted by family member. http://www.screencast.com/t/1cgbq8nriR
96% (Y)	13	Fall from lowest level (bed on lowest level, mats on floor) http://www.screencast.com/t/8dR5iSulRY5
100% (N)	14	Repetition of scenario 6 http://www.screencast.com/t/OTY3NmY5YWQt
46% (Y)	15	Patient (cognitively impaired and NOT a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/s2nVmKnp
58% (Y)	16	Patient stands from sitting in chair, mobilizes forward with walking frame, and then overbalances sideways onto bed http://www.screencast.com/t/ubqzr5u1
67% (N)	17	Patient (cognitively intact and IS a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/RTjsiQ3r5GRw
96% (Y)	18	Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant slowly lowers patient to ground level http://www.screencast.com/t/pDmx7BkfTB9
96% (Y)	19	In sitting, patient experiences a seizure and slides from chair to ground level http://www.screencast.com/t/OoAHklImrf
88% (Y)	20	Physical therapist (PT) expects that patient falls and brings the patient to ground to prevent injuries. http://www.screencast.com/t/GpJzshdGQ
42% (Ucl)	21	Repetition of scenario 15
54% (N)	22	Patient falls outside of patient unit.
92 (N)	23	Nurse falls
78% (N)	24	Visitor falls

UNIT SELECTION & ELIGIBILITY

Data collection for the video survey was focused on the unit level and targeted to the unit types in NDNQI eligible for data collection on falls (Critical Care-Adult, Step Down-Adult, Medical-Adult, Surgical-Adult, Medical-Surgical Adult, and Rehabilitation Adult). Additionally, only units that have reported fall data to NDNQI the previous four quarters were considered eligible.

SAMPLE SIZE

For the calculation of the sample size with 80% power and alpha-level of .05 we assumed at least 10 fall/non-fall scenarios with a minimum difference of 10% between units. This led to an estimated sample size of 180 units per unit type with at least 5 responses each or a total of 1080 units.

RELIABILITY ASSESSMENT

The reliability analysis employed several analysis steps. The **first step** was to compare the ratings of experts and direct care providers to determine if fall assessments differed between groups. The **second step** explored how common the shown fall situations were and if there were differences between different unit types. Based on a single item asking for the occurrence of the fall situation, all scenarios were rank ordered by frequency. The **third step** employed the expert and majority judgments to conduct a rater to standard analysis.

VALIDITY ASSESSMENT

To assess validity, the sensitivity and specificity of assignment of 14 scenarios to the category of fall or non-fall was used. This approach used the **expert judgments** to define the standard. In this case, respondents answers to the 10 fall scenarios were used to calculate the sensitivity (correctly responding that a scenario was a fall) and to the 4 non-fall scenarios were used to calculate specificity (correctly responding that a situation was a non-fall). Ambiguous scenarios were excluded from the expert judgment analysis.

RESULTS

SAMPLE

The initial call to participate in the fall reliability study was sent out by email to a random sample of 1,200 units with 594 site coordinators representing 662 hospitals. A low response resulted in an email inviting all remaining units that met the inclusion criteria to participate. In this second email, 369 site coordinators representing 1,784 units in 396 hospitals were contacted. In summary 910 site coordinators representing 963 hospitals with 2,984 eligible units were invited to participate in the study. In the end, 615 units in 247 hospitals with 206 site coordinators agreed to participate in the study.

All in all 8,655 out of 21,043 (41.1%) eligible participants submitted responses to the online survey. Due to a technical error, missing information on the number of eligible participants, or low response rates, unit-level response rates could only be calculated for 404 units. The median response rate for units was 39.3% and the mean response rate was 48.3%.

The following analysis uses a sample focusing on units rather than individuals (Table 5). The unit sample includes only responses from individuals that have been unambiguously assigned to units and with at least five respondents per unit, without restrictions regarding missing data across variables ($n_{\text{indiv}}=6,446$; $n_{\text{unit}}=362$; $n_{\text{hospital}}=170$). Multiple imputations through the EMB (expectation maximization with bootstrapping) algorithm of Amelia II (Honaker, King et al. 2010) were used to replace missing values which were treated as missing at random (MAR). Overall, participating units had characteristics similar to all eligible units. Critical care units were under-represented, while rehabilitation units were over-represented. Participating units were less likely than expected to come from the smallest hospitals and from academic medical centers.

Table 5: Unit Sample Characteristics

	Eligible Units		Participating Units		Participants	
Adult Unit Type	n	%	n	%	n	%
Critical Care	1,577	21	56	15	791	12
Step Down	1,116	15	54	15	1,051	16
Medical	1,483	20	71	20	1,307	20
Surgical	1,116	15	60	17	1,233	19
Medical-Surgical	1,842	25	75	21	1,351	21
Rehabilitation	377	5	46	13	749	12
Hospital Size						
1-99	177	18	40	11	665	11
100-199	293	29	104	29	1,534	24
200-299	211	21	84	23	1,494	23
300-399	155	15	58	16	1,103	17
400-499	77	8	30	8	633	10
500+	109	11	46	13	1,017	16
Hospital Teaching Status						
Academic Medical Center	119	12	22	6	428	7
Teaching	364	36	158	44	2,719	42
Non-Teaching	539	53	182	50	3,299	51

RELIABILITY ANALYSIS*Comparison of expert and direct care provider judgment*

The comparison between the expert ratings and the ratings of the direct care providers (Table) shows high agreement for almost all scenarios within a range of -9% to +7% differences.

However, scenarios 18 and 20 were considerably less often judged as fall situations by direct care providers than by the experts (-25% and -32%). Both scenarios are fall situations which would be rated as “assisted falls” according to NDNQI guidelines. However, because neither the NDNQI fall definition nor guidance assisted falls were provided to direct care providers. This could explain, to some extent, the difference between experts and direct care providers.

Table 6: Comparison of Expert Ratings and Individual Respondent Ratings

	Fall scenario	% (most frequent answer)	
		Respondents n=6,446	Experts (n=24)
1	Patient slides from chair to ground level.	93% (Y)	100% (Y)
2	Patient found lying on floor.	87% (Y)	96% (Y)
3	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward, landing on arm of chair (without control) before finally coming to rest in seated position on seat of chair.	63% (N)	54% (N)
4	Patient A (mobilizing with single-point cane) turns around and blocks Patient B (mobilizing with walking frame), who overbalances sideways to ground level.	99% (Y)	100% (Y)
5	Patient lowers himself unsteadily and, without control, lands heavily on one wrist and knees, then pulls shoes out from under bed.	76% (Y)	75% (Y)
6	Patient steadily lowers himself to kneeling position on floor with one hand support to pull shoes out from under bed.	97% (N)	100% (N)
7	Patient stands from sitting in chair mobilizes forward using walking frame to wash his hands, and then overbalances sideways to ground level.	99% (Y)	100% (Y)
8	Repetition of scenario 16.	62% (Y)	54% (Y)
9	Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant facilitates patient to regain balance in the upright position.	89% (N)	83% (N)
10	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward onto seat of chair.	68% (N)	71% (N)
11	Physical therapy. Patient feels shaky. PT grabs chair for patient to sit down.	86% (N)	62% (N)
12	Patient walks with family member. Patient fall assisted by family member.	92% (Y)	92% (Y)
13	Fall from bed on lowest level to mats on floor.	90% (Y)	96% (Y)

14	Repetition of scenario 6.	98% (N)	100% (N)
15	Patient (cognitively impaired and not a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress.	48% (Y)	46% (Y)
16	Patient stands from sitting in chair, mobilizes forward with walking frame, and then overbalances sideways onto bed	64% (Y)	58% (Y)
17	Patient (cognitively intact and is a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress.	58% (N)	67% (N)
18	Patient is mobilizing with walking frame and the assistance of one healthcare provider and overbalances sideways; assistant slowly lowers patient to ground level.	64% (Y)	96% (Y)
19	In sitting, patient experiences a seizure and slides from chair to ground level.	89% (Y)	96% (Y)
20	Physical therapist (PT) expects that patient may fall and brings the patient to ground to prevent injuries.	64% (Y)	88% (Y)

Scenario Frequency

To assess how common each fall scenario is, respondents were asked to rate how recently they had seen each scenario. One item (“Have you experienced this scenario in your clinical practice?”) offered four response options (“*Yes, not long ago (up to four weeks)*”, “*Yes, some time ago (1-12 months)*”, “*Yes, but I cannot remember when (more than 12 months)*”, “*No, never seen this*”). Two approaches were considered to rank the scenarios by frequency: (1) by calculating the mean based on all four response options or (2) by dichotomizing the variable in two groups (1=“*Yes, not long ago (up to four weeks)*”; 0=*all other response options*) and then calculating the mean. While both approaches correlate very highly ($r=0.81$) the latter approach permits a clear interpretation in terms of the percentage of respondents that have seen a fall in the last four weeks. Therefore the second option was chosen. Based on this definition, unconditional generalized random effects models were calculated with unit type as group factor. The means calculated through this method were adjusted for the unbalanced sample sizes in each group. Furthermore, the random coefficients with prediction intervals permits the determination of whether unit type means deviate from the grand mean (see Appendix B for unit type differences).

On average, a scenario had been “experienced” by 3.5% of the respondents during the last four weeks (Table 7). The most common scenario (patient found on the floor) was experienced by 9.4% of the respondents; the least common scenario (patient A runs over patient B) was experienced only by 0.6% of the cases. The unclear scenarios were ranked in terms of “seen recently” at positions 4, 8, 10, 11, 18, and 19. While the latter two scenarios can be assumed to be very rare, the first four unclear scenarios are relatively common and are apparently difficult to judge as a fall by direct care providers.

Table 7: Scenarios ranked by the percentage of respondents having seen the scenario in the last four weeks (unit sample)
(Grey highlighted scenarios were those determined to be unclear by a panel of experts)

#	Scenario		rank
2	Patient found lying on floor http://www.screencast.com/t/yHixM4QmqW4	9.44%	1
6	Patient steadily lowers himself to kneeling position on floor with one hand support to pull shoes out from under bed http://www.screencast.com/t/4mtXT9gGg	9.09%	2
14	Repetition of scenario 6 http://www.screencast.com/t/OTY3NmY5YWQt	7.24%	3
3	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward, landing on arm of chair (without control) before finally coming to rest in seated position on seat of chair http://www.screencast.com/t/0LIJnbhC	7.11%	4
9	Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant facilitates patient to regain balance in the upright position http://www.screencast.com/t/aCU1BsmwdBTv	6.20%	5
11	Physical therapy. Patient feels shaky. PT grabs chair for patient to sit down. http://www.screencast.com/t/gaOgo8fX57B	6.08%	6
18	Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant slowly lowers patient to ground level http://www.screencast.com/t/pDmx7BkfTB9	3.70%	7
1	Patient slides from chair to ground level http://www.screencast.com/t/EReKjtQ7g	3.51%	8
10	Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward onto seat of chair	3.27%	9

	http://www.screencast.com/t/jE9frxg9X8o7		
15	Patient (cognitively impaired and NOT a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/s2nVmKnp	2.21%	10
20	Physical therapist (PT) expects that patient falls and brings the patient to ground to prevent injuries. http://www.screencast.com/t/GpJzshdGQ	1.72%	11
13	Fall from lowest level (bed on lowest level, mats on floor) http://www.screencast.com/t/8dR5iSulRY5	1.59%	12
8	Repetition of scenario 16 http://www.screencast.com/t/XScDv2WABvFn	1.58%	13
12	Patient walks with family member. Patient falls assisted by family member. http://www.screencast.com/t/1cgbq8nriR	1.51%	14
7	Patient stands from sitting in chair mobilizes forward using walking frame to wash his hands, and then overbalances sideways to ground level http://www.screencast.com/t/an4VOKRmX	1.47%	15
5	Patient lowers himself unsteadily and, without control, lands heavily on one wrist and knees, then pulls shoes out from under bed http://www.screencast.com/t/ZDJiZWM1	1.20%	16
19	In sitting, patient experiences a seizure and slides from chair to ground level http://www.screencast.com/t/OoAHklImrf	0.96%	17
16	Patient stands from sitting in chair, mobilizes forward with walking frame, and then overbalances sideways onto bed http://www.screencast.com/t/ubqzr5u1	0.89%	18
17	Patient (cognitively intact and IS a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/RTjsiQ3r5GRw	0.84%	19
4	Patient A (mobilizing with single-point cane) turns around and blocks Patient B (mobilizing with walking frame), who overbalances sideways to ground level. http://www.screencast.com/t/ddgoMAJza4	0.60%	20

Rater to Standard Analysis

Two different approaches were used to determine the standard according to which a scenario was judged to be a fall, non-fall, or an unclear situation. The **majority judgment** was the category with the highest percentage of direct care provider ratings. This approach allowed us to include all scenarios in the analysis. The overall agreement was expressed by a binary variable (0=deviating from majority rating, 1= consistent with majority rating). Based on this approach a generalized linear mixed model including random effects for individuals, scenarios, units and hospitals (four levels) and unit type as a fixed effect was specified to produce an estimate for overall rater-to-standard agreement. The second approach used the **expert judgments** to define the standard. In this case, respondents answers to the 10 fall scenarios were used to calculate the sensitivity (correctly responding that a scenario was a fall) and to the 4 non-fall scenarios were used to calculate specificity (correctly responding that a situation was a non-fall). Ambiguous scenarios were excluded from the expert judgment analysis.

Majority Judgment

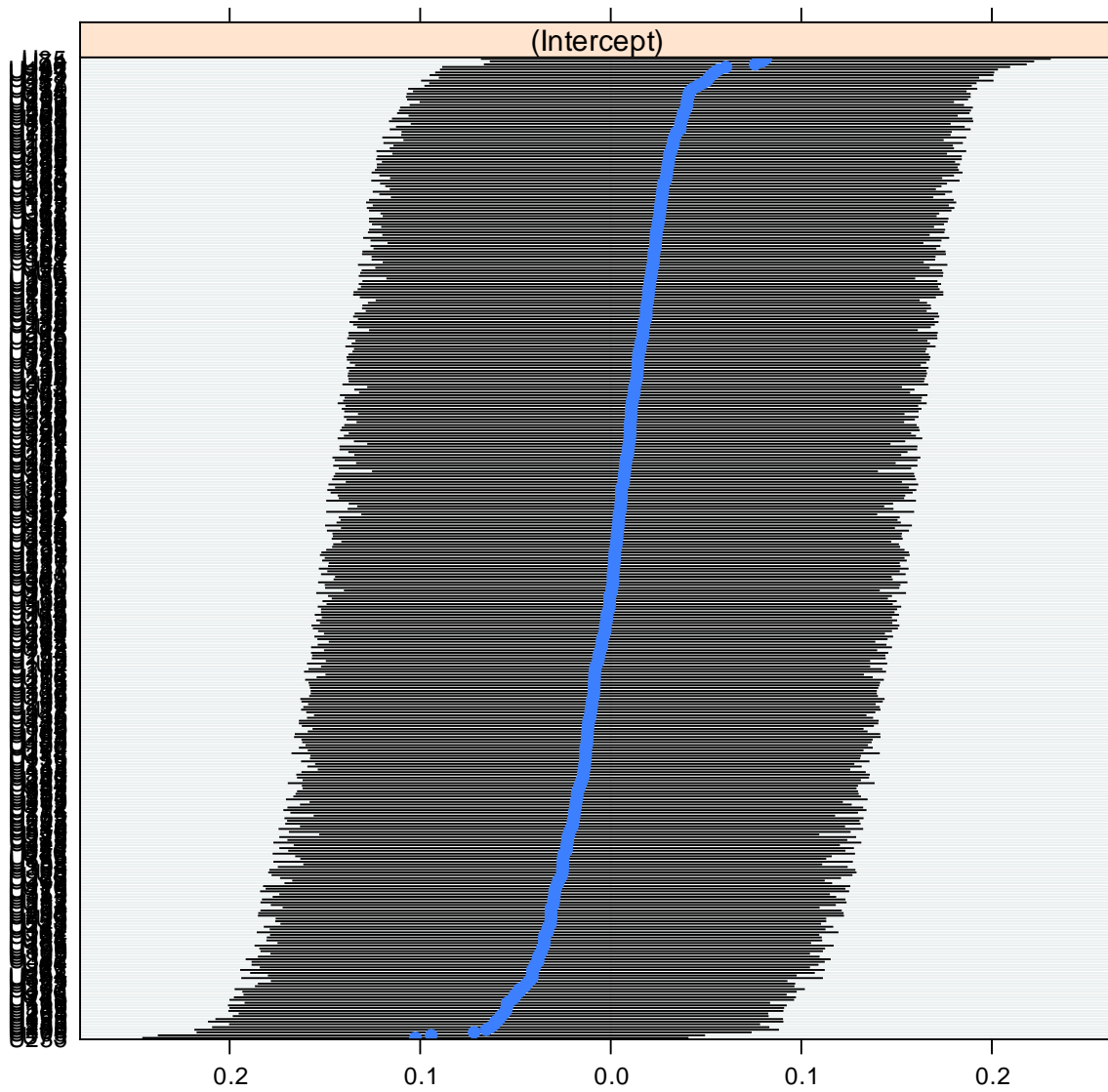
The overall agreement in the model was 85% (Table 8). Except for rehabilitation units (86.3%) no significant differences were found by unit type. Empirical Bayes analysis with a unit level random effect showed that no units deviated from the grand mean (Figure 4). Just 8 out of 170 hospitals (4.7%) deviated from the mean (not shown).

Table 8: Agreement from Majority Judgment Model

```
Generalized linear mixed model fit by the Laplace approximation
Formula: maj ~ 1 + (1|scen) + (1|indiv) + (1|UnitID) + (1|HospCode) +
xDesignationFID
Data: rALL.maj.out3
AIC      BIC logLik deviance
114018 114116 -56999  113998
Random effects:
Groups      Name          Variance Std.Dev.
indiv      (Intercept) 0.222755 0.471970
UnitID     (Intercept) 0.006488 0.080548
HospCode   (Intercept) 0.020192 0.142100
scen       (Intercept) 1.429383 1.195568
Number of obs: 128920, groups: indiv, 6446; UnitID, 362; HospCode, 170;
scen, 20

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)      1.73432    0.26969   6.431 1.27e-10 ***
Reference: ICU
Step Down-Adult  -0.01623    0.04550  -0.357   0.7213
Medical-Adult    -0.08383    0.04295  -1.952   0.0510 .
Surgical-Adult    0.02632    0.04511   0.584   0.5596
Med-Surg Adult   -0.03227    0.04266  -0.756   0.4494
Rehab Adult       0.10942    0.04966   2.203   0.0276 *
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

Figure 4: Empirical Bayes with 95% confidence intervals of Majority judgment random intercept model



VALIDITY ANALYSIS

Expert judgment

Based on the *expert judgment*, ten vignettes were determined to be falls, while four were judged to be non-falls. Identified fall and non-fall scenarios were used to calculate sensitivity and specificity. Sensitivity describes the rate of correctly identified fall situations, while specificity expresses the rate of correctly identified non-fall situations.

Sensitivity from the expert judgment model (Table 9) was 91.4 % with significantly higher sensitivity for Medical-Surgical (93.1%) and Rehabilitation units (94.7%). Empirical Bayes for the unit level random effect showed no units deviated from the grand mean (Figure 5). Twelve out of 170 hospitals (7.1%) deviated from the mean (not shown).

Table 9: Expert judgment model for Sensitivity

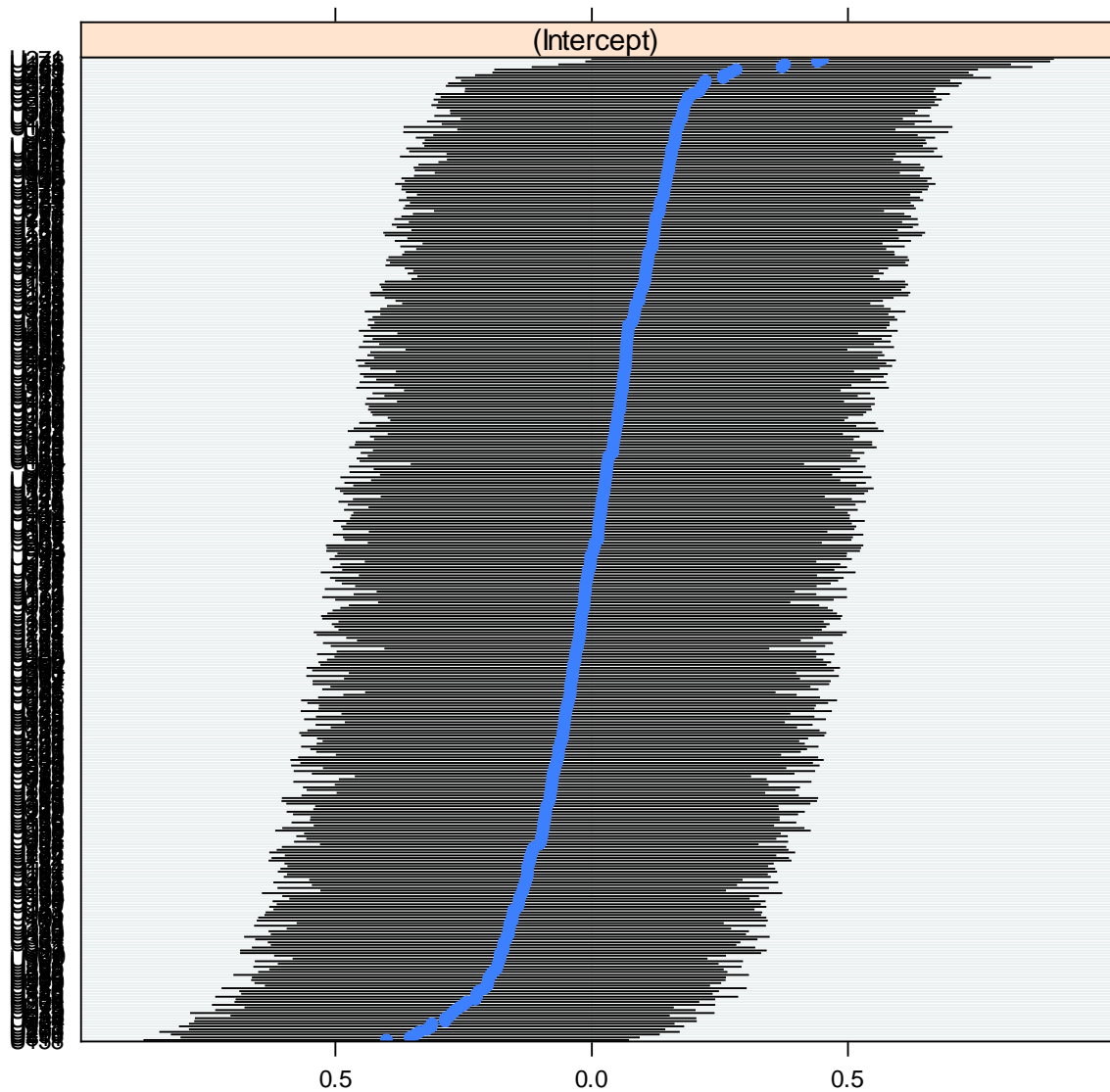
```

Generalized linear mixed model fit by the Laplace approximation
Formula: nusens ~ 1 + (1|scen) + (1|indiv) + (1|UnitID) + (1|HospCode)
+      xDesignationFID
Data: rALL.sens.out3
AIC    BIC logLik deviance
45731 45822 -22856    45711
Random effects:
Groups   Name             Variance Std.Dev.
indiv    (Intercept)  1.266814  1.12553
UnitID   (Intercept)  0.080694  0.28407
HospCode (Intercept)  0.150202  0.38756
scen     (Intercept)  1.561068  1.24943
Number of obs: 64460, groups: indiv, 6446; UnitID, 362; HospCode, 170;
scen, 10

Fixed effects:
              Estimate Std. Error z value Pr(>|z|)
(Intercept)      2.35844    0.40384   5.840 5.22e-09 ***
Reference: ICU
Step Down-Adult      0.07047    0.10779   0.654  0.5133
Medical-Adult        0.03788    0.10135   0.374  0.7086
Surgical-Adult       0.17711    0.10777   1.643  0.1003
Med-Surg Adult       0.24797    0.10100   2.455  0.0141 *
Rehab Adult          0.52854    0.11911   4.437 9.11e-06 ***
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

```


Figure 5: Empirical Bayes with 95% confidence intervals of Expert judgment sensitivity model



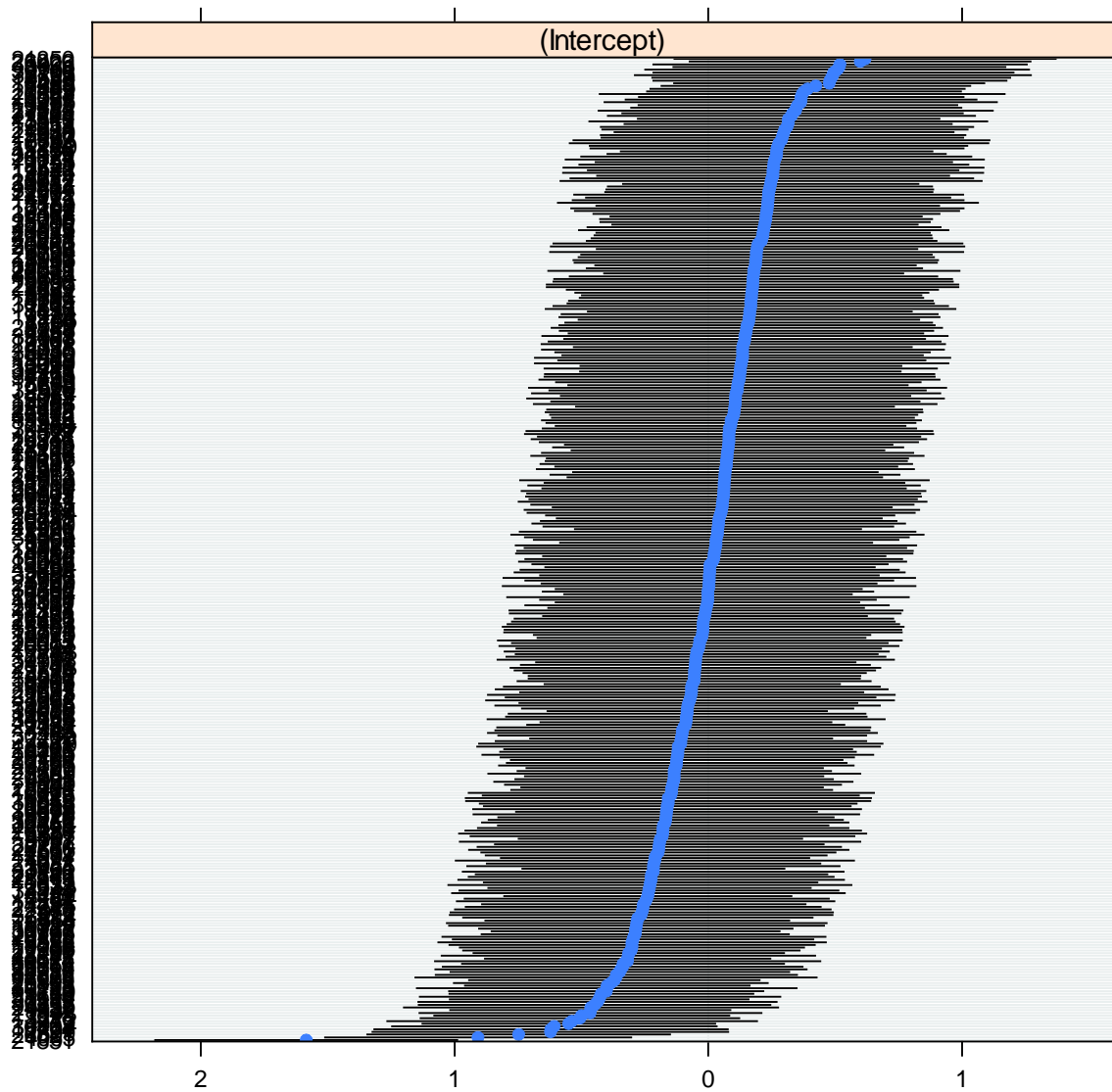
Specificity from the expert judgment model (Table 10) was 95.7 %, with lower specificity for Medical-Surgical units (93.1%). Empirical Bayes for the unit level random effect showed four units deviated from the grand mean, representing 1.1% of the units included in the model (Figure 6). Two out of 170 hospitals (1.2%) deviated from the mean (not shown).

Table 10: Expert judgment model for Specificity

```
Generalized linear mixed model fit by the Laplace approximation
Formula: nuspec ~ 1 + (1 | scen) + (1 | indiv) + (1 | UnitID) + (1 |
HospCode) +          xDesignationFID
Data: rALL.spec.out3
AIC    BIC logLik deviance
16319 16400  -8149    16299
Random effects:
Groups   Name             Variance Std.Dev.
indiv    (Intercept)  1.32693  1.15192
UnitID   (Intercept)  0.20766  0.45569
HospCode (Intercept)  0.08493  0.29143
scen     (Intercept)  1.36338  1.16764
Number of obs: 25784, groups: indiv, 6446; UnitID, 362; HospCode, 170;
scen, 4

Fixed effects:
                                Estimate Std. Error z value Pr(>|z|)
(Intercept)                    3.10399    0.59429   5.223 1.76e-07 ***
Reference: ICU
Step Down-Adult                -0.05735    0.14801  -0.387 0.698434
Medical-Adult                  -0.16784    0.13884  -1.209 0.226731
Surgical-Adult                 -0.24110    0.14388  -1.676 0.093811 .
Med-Surg Adult                 -0.48697    0.13685  -3.559 0.000373 ***
FIDRehab Adult                 -0.18157    0.15706  -1.156 0.247668
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

**Figure 6: Empirical Bayes with 95% confidence intervals of
Expert judgment specificity model**



5. CONCLUSIONS

Falls are serious adverse events in hospital care. Despite its wide recognition as an important health care quality concern, reporting processes for falls differ across hospitals. Furthermore even when fall reporting standards are in place, inter-rater reliability across units and hospitals has not been investigated.

On behalf of the American Nurses Association, the National Database of Nursing Quality Indicators (NDNQI) conducted two studies to assess the reliability of fall reporting: 1) a site coordinator survey to investigate data collection processes that could influence fall measurement and 2) an online video survey of direct care providers in NDNQI units and hospitals to investigate the rater-to-standard classification of potential fall scenarios. The video survey employed 20 videos displaying different fall situations. Based on an expert survey, unambiguous fall (10) and non-fall (4) situations were identified, which were employed subsequently in a sensitivity and specificity analysis. Furthermore the majority opinions of direct care providers who participated in the study were used to assess the overall agreement in fall, non-fall and unclear fall situations.

All 1,244 NDNQI site coordinators received an invitation to participate in the *site coordinator survey* and 727 responded, resulting in a response rate of 58.4%. The comparison of NDNQI hospital characteristics with those of survey respondents confirmed the representativeness of the sample. The results showed the important role of nurses in the fall data collection process, as the most frequent staff to file incident reports. Although many hospitals use electronic incident report systems, 28% use paper. Training provided by hospitals on fall reporting was common, but the format varied widely between written tutorials, in-house training, and embedded in orientation. Standardization efforts of fall incident reporting should also include a focus on training.

In the online video study, 910 site coordinators representing 963 hospitals with 2,984 eligible units were invited to participate in the *fall reliability study*. Altogether, 615 units in 247 hospitals with 206 site coordinators participated in the study. A total of 8,655 out of 21,043 eligible

participants (41.1%) responded to the online survey. The median response rate for units was 39.3% while the mean response rate was 48.3%

On average a scenario had been “experienced” by 3.5% of the respondents during the last four weeks. The most common scenario was experienced by 9.4% of the respondents; the least common scenario was experienced only by 0.6%. Four unclear scenarios were relatively common (experienced relatively frequently) and were difficult to judge by direct care providers.

The **overall agreement** of all scenarios according to the majority judgment was **85%**. Based on empirical Bayes estimates, no unit level average agreement was significantly lower or higher than the overall mean of all units. This indicates that no substantial differences among units was found, demonstrating a high degree of reliability on the unit level. However 4.7% of the hospitals had significantly higher or lower rates compared to the overall hospital mean which indicates that a small proportion of hospitals differed in terms of overall agreement.

Based on the expert judgment the average **sensitivity was 91%** with even higher sensitivity for medical-surgical (93.1%) and rehabilitation (94.7%) units. Again no unit average deviated from the grand mean. The average **specificity was 95.7%** with lower specificity for medical-surgical units (93.1%). Just 1% of the units deviated significantly from the grand mean. These results support the validity of the categorization to fall or non-fall.

The results indicate a very high degree of agreement in terms of fall reporting across hospitals and units. Nonetheless, the studies suggest that some adjustments in three areas may improve the reliability of fall reporting: guideline development to clarify unclear scenarios and to emphasize the importance of reporting assisted falls, standardized training for fall reporting, and future research and development.

The presence and frequency of unclear scenarios underscores the importance of reviewing NDNQI’s fall data collection guidelines. In particular, there is a need to improve the definition of the “lower level” (e.g. floor, bed, chair), but also to clarify guidance for planned/intentional or attention seeking behaviors that involve patients descending to the floor. To develop a robust revision to the definition, a Delphi study of international fall experts could be conducted.

The site coordinator survey illustrated the variety of mechanisms used to train direct care providers on filing incident reports for fall situations. Thus, there may be a need for standardized fall reporting training for direct care providers. NDNQI's experience with developing training for pressure ulcers could be used as a blue print for a fall reporting training.

APPENDIX A: FALL VIDEO SURVEY

Fall Video Reliability Survey

Page 1 - Heading

Video contains no sound.

Page 1 - Question 1 - Choice - One Answer (Bullets)

Would you classify this scenario as a fall?

- ☐ Yes
- ☐ No
- ☐ Unclear

Page 1 - Question 2 - Choice - One Answer (Bullets)

Would you complete an incident report in this scenario?

- ☐ Yes
- ☐ No
- ☐ Unclear

Page 1 - Question 3 - Choice - One Answer (Bullets)

Have you experienced this scenario in your clinical practice?

- ☐ Yes, not long ago (up to four weeks)
- ☐ Yes, some time ago (1-12 months)
- ☐ Yes, but I cannot remember when (more than 12 months)
- ☐ No, never seen this

First 3 questions repeated for 20 fall situations.

What is your professional background?

- ☐ Nursing Assistant (NA)
 - ☐ Patient Care Technician (PCT)
 - ☐ Licensed Practical Nurse (LPN, LVN)
 - ☐ Registered Nurse (RN)
 - ☐ Advanced Practice Nurse (Clinical Nurse Specialist, Nurse Anesthetist, Nurse Midwife, or Nurse Practitioner)
 - ☐ Physician (MD)
 - ☐ Physical Therapist (PT)
 - ☐ Other, please specify:
-

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What is your highest level of education?

- ☐ Diploma
 - ☐ Associate degree
 - ☐ Baccalaureate degree
 - ☐ Masters degree
 - ☐ Doctorate degree (PhD, MD, DNP, DNS)
 - ☐ Other, please specify
-

What is the highest nursing license you currently hold?

- ☐ I am not a nurse
- ☐ Not licensed
- ☐ LPN/LVN license
- ☐ RN license
- ☐ Advanced Practice license (Clinical Nurse Specialist, Nurse Anesthetist, Nurse Midwife, or Nurse Practitioner)

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Have you ever received a training on incident reporting (with or without falls)? Check all that apply.

- ☐ No, never [Skip to 26]
- ☐ No, but we have instructions on the form [Skip to 26]

- ☐ Yes, when I was in school
- ☐ Yes, during orientation
- ☐ Yes, on the job by co-workers
- ☐ Yes, a training session/workshop
- ☐ Yes, a written tutorial (paper based or online)

Page 23 - Heading

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Page 24 - Question 65 - Choice - One Answer (Bullets)

[Mandatory]

Did the training (e.g. written tutorials, trainings sessions etc). cover fall reporting?

- ☐ No, the training did not cover fall incident reporting [\[Skip to 26\]](#)
- ☐ Yes, the training covered fall incident reporting

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Page 25 - Heading

Please answer the following questions specific for falls and fall reporting.

Page 25 - Question 66 - Choice - Multiple Answers (Bullets)

[Randomize]

Did the training on fall reporting include one of the following parts? Check all that apply.

- ☐ NDNQI-Guidelines
- ☐ NDNQI-Tutorial on falls
- ☐ Definition of falls according to NDNQI
- ☐ Information from our incident reporting vendor
- ☐ Other, please specify

Page 25 - Question 67 - Choice - One Answer (Bullets)

When was the last time you received training on incident reporting?

- ☐ Never
- ☐ Less than 1 year ago
- ☐ 1-3 years ago
- ☐ 3 or more years ago

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Page 26 - Question 68 - Choice - One Answer (Bullets)

Have you ever submitted a fall incident report?

- ☐ Yes
- ☐ No

Page 26 - Question 69 - Choice - One Answer (Drop Down)

In the past YEAR how many times did you submit a fall related incident report?

- ☐ None
- ☐ 3 or less
- ☐ 4-10
- ☐ 11 or more

Page 26 - Question 70 - Choice - One Answer (Drop Down)

In the past MONTH how many times did you submit a fall related incident report?

- ☐ None
- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4-7
- ☐ >=8

Page 26 - Question 71 - Choice - One Answer (Drop Down)

How many years have you worked as an RN in the United States?

Page 26 - Question 72 - Choice - One Answer (Drop Down)

How many years have you been employed as an RN on your current unit?

Page 26 - Question 73 - Choice - One Answer (Drop Down)

What is your age?

Page 26 - Question 74 - Choice - One Answer (Bullets)

What is your gender?

- ☐ Male
- ☐ Female

Page 26 - Heading

Page 26 of 26

[Randomize]

Thank You Page

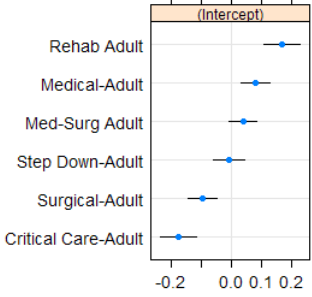
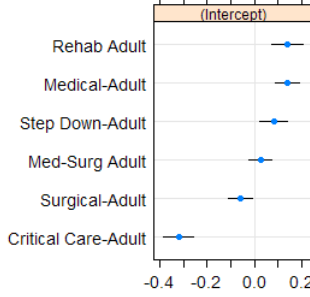
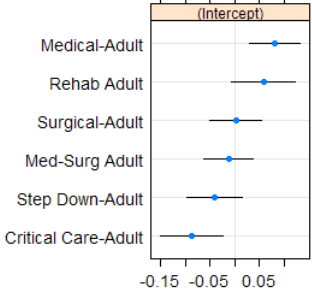
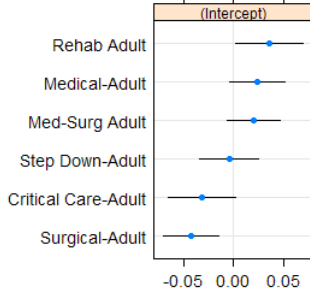
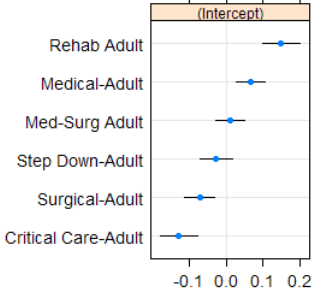
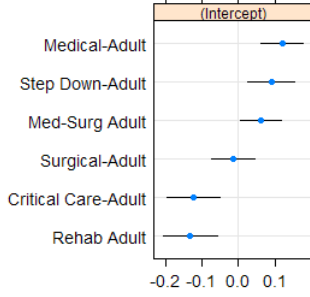
Thank you for participating in the Falls Reliability Study - Video Survey. If you have any questions or comments concerning this study please call NDNQI at 913.588.1691. You may click on this text to go to our Home Page. [<https://www.nursingquality.org/>](https://www.nursingquality.org/)



[<https://www.nursingquality.org/>](https://www.nursingquality.org/)

Appendix B: Fall scenario unit type differences

Table 2: Scenario frequencies, ranks and unit type comparison (grey shaded: unclear scenario)

Scenario 1		Scenario 2	
<p>Patient slides from chair to ground level http://www.screencast.com/t/EReKjtQ7g</p> <p>Mean 0.035</p> <p>Rank 8</p>		<p>Patient found lying on floor http://www.screencast.com/t/yHixM4QmqW4</p> <p>Mean 0.094</p> <p>Rank 1</p>	
Scenario 3		Scenario 4	
<p>Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward, landing on arm of chair (without control) before finally coming to rest in seated position on seat of chair http://www.screencast.com/t/OLJnbhC</p> <p>Mean 0.071</p> <p>Rank 4</p>		<p>Patient A (mobilizing with single-point cane) turns around and blocks Patient B (mobilizing with walking frame), who overbalances sideways to ground level. http://www.screencast.com/t/ddgoMAJza4</p> <p>Mean 0.006</p> <p>Rank 20</p>	
Scenario 5		Scenario 6	
<p>Patient lowers himself unsteadily and, without control, lands heavily on one wrist and knees, then pulls shoes out from under bed http://www.screencast.com/t/ZDJjZWM1</p> <p>Mean 0.012</p> <p>Rank 16</p>		<p>Patient steadily lowers himself to kneeling position on floor with one hand support to pull shoes out from under bed http://www.screencast.com/t/4mtXT9gGg</p> <p>Mean 0.091</p> <p>Rank 2</p>	
Scenario 7		Scenario 8	

<p>Patient stands from sitting in chair mobilizes forward using walking frame to wash his hands, and then overbalances sideways to ground level http://www.screenecast.com/t/an4VOKRmX</p> <p>Mean 0.015</p> <p>Rank 15</p>		<p>Repetition of scenario 16 http://www.screenecast.com/t/XScDv2WABvFn</p> <p>Mean 0.016</p> <p>Rank 13</p>	
Scenario 9		Scenario 10	
<p>Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant facilitates patient to regain balance in the upright position http://www.screenecast.com/t/aCU1BsmwdBTv</p> <p>Mean 0.062</p> <p>Rank 5</p>		<p>Patient stands from sitting in chair, steps forward using walking frame, and then overbalances backward onto seat of chair http://www.screenecast.com/t/iE9frxq9X8o7</p> <p>Mean 0.033</p> <p>Rank 9</p>	
Scenario 11		Scenario 12	
<p>Physical therapy. Patient feels shaky. PT grabs chair for patient to sit down. http://www.screenecast.com/t/gaOgo8fX57B</p> <p>Mean 0.061</p> <p>Rank 6</p>		<p>Patient walks with family member. Patient falls assisted by family member. http://www.screenecast.com/t/1cgbq8nriR</p> <p>Mean 0.015</p> <p>Rank 14</p>	
Scenario 13		Scenario 14	
<p>Fall from lowest level (bed on lowest level, mats on floor) http://www.screenecast.com/t/8dR5iSulRY5</p> <p>Mean 0.016</p> <p>Rank 12</p>		<p>Repetition of scenario 6 http://www.screenecast.com/t/OTY3NmY5YWQt</p> <p>Mean 0.072</p> <p>Rank 3</p>	
Scenario 15		Scenario 16	

<p>Patient (cognitively impaired and NOT a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/s2nVmKnp</p> <p>Mean 0.022</p> <p>Rank 10</p>	<p>(Intercept)</p> <p>Medical-Adult</p> <p>Rehab Adult</p> <p>Med-Surg Adult</p> <p>Step Down-Adult</p> <p>Surgical-Adult</p> <p>Critical Care-Adult</p> <p>-0.2 -0.1 0.0 0.1</p>	<p>Patient stands from sitting in chair, mobilizes forward with walking frame, and then overbalances sideways onto bed http://www.screencast.com/t/ubqzr5u1</p> <p>Mean 0.009</p> <p>Rank 18</p>	<p>(Intercept)</p> <p>Medical-Adult</p> <p>Rehab Adult</p> <p>Med-Surg Adult</p> <p>Step Down-Adult</p> <p>Surgical-Adult</p> <p>Critical Care-Adult</p> <p>-0.10 0.00 0.10</p>
Scenario 17		Scenario 18	
<p>Patient (cognitively intact and IS a reliable historian) sitting on floor and reports that the reason they are on the floor is that they are attempting to dress http://www.screencast.com/t/RTjsiQ3r5GRw</p> <p>Mean 0.008</p> <p>Rank 19</p>	<p>(Intercept)</p> <p>Medical-Adult</p> <p>Rehab Adult</p> <p>Med-Surg Adult</p> <p>Step Down-Adult</p> <p>Surgical-Adult</p> <p>Critical Care-Adult</p> <p>-0.10 0.00 0.05</p>	<p>Patient is mobilizing with walking frame and one-person assistance and overbalances sideways; assistant slowly lowers patient to ground level http://www.screencast.com/t/pDmx7BkFTB9</p> <p>Mean 0.037</p> <p>Rank 7</p>	<p>(Intercept)</p> <p>Rehab Adult</p> <p>Surgical-Adult</p> <p>Medical-Adult</p> <p>Med-Surg Adult</p> <p>Step Down-Adult</p> <p>Critical Care-Adult</p> <p>-0.2 0.00 0.10 0.20 0.3</p>
Scenario 19		Scenario 20	
<p>In sitting, patient experiences a seizure and slides from chair to ground level http://www.screencast.com/t/OoAHklmrf</p> <p>Mean 0.010</p> <p>Rank 17</p>	<p>(Intercept)</p> <p>Med-Surg Adult</p> <p>Medical-Adult</p> <p>Step Down-Adult</p> <p>Critical Care-Adult</p> <p>Rehab Adult</p> <p>Surgical-Adult</p> <p>-0.10 -0.05 0.00 0.05</p>	<p>Physical therapist (PT) expects that patient falls and brings the patient to ground to prevent injuries. http://www.screencast.com/t/GpJzshdGQ</p> <p>Mean 0.17</p> <p>Rank 11</p>	<p>(Intercept)</p> <p>Rehab Adult</p> <p>Surgical-Adult</p> <p>Med-Surg Adult</p> <p>Medical-Adult</p> <p>Step Down-Adult</p> <p>Critical Care-Adult</p> <p>-0.1 0.0 0.1</p>

Appendix C: Original Survey Questions

Fall Indicator Reliability Study - Site Coordinator Survey

Page 1 - Heading

Please click on the circle that best represents your answer. Your answers will be saved when you click the "Submit" button at the end of each page. If you are coordinating more than one hospital please answer the questions from the viewpoint of the hospital that is the newest member of NDNQI, or among the newest members that joined NDNQI with the smallest staffed bed size.

Page 1 - Question 1 - Choice - One Answer (Bullets) [Mandatory]

Did your hospital submit fall data to NDNQI during the past year (August 2008 - July 2009)?

- ☐ Yes, for one or more quarters on all eligible reporting units
- ☐ Yes, for one or more quarters on selected units
- ☐ No, our hospital does not report fall data to NDNQI [\[Skip to 9\]](#)

Page 2 - Question 2 - Choice - Multiple Answers (Bullets) [Randomize]

When a patient fall occurs, who initiates the incident/event report? (Check all that apply)

- ☐ Staff Nurse (RN, LPN/LVN)
 - ☐ Charge Nurse
 - ☐ Nurse Manager
 - ☐ Patient Care Technician (PCT)
 - ☐ Nursing Assistant (NA)
 - ☐ Physician
 - ☐ Physical Therapist (PT)
 - ☐ Risk Management Staff
 - ☐ Quality Improvement Staff
 - ☐ NDNQI Site Coordinator
 - ☐ Other, please specify:
-

Page 2 - Question 3 - Choice - One Answer (Bullets)

What is the role of the person who initiates the fall incident/event report?

- ☐ A direct care provider (usually the one who finds the patient)
 - ☐ The unit has a designated person to submit incident reports
 - ☐ Other, please specify:
-

Considering the previous question (who initiates the fall incident/event report on patient falls), which group most often submits fall related incident reports?

	m o s t o f t e n	o f t e n	l e s s o f t e n	n e v e r
Staff Nurse (RN, LPN/LVN)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
C h a r g e N u r s e	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
N u r s e M a n a g e r	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Patient Care Technician (PCT)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nursing Assistant (NA)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
P h y s i c i a n	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Physical Therapist (PT)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk Management Staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Quality Improvement Staff	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NDNQI Site Coordinator	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

What is your primary format of your incident reports (for fall incidents/events)? (Pick one)

- ☐ Electronic incident report system
- ☐ Paper based form developed by hospital/system
- ☐ Paper based form provided by a vendor
- ☐ Excel spreadsheet developed by hospital/system
- ☐ Excel spreadsheet provided by NDNQI
- ☐ Other, please specify

Of the following, what information is collected for the initial fall incident/event report? (Check all that apply)

- ☐ Patient Name/Patient identifier
- ☐ Age
- ☐ Gender
- ☐ Incident narrative/ description of the event
- ☐ Injury level
- ☐ Date of fall
- ☐ Time of last fall assessment
- ☐ Fall risk assessment score
- ☐ If it is an assisted fall
- ☐ If it is a repeat fall
- ☐ Physical Restraint use
- ☐ Other

Does the incident/event report provide the information needed to submit data for NDNQI?

- ☐ Yes
- ☐ No

- ☐ Don't Know

Page 4 - Question 8 - Choice - One Answer (Bullets)

If you use an electronic incident report system, does this fit your needs to submit data to NDNQI?

- ☐ Yes, the electronic incident report system collects all information we need for NDNQI.
- ☐ Yes, the electronic incident report system collects all information we need for NDNQI, but it had to be customized.
- ☐ No, the electronic incident report system lacks some information, but it will be customized for our needs in the future (up to 6 months).
- ☐ No, the electronic incident report system lacks some information, it will not be customized and we supplement with a second report (electronic or paper).

Page 5 - Question 9 - Choice - One Answer (Bullets)

Who enters the fall data that you collect for NDNQI?

- ☐ Fall data submitted by XML
- ☐ NDNQI Site Coordinator
- ☐ Risk Management office staff person
- ☐ Quality Department staff person
- ☐ Nurse Manager of reporting unit
- ☐ Nursing department administrative assistant/secretary/unit clerk
- ☐ Other

Page 5 - Question 10 - Choice - One Answer (Bullets)

Do staff that enter fall incidents/events receive training on how to do this?

- ☐ No, they figure out how to do it on their own
 - ☐ Yes, we have a written tutorial how to submit incident reports for falls
 - ☐ Yes, we have an in-house training for falls
 - ☐ Other, please specify
-

Page 5 - Question 11 - Choice - One Answer (Bullets)

If you have training for fall incident reporting, does the training cover NDNQI's definition of a fall?

- ☐ Yes
- ☐ No
- ☐ I don't know

Page 6 - Question 12 - Choice - One Answer (Bullets)

Generally, how often is additional information needed from the medical record to submit data to NDNQI?

- ☐ More than 50% of all cases
- ☐ Between 25%-50% of all cases
- ☐ Between 10-25% of all cases
- ☐ Less than 10%

Page 6 - Question 13 - Choice - One Answer (Bullets)

When a fall occurs, who determines the injury level according to NDNQI guidelines?

- ☐ Whoever fills the incident report (nurse, PCT/NA, physical therapist)
- ☐ Each unit's nurse manager
- ☐ Quality Department Manager
- ☐ Risk Manager
- ☐ NDNQI Site coordinator
- ☐ Physician
- ☐ Other

Page 6 - Question 14 - Choice - One Answer (Bullets)

What process do you use to determine injury level?

- ☐ Injury levels are assessed on every patient 24 hours after the fall or upon hospital discharge, whichever occurs first.
- ☐ Injury levels are assessed on patients 24 hours after the fall when the initial report indicates an injury or an x-ray was ordered. Patient without injury or x-ray orders are not rechecked in 24 hours.
- ☐ We use the injury level that is reported on the initial report.

Page 6 - Question 15 - Choice - One Answer (Bullets)

Overall who is responsible for fall event surveillance?

- ☐ A designated interdisciplinary group (e.g. fall prevention task force)
 - ☐ Risk Management department
 - ☐ Quality Improvement department
 - ☐ Nursing Management
 - ☐ Other, please specify:
-

Page 7 - Question 16 - Choice - Multiple Answers (Bullets) [Randomize]

Who reviews the data before it is submitted to NDNQI? (Check all that apply)

- ☐ No one, it will be submitted as is
- ☐ Each unit's Nurse Manager
- ☐ Risk Management Department staff
- ☐ Quality Improvement Department staff
- ☐ NDNQI Site Coordinator
- ☐ Physician
- ☐ Other

Page 7 - Question 17 - Choice - One Answer (Bullets)

Estimate the likelihood that your hospital staff will submit a report on a non-injury fall.

- ☐ Always

- ☐ Most of the time
- ☐ Occasionally
- ☐ Rarely
- ☐ Never
- ☐ Unknown

Page 7 - Question 18 - Choice - Multiple Answers (Bullets)

Before submitting patient falls data to NDNQI, your data are reviewed and verified by the site coordinator with the following methods. Check all that apply.

- ☐ Compared each unit's fall counts to earlier quarters
- ☐ Reviewed and verified by nurse managers
- ☐ Reviewed and verified by risk managers
- ☐ Compared to fall counts used in other reports
- ☐ Spot check a few falls
- ☐ No additional verification; entered as received

Page 8 - Question 19 - Choice - One Answer (Bullets)

How frequently do you refer to the NDNQI Guidelines for Data Collection manual or online tutorial for information on the collection and submission of patient falls data?

- ☐ Never
- ☐ Once a year or less
- ☐ 2-3 times a year
- ☐ Once a quarter
- ☐ Several times each quarter

Page 8 - Question 20 - Choice - One Answer (Bullets)

In general taking all the data collection processes for patient falls at your hospital into account, how would you rate the accuracy of patient falls for your hospital reported to NDNQI?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

Page 8 - Question 21 - Choice - One Answer (Bullets)

In general taking all the data collection processes of patient falls at your hospital into account, how would you rate the accuracy of fall injuries for your hospital reported to NDNQI?

- ☐ Excellent
- ☐ Good
- ☐ Fair
- ☐ Poor

Your hospital is classified as a:

- ☐ General Hospital
- ☐ Critical Access Hospital
- ☐ Qualified Swing Bed Hospital
- ☐ Long Term Acute Care
- ☐ Pediatric Hospital
- ☐ Psychiatric Hospital
- ☐ Rehabilitation Hospital
- ☐ Specialty Hospital—Cardiac
- ☐ Specialty Hospital—Oncology
- ☐ Specialty Hospital—Orthopedic
- ☐ Specialty Hospital—Women and Infant
- ☐ Other Specialty Hospital—(not listed above)

Identify the number of staffed beds at your hospital.

- ☐ 0-24
- ☐ 25-49
- ☐ 50-74
- ☐ 75-99
- ☐ 100-199
- ☐ 200-299
- ☐ 300-399
- ☐ 400-499
- ☐ 500 or more

Is your hospital currently recognized as a Magnet hospital by the American Nurses Credentialing Center?

- ☐ Yes
- ☐ No

Which of the following best describes the teaching status of your hospital?

- ☐ Our hospital is an academic medical center. We are the primary clinical training hospital for a School of Medicine.
- ☐ Our hospital is a teaching hospital, but not an academic medical center. We have medical residents, but are not the primary clinical site for a School of Medicine.
- ☐ Our hospital is a non-teaching hospital. We do not have medical residents.

How long have you been site coordinator?

- ☐ Less than 6 months
- ☐ 6 months to 2 years
- ☐ More than 2 years

What is your professional background?

- ☐ RN
- ☐ LPN/LVN
- ☐ Other, please specify:

Is there anything we failed to ask in this survey regarding the data collection of patient falls that is important from your point of view? Please feel free to comment below.

This is the last page. Do not "submit" unless you have answered all questions you wanted to answer. Once submitted you cannot access the survey again.

Thank you for taking the Falls Reliability Study - Site Coordinator Survey. If you have any questions or comments concerning this study please call NDNQI at 913.588.1691. You may click on this text to go to our Home Page. [<https://www.nursingquality.org/>](https://www.nursingquality.org/)



[<https://www.nursingquality.org/>](https://www.nursingquality.org/)

APPENDIX D: SURVEY DATA

1. Did your hospital submit fall data to NDNQI during the past year (August 2008 - July 2009)?

Yes, for one or more quarters on all eligible reporting units	612	84%
Yes, for one or more quarters on selected units	55	8%
No, our hospital does not report fall data to NDNQI	62	9%
Total	729	100%

2. When a patient fall occurs, who initiates the incident/event report? (Check all that apply)

Staff Nurse (RN, LPN/LVN)	629	94%
Charge Nurse	332	50%
Nurse Manager	284	43%
Patient Care Technician (PCT)	137	21%
Nursing Assistant (NA)	160	24%
Physician	69	10%
Physical Therapist (PT)	226	34%
Risk Management Staff	52	8%
Quality Improvement Staff	24	4%
NDNQI Site Coordinator	6	1%
Other, please specify:	103	15%

3. What is the role of the person who initiates the fall incident/event report?

A direct care provider (usually the one who finds the patient)	640	96%
The unit has a designated person to submit incident reports	5	1%
Other, please specify:	20	3%
Total	665	100%

4. Considering the previous question (who initiates the fall incident/event report on patient falls), which group most often submits fall related incident reports?

Top number is the count of respondents selecting the option. Bottom % is percent of the total respondents selecting the option.	most often	often	less often	never
Staff Nurse (RN, LPN/LVN)	614 94%	35 5%	1 0%	4 1%
Charge Nurse	96 17%	264 46%	194 34%	15 3%
Nurse Manager	41 7%	130 23%	354 63%	35 6%
Patient Care Technician (PCT)	13 3%	46 9%	207 42%	230 46%
Nursing Assistant (NA)	19 4%	55 11%	237 46%	205 40%
Physician	1 0%	2 0%	121 24%	375 75%
Physical Therapist (PT)	13 2%	85 16%	356 68%	68 13%
Risk Management Staff	3 1%	13 3%	152 31%	327 66%
Quality Improvement Staff	2 0%	10 2%	98 20%	382 78%
NDNQI Site Coordinator	2 0%	2 0%	52 10%	445 89%

5. What is your primary format of your incident reports (for fall incidents/events)? (Pick one)

Electronic incident report system	477	72%
Paper based form developed by hospital/system	145	22%
Paper based form provided by a vendor	23	3%
Excel spreadsheet developed by hospital/system	5	1%
Excel spreadsheet provided by NDNQI	2	0%
Other, please specify	12	2%
Total	664	100%

6. Of the following, what information is collected for the initial fall incident/event report? (Check all that apply)

Patient Name/Patient identifier	664	100%
Age	640	96%
Gender	632	95%
Incident narrative/ description of the event	649	97%
Injury level	633	95%
Date of fall	663	100%
Time of last fall assessment	464	70%
Fall risk assessment score	459	69%
If it is an assisted fall	613	92%
If it is a repeat fall	377	57%
Physical Restraint use	527	79%
Other	199	30%

7. Does the incident/event report provide the information needed to submit data for NDNQI?

Yes	509	77%
No	147	22%
Don't Know	7	1%
Total	663	100%

8. If you use an electronic incident report system, does this fit your needs to submit data to NDNQI?

Yes, the electronic incident report system collects all information we need for NDNQI.	194	39%
Yes, the electronic incident report system collects all information we need for NDNQI, but it had to be customized.	139	28%
No, the electronic incident report system lacks some information, but it will be customized for our needs in the future (up to 6 months).	44	9%
No, the electronic incident report system lacks some information, it will not be customized and we supplement with a second report (electronic or paper).	123	25%
Total	500	100%

9. Who enters the fall data that you collect for NDNQI?

Fall data submitted by XML	17	3%
NDNQI Site Coordinator	362	54%
Risk Management office staff person	39	6%
Quality Department staff person	103	15%
Nurse Manager of reporting unit	14	2%
Nursing department administrative assistant/secretary/unit clerk	73	11%
Other	58	9%
Total	666	100%

10. Do staff that enter fall incidents/events receive training on how to do this?

No, they figure out how to do it on their own	36	6%
Yes, we have a written tutorial how to submit incident reports for falls	155	24%
Yes, we have an in-house training for falls	331	51%
Other, please specify	121	19%
Total	643	100%

11. If you have training for fall incident reporting, does the training cover NDNQI's definition of a fall?

Yes	414	66%
No	130	21%
I don't know	88	14%
Total	632	100%

12. Generally, how often is additional information needed from the medical record to submit data to NDNQI?

More than 50% of all cases	149	23%
Between 25%-50% of all cases	63	10%
Between 10-25% of all cases	104	16%
Less than 10%	342	52%
Total	658	100%

13. When a fall occurs, who determines the injury level according to NDNQI guidelines?

Whoever fills the incident report (nurse, PCT/NA, physical therapist)	206	31%
Each unit's nurse manager	94	14%
Quality Department Manager	48	7%
Risk Manager	115	17%
NDNQI Site coordinator	121	18%
Physician	32	5%
Other	50	8%
Total	666	100%

14. What process do you use to determine injury level?

Injury levels are assessed on every patient 24 hours after the fall or upon hospital discharge, whichever occurs first.	159	25%
Injury levels are assessed on patients 24 hours after the fall when the initial report indicates an injury or an x-ray was ordered. Patient without injury or x-ray orders are not rechecked in 24 hours.	204	32%
We use the injury level that is reported on the initial report.	281	44%
Total	644	100%

15. Overall who is responsible for fall event surveillance?

A designated interdisciplinary group (e.g. fall prevention task force)	263	40%
Risk Management department	145	22%
Quality Improvement department	96	15%
Nursing Management	91	14%
Other, please specify:	66	10%
Total	661	100%

16. Who reviews the data before it is submitted to NDNQI? (Check all that apply)

No one, it will be submitted as is	22	3%
Each unit's Nurse Manager	144	22%
Risk Management Department staff	154	23%
Quality Improvement Department staff	183	28%
NDNQI Site Coordinator	487	73%
Physician	4	1%
Other	69	10%

17. Estimate the likelihood that your hospital staff will submit a report on a non-injury fall.

Always	361	55%
Most of the time	254	38%
Occasionally	13	2%
Rarely	16	2%
Never	5	1%
Unknown	12	2%
Total	661	100%

18. Before submitting patient falls data to NDNQI, your data are reviewed and verified by the site coordinator with the following methods. Check all that apply.

Compared each unit's fall counts to earlier quarters	239	37%
Reviewed and verified by nurse managers	245	38%
Reviewed and verified by risk managers	235	36%
Compared to fall counts used in other reports	268	41%
Spot check a few falls	79	12%
No additional verification; entered as received	138	21%

19. How frequently do you refer to the NDNQI Guidelines for Data Collection manual or online tutorial for information on the collection and submission of patient falls data?

Never	13	2%
Once a year or less	189	29%
2-3 times a year	216	33%
Once a quarter	159	24%
Several times each quarter	85	13%
Total	662	100%

20. In general taking all the data collection processes for patient falls at your hospital into account, how would you rate the accuracy of patient falls for your hospital reported to NDNQI?

Excellent	411	62%
Good	233	35%
Fair	17	3%
Poor	2	0%
Total	663	100%

21. In general taking all the data collection processes of patient falls at your hospital into account, how would you rate the accuracy of fall injuries for your hospital reported to NDNQI?

Excellent	401	61%
Good	234	36%
Fair	20	3%
Poor	3	0%
Total	658	100%

22. Your hospital is classified as a:

General Hospital	631	87%
Critical Access Hospital	25	3%
Qualified Swing Bed Hospital	0	0%
Long Term Acute Care	3	0%
Pediatric Hospital	25	3%
Psychiatric Hospital	1	0%
Rehabilitation Hospital	13	2%
Specialty Hospital—Cardiac	3	0%
Specialty Hospital—Oncology	7	1%
Specialty Hospital—Orthopedic	3	0%
Specialty Hospital—Women and Infant	1	0%
Other Specialty Hospital—(not listed above)	15	2%
Total	727	100%

23. Identify the number of staffed beds at your hospital.

0-24	14	2%
25-49	22	3%
50-74	41	6%
75-99	46	6%
100-199	193	27%
200-299	142	20%
300-399	120	16%
400-499	58	8%
500 or more	92	13%
Total	728	100%

24. Is your hospital currently recognized as a Magnet hospital by the American Nurses Credentialing Center?

Yes	182	25%
No	543	75%
Total	725	100%

25. Which of the following best describes the teaching status of your hospital?

Our hospital is an academic medical center. We are the primary clinical training hospital for a School of Medicine.	118	16%
Our hospital is a teaching hospital, but not an academic medical center. We have medical residents, but are not the primary clinical site for a School of Medicine.	287	40%
Our hospital is a non-teaching hospital. We do not have medical residents.	321	44%
Total	726	100%

26. How long have you been site coordinator?

Less than 6 months	94	13%
6 months to 2 years	258	36%
More than 2 years	371	51%
Total	723	100%

27. What is your professional background?

RN	597	83%
LPN/LVN	2	0%
Other, please specify:	116	16%
Total	715	100%

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Study 3

Injury Fall Reliability and Validity study

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Study 3: Online Injury Fall Written Scenario Reliability and Validity study

Aims:

1. To assess consistency (inter-rater reliability) of injury level assignment among raters of the fall injury scenarios.
2. To determine if the fall scenarios could appropriately predict the severity of injury falls. We approached this by conducting a two-step Factor Analysis. First, an Exploratory Factor Analysis (EFA) was conducted to identify the possible latent factor structure of the injury levels. Second, a Confirmatory Factor Analysis (CFA) using structural equation modeling was used to verify the factor structure identified from the previous EFA step.

Data Sample:

To assess reliability, we used an online survey that contained 15 fall-related scenarios (Appendix A). Each scenario could be rated as non-injurious fall, minor injury, moderate injury, major injury, or death. Several scenarios for each injury level (none to death) were generated using sample de-identified fall incident reports. As a pilot study, 17 NDNQI staff members and 101 NDNQI site coordinators were invited to rate each scenario on injury level and to provide comments to improve the clarity and 'realism' of the scenarios. Sixty-two persons responded to the survey for a response rate of 52.5%. Each scenario was revised based on injury level assignment and comments.

Next, 1159 NDNQI site coordinators were invited to rate the 15 revised scenarios as non-injurious fall, minor injury, moderate injury, major injury, or death. The site coordinators were instructed to involve other hospital personnel who normally would be responsible for making the final decision about injury category. They also were instructed to classify the injury level according to NDNQI guidelines. There were 461 respondents to the survey for a response rate of 40%. The typical respondent was a registered nurse (91%), held a masters or higher degree (60%), and worked in nursing management (40%) or quality improvement (31%).

Using the general guideline of 10 respondents per item (scenario here) for factor analysis, 461 respondents were more than adequate for analysis.

Analytic Methods:

Aim 1: To assess consistency (reliability) of responses (assignment to injury category) among respondents, intra-class correlations across the fall scenarios were calculated using ICC(1,k).

Aim 2: To assess validity of responses we employed factor analysis as follows:

First, scenarios were scored as correct (assignment to correct injury category according to NDNQI guidelines) or incorrect.

Second, due to the nature of dichotomous data, tetrachoric correlation was selected to be the most appropriate correlational method to serve as the basis of exploratory factor analysis. Unlike Pearson's correlation for continuous data, tetrachoric correlation estimates correlations among dichotomously measured variables as if the variables were made on a continuous scale. We conducted an EFA with categorical factor indicators in Mplus software, which conveniently incorporates tetrachoric correlation into the analysis.

Third, we conducted a Confirmatory Factor Analysis with categorical factor indicators using structural equation modeling in Mplus software to confirm the factor structure identified in the EFA.

Testing Results:

Two of the scenarios were determined to be complex (# 14 and # 17), which resulted in a wide variance of injury category assignment. In one of these scenarios the sequence of events was unclear (fall caused death? or death caused fall?), and in the second scenario the patient fell and then was dropped by staff as they were assisting the patient back to bed-- leading to confusion about injury category assignment. These scenarios were discarded based on item statistics, leaving 13 scenarios (items) for analysis.

RELIABILITY RESULTS

Across the remaining 13 scenarios, the intra-class correlation [ICC(1,k)] was .85, indicating high inter-rater reliability.

VALIDITY RESULTS

Exploratory Factor Analysis (EFA)

Based on Kaiser's criterion (retaining factors with Eigenvalues greater than 1), four factors were considered. Upon further examination of the factor loadings with Promax rotation, the majority of items (scenarios) loaded high on the first two factors with the exception of scenario 10. Scenario 10 loaded high on the fourth factor and none of the scenarios loaded on the third factor. Based on the initial assessment, a two factor structure was deemed the best solution and theoretically relevant.

Table 1. Initial Factors and Eigenvalues

Value	Eigenvalue
1	3.736
2	2.464
3	1.583
4	1.208
5	
6	
7	
8	
9	
10	
11	
12	
13	

The EFA was repeated on a two factor model with Promax rotation (RMSEA = 0.051). The aim of the EFA is to identify underlying factor structure that could be used to predict the severity of injury falls. The results clearly indicate two latent factors: None/Minor Injuries and Moderate/Major Injuries. Scenarios that met a criterion of .40 for factor loading were retained for the confirmatory factor analysis (CFA) in step 2. Scenario 5 (0.161) and scenario 11 (0.247) both loaded higher on the second factor; however, they were excluded from further analysis for failing to meet the 0.40 loading criterion. Both scenario 5 and 11 were self-reported falls by patients.

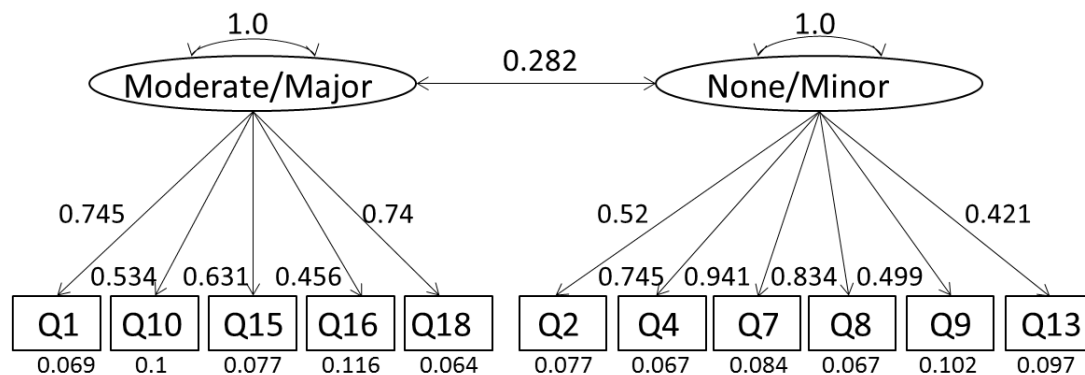
Table 2. Final 2 Factor Structure and Injury Level of Scenario

	F1	F2	Injury Level
Q1	0.697	0.284	Moderate
Q10	0.516	0.095	Major
Q15	0.646	0.15	Major
Q16	0.742	-0.1	Major
Q18	0.701	0.234	Moderate
Q2	0.123	0.457	Minor
Q4	0.348	0.716	None
Q5	-0.038	0.161	None
Q7	0.226	0.973	None
Q8	0.105	0.832	None
Q9	0.041	0.479	Minor
Q11	0.204	0.247	None
Q13	-0.134	0.535	Minor

Confirmatory Factor Analysis

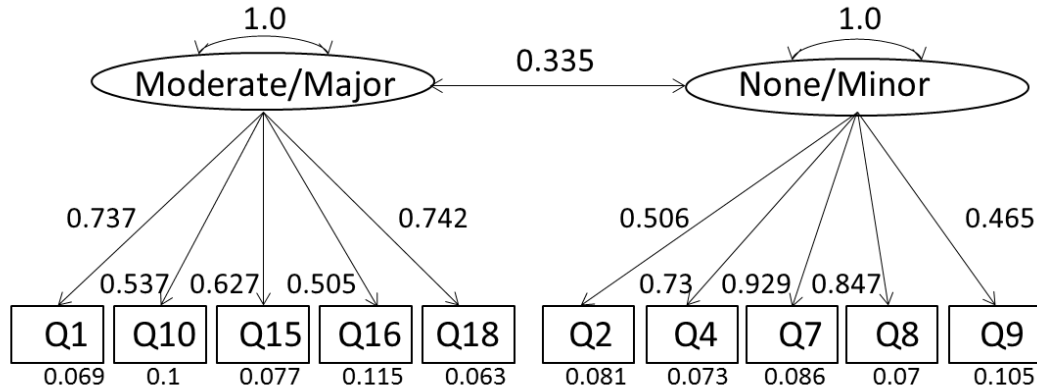
We next conducted a CFA with categorical factor indicators using structural equation modeling in Mplus to confirm the factor structure identified in the EFA. We began the analysis by first identifying the model through a CFA diagram (Figure 1). The model was specified using the two factors measured by the 11 scenarios, with each item assigned to the relevant factor.

Figure 1. Initial Assessment Model for CFA with Categorical Factor Indicators



CFA utilizes several statistical indices to determine the adequacy of model fit to the data. The results from the initial CFA procedure did not indicate a good model fit (CFI = 0.883, TLI = 0.878, RMSEA = 0.06). In order to improve the fit of the measurement model, we repeated the CFA procedure by removing scenario 13 from the model (Figure 2). The final CFA assessment confirmed a good model fit and our hypothesis that a relationship between the 10 observed scenarios and the two underlying latent factors exist (CFI = 0.95, TLI = 0.945, RMSEA = 0.042).

Figure 2. Final Model with Categorical Factor Indicators



Findings from step 2 confirm that the 10 scenarios from the injury falls survey resulted in latent structures that are appropriate for predicting the severity of the injury falls, and thus supporting the validity (accuracy) of survey respondents categorization of fall scenarios.

OVERALL CONCLUSIONS

1. NDNQI is doing well in obtaining standardized classifications of injury and non-injury falls.
2. Continue to encourage site coordinators to call NDNQI to get help with classifying complex falls situations and patient self-report fall situations.

Appendix A: Fall Injury Level Questionnaire (Final)

Answer Choices for all Fall Scenarios

What is the injury level of the described fall?

- ☐ None
- ☐ Minor
- ☐ Moderate
- ☐ Major
- ☐ Death

Find below and on the following pages fall narratives from fall incident reports. Please classify them according to NDNQI guidelines, which are provided at the end of each narrative.

Scenario 1

Pt found sitting in the floor of the bathroom, alert and oriented x's 3, vital signs checked 36.5, 74, 19, 118/70, 95% RA. Patient states he lost his balance and fell. C/o pain in the right elbow and found to have a laceration approx 3cm, not previously noted. Steri-strips applied to laceration. Further assessed for additional injuries (none noted) .Helped patient to the bed. MD notified.

Additional Information:

The patient's risk status was not assessed prior to fall and no fall prevention protocol was in place. The fall was not observed and it is unknown in which activity the patient was involved in. The patient received diuretics and pain medication prior to the fall.

Scenario 2

Upon assessment, pt's bathroom door was closed and lights were off. I knocked on the door and as I was opening the door, the pt was right behind the other side reaching for the door knob. The pt was taken by surprise and lost her balance. Nurse saw the patient fall backwards on her buttocks. She did not hit her head or have changes in LOC. Staff members assisted her back into bed. No immediate c/o pain. MD notified, charge RN at bedside. Ten minutes later, pt c/o lower back pain. MD notified again, came up to assess pt and ordered dilaudid for lower back pain. Dilaudid 0.4 mg IVP given with pain level decreasing to 4/10 from 6/10. Heat packs provided which pt states: "helped". T&L spine series x-ray taken; xrays negative for fracture or displacement. Pt denied any other symptoms or further lower back pain 2 hours after administration of pain medication and heat packs. Pt status changed to "at risk for falls", rounding done q 30 min x's 4.

Additional Information:

The patient's risk status was not assessed prior to fall and no fall prevention protocol was in place. The fall was observed while patient was in the bathroom. The patient is receiving diuretics and Anticoagulants.

Scenario 4

Staff heard noise of fall from pt room. Staff entered room to discover pt lying on floor beside his bed. Pt conscious, but disoriented to place and time. Pt able to stand up with assistance and back to bed. Pt now a&o x's 3, VS:BP 110/70, afebrile, hr 82, 99% on ra. Neuro checks done, no abnormality noted after patient transferred to bed. Physical exam done, no s/s of physical injury at time of incident and at 24 hrs post event. Pt reports no pain. MD to bedside 0535. MD examines pt; CT of head ordered to r/o abnormality r/t initial disorientation ; CT results: no significant abnormalities noted,. Orthostatic BP taken, without significant drop in BP. Pt placed on tele, sr 3/4 bedrails up. Pt able to demo use of call light. Pt given education regarding fall safety and use of call light, frequent checks done on Pt, bed in low position, personal items near bed, pt wearing socks pre and post fall.

Additional Information:

The patient was at risk and the fall prevention protocol was in place. The fall was not observed and it is unknown in which activity the patient was involved. The patient is receiving benzodiazepines, diuretics and pain medication.

Scenario 5

Upon entering the room, patient stated to the nurse that she fell while trying to walk to the BR and "hurt her arm" no other c/o pain. Pt advised to use call light when attempting to move. No physical signs of injury; ROM w/i normal limits. The physician notified; Tylenol ordered as needed for the pain. The nurse administered Tylenol once for pain. No further c/o arm pain 1 hour after Tylenol given and at 24 hr f/u.

Additional Information:

The patient was at risk and the fall prevention protocol was in place. The fall was not observed and the patient was sitting at the edge of the bed. The patient received diuretics prior to the fall.

Scenario 7

Patient states he tripped on IV pump power cord and fell. Does not complain of pain after fall and there was no bruise/ break in the skin or any other injury noted at 24hrs post fall. The patient is currently on pain medication.MD notified, pain medication decreased per order.

Additional Information:

The patient's risk status was not assessed and no fall prevention protocol was in place. Patient tripped on IV pump power cord. The fall was not observed. Current medications include opiates.

Scenario 8

Patient states she fell out of the chair to the floor while trying to reach for a book on the bedside table. No subsequent pain or injury immediately after reported fall and at 24 hrs post fall. VS and neuro checks w/i normal limits. No additional tests ordered. The patient had an NG tube which was pulled out of the patient's nose during the fall, after which the physician said to leave the NG tube out.

Additional Information:

The patient's risk status was not assessed and no fall prevention protocol was in place. The patient was reaching for a dropped object. The fall was not observed. Patient medications include opiates and anticoagulants at the time of the fall.

Scenario 9

A patient states she fell on her knees while reaching for her shoes, no injury noted at the time of the fall. The next day (15 hours later) the patient complained of R knee pain "right where she landed on her knees the previous day". R knee xray was performed. The x-ray was negative for fracture. Ice and ACE bandage applied to affected knee.

Additional Information:

The patient was at risk and the fall prevention protocol was in place. Patient was reaching for her shoes. Fall was not observed. Patient medications include opiates at the time of the fall.

Scenario 10

Patient found on floor, complained of pain on right side of head, R elbow, and knees. Pt states he is "dizzy"; neuro checks include softer grasp with right hand, PERRLA, able to follow gaze appropriately. Pt states he has nausea. A head CT was ordered indicating a small subdural hematoma. Patient was transferred to ICU.

Additional Information:

The patient was at risk and the fall prevention protocol was in place. The fall was not observed and it is unknown in which activity the patient was involved. Patient medications include diuretics and anticoagulants at the time of the fall.

Scenario 11

Patient is cognitively intact but tripped with the walker on a door jam. The patient got himself up and reported the fall to the nurse. Patient stated he had no pain, no other injury noted. Pt instructed to use call light when transferring. Call light placed w/i patient's reach, again. Previously ordered chest x-rays include a recent rib fracture. Pt instructed to continue deep breathing exercises. Pain medications given 4hrs prior to deep breathing exercises as ordered by practitioner.

Additional Information:

Risk assessment completed on admission. The patient was "at risk" and fall prevention protocol was in place. The fall was not observed but indicated he was ambulating. Patient was receiving hypertensive medication at the time of the fall.

Scenario 13

Patient was found on the bathroom floor, stating that she hit her head during the fall. Small laceration noted on the right side of pt's forehead. Band-aid applied to laceration. She also complained of lower back pain. VS and neuro checks within normal limits. Patient was examined by the physician who ordered CT of the head and lumbar back xray series; both were negative for fracture or hematomas/bleeds. Pt received acetaminophen for c/o head and back pain.

Additional Information:

The patient's risk status was assessed and no fall prevention protocol was in place. The fall was not observed. The patient's medications include diuretics and Anticoagulants at the time of the fall.

Scenario 14

Pt found on floor in bathroom; found unconscious after loud sound heard from nurses' station. Does not respond to painful stimuli. Large amount of blood seen on bathroom floor, corner of bathroom sink, and pt's right side of her head. Pt presents with dilated pupils, unable to assess BP after multiple attempts, pulse is weak and thready. Breaths are shallow. Pt moved to supine position between bathroom and bed. Code blue activated. MD notified. CPR performed for approx 15 min. by code team without success.

Additional Information:

Pt was not at fall risk after risk assessment performed on admit; no fall protocol initiated. Fall was unobserved. Prior to fall, pt was on diuretics, anticoagulants, and pain meds post surgery.

Scenario 15

Pt assisted to bathroom using gait belt, c/o dizziness. While trying to lower patient to the toilet, patient became limp and hit his arm on the handrail in bathroom. Bruise and swelling appeared at area where arm was hit. Pt lowered to the floor. VS: BP 82/50, P 50, R 22. After complete assessment, no other injuries noted. Pt transferred back to bed after SBP was greater than 100. 12Hours post fall, pt c/o pain on bruised arm. X-ray revealed closed fractured ulna. Pain meds ordered by attending MD and arm was casted.

Additional Information:

Fall risk assessment indicated pt at high risk for fall. Fall protocol was in place at time of fall. Medications include: diuretics, antihypertensives, and pain medication.

Scenario 16

After patient returned from EGD, receiving conscious sedation, pt states he walked into bathroom without assistance and fell to floor after trying to get back into bed. Nurse found patient back in bed after the patient stated he fell. Pt c/o pain in right ankle not previously mentioned on admission. Rt ankle has moderate purple bruising, and 2+ swelling. Has 2+ pedal pulses. MD notified. Xray of right ankle indicated a distal fracture. Pain medication ordered for patient after casting. 3 days after casting, pt c/o numbness and tingling in right foot and toes. Toes appear blue/purple in color w/ swelling over the casted area. MD immediately notified of findings. MD states he will come to patient's room to remove cast. MD arrived approx 17 hours later to remove cast. Pt states his toes were now cold and numb. Upon removal of the cast, the foot appeared a deep blue color from the toes to approx 5 inches on the foot. No pedal pulses could be palpated. Pt was immediately prepped for an amputation.

Additional Information:

No previous fall risk assessment was completed. Pt was not on a fall protocol and fall was not observed. Pt was found in bed after c/o fall. Prior to stated fall, patient was a&o times 3 upon arrival from EGD. No other person was in the room when pt stated he fell.

Scenario 17

When transferring patient from commode to bed, pt lost his balance and fell to the floor. Two nurses unable to help patient to a standing position. 2 bath blankets were placed under patient and 4 nurses, and 2 PTs helped lift patient with the bath blankets to the bed. Both bath blankets ripped while pt suspended in the air and pt then fell again on the side rails. Pt received minor abrasions on the lumbar area of his back, measuring 5 inches in length. Open skin area on lumbar area of the back dressed with 2 4x4s and triple antibiotic ointment. Pt c/o low back pain. MD notified. Xray of lumbar back revealed small compression fracture. Pt placed in back brace and given pain and muscle relaxation medication with relief.

Additional Information:

Pt was assessed for fall risk and was found "at risk". Fall protocol was in place at time of fall. Pt had unsteady gait at time of fall. He was on laxatives, anti-depressants, and has hx of ETOH abuse.

Scenario 18

While walking with patient to bathroom using gait belt and wheeled walker, pt became “dizzy”. Nurse assisted patient fall to the floor. On decent to the floor, pt received a 4 inch skin tear on right forearm. Steri-strips and Kerlix bandage was applied to pt arm. VS: BP 102/54 (sitting) and 80/48 (standing); P 64; R 16. 500cc NS bolus given. Pt had no further c/o dizziness after fluid bolus given. BP 122/66 (sitting) 114/58 (standing). No change in status after 24 hrs.

Additional Information:

Pt previously assessed for fall as was found at risk. Fall protocol in place at time of fall. Pt had some cognitive impairment (dementia) at time of fall. Medications include: antihypertensives, laxatives, and diuretics.

How many people have been involved in answering this survey?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4
- ☐ 5
- ☐ more than 5

Are you the NDNQI Site coordinator?

- ☐ Yes
- ☐ No

What is your professional background?

- ☐ Registered Nurse (RN)
- ☐ Other

What is your highest level of education?

- ☐ Diploma
- ☐ Associate degree
- ☐ Baccalaureate degree
- ☐ Masters degree
- ☐ Doctorate degree (PhD, MD, DNP, DNS)

What is your department?

- ☐ Nursing Management
- ☐ Quality Improvement
- ☐ Risk Management
- ☐ Other, please specify