Impact of Patient Safety Culture on Missed Nursing Care and Adverse Patient Events

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Abstract

Background.—A strong patient safety culture (PSC) may be associated with improved patient outcomes in hospitals. The mechanism that explains this relationship is underexplored; missed nursing care may be an important link.

Purpose.—The purpose of this study was to describe relationships among PSC, missed nursing care, and 4 types of adverse patient events.

Methods.—This cross-sectional study employed primary survey data from 311 nurses from 29 units in 5 hospitals and secondary adverse event data from those same units. Analyses includes ANOVA and regression models.

Results.—Missed nursing care was reported to occur at an occasional level (M=3.44, SD=0.24) across all 29 units. PSC dimensions explained up to 30% of the variance in missed nursing care, 26% of quality of care concerns, and 15% of vascular access device events. Missed care was associated with falls ($p < .05$).

Conclusions.—Prioritized actions to enhance PSC should be taken to reduce missed nursing care and adverse patient outcomes.

Keywords

adverse events; missed nursing care; organizational culture; patient safety culture; specialty certification

Adverse events in hospitalized patients are catastrophic and costly to individuals, hospitals and society.[1] The most recent Department of Health and Human Services report suggests that annually approximately 13.5% of hospitalized Medicare beneficiaries experience an adverse event during their hospitalization, and alarmingly 44% are deemed preventable.[1] The rate of preventable harm to patients was found to remain relatively stable at 40.2 adverse events per 1,000 patient days over a 5-year study period all signifying poor health care quality.[2] Similarly, James found preventable deaths due to medical error incidence rates range between 210,000– 400,000 annually.[3] Reports continue to indicate that despite national attention and substantial resource allocation over the past decade, there has been no substantive reduction in the incidence of preventable adverse inpatient events.[4] In the absence of national standardization and reporting requirements, the most recent estimate reported in 2016, derived from pooling existing estimates and extrapolating to the 2013 US admission population, suggests medical error is the third leading cause of death.[5]

In context of this burden and lag time, there is increasing demand for transparency and subsequently voluntary adverse event reporting systems have been broadly adopted in US health care systems.[6,7] The reporting of adverse events by providers at the point of care is an established and recommended mechanism to identify "near misses" and actual errors in care despite the lack of national adverse event reporting systems.[7,8] Literature suggests features of a positive patient safety culture (PSC), such as a non- punitive environment, enhance voluntary reports of near misses and error.[7–9]

Patient safety is a vital component of health care quality. A culture of patient safety, characterized by shared health care provider perspectives of the importance of safety, fidelity and transparency of communications, and shared confidence in the efficacy of preventive measures, has been associated with some improved patient outcomes.[9-11] An emerging body of evidence also suggests that features inherent in a better PSC, such as attention to workload, organizational priorities, and communication are associated with less missed nursing care by supporting nurses to do the important work they perform every day.[12,13] Survey measures to assess PSC have been developed, tested and broadly adopted in the US. [9,14]

Missed nursing care, care that should be provided to patients but is left undone, as an indicator of inferior nursing care practices, is also theoretically and empirically associated with adverse patient events.[13,15–18] A number of studies have demonstrated that missed nursing care processes in hospitals is both prevalent and portends certain patient outcomes including higher occurrence of infections and falls, new onset delirium, pneumonia, medication variances and increased length of stay, delayed discharge and increased pain and discomfort.[16, 18,19] This significant amount of nursing care processes missed in hospitals spans all nursing care responsibilities including assessment (44%), interventions and basic care (73%), and planning (71%).[16]

These studies provide empirical support that a stronger PSC is associated with improved patient outcomes and increased missed nursing care is associated with increased adverse patient safety events. Thus, though few in numbers, these early and novel lines of research are beginning to suggest an explanatory mechanism between PSC and adverse patient safety events. However, no studies have directly examined the relationship between PSC and missed care, and therefore no studies have tested the theoretical relationship that missed nursing care mediates the relationship between the PSC and adverse patient safety events.

Guided by the Missed Nursing Care Model, [17] the primary purpose of this cross-sectional study was to describe the relationships among patient safety culture, missed nursing care and adverse patient safety events in hospitals. The aims of this study were to determine: (1) if any dimensions of PSC predict missed nursing care, (2) if missed nursing care predicts adverse patient safety events, and (3) the relationships among PSC and adverse patient safety event rates controlling for missed nursing care and other hospital and nurse characteristics.

METHODS

Design and data sources

This was a cross-sectional study that pooled existing unit level adverse outcomes data with primary PSC and missed nursing care survey data from hospital based nurses. The sample used in the study included hospitals that differ in terms of structural and organizational characteristics (size, teaching, and Magnet® designation status) and nursing characteristics (nurse education, specialty certification). Hospital inpatient units that used the adverse event reporting system CareLink©[6] were included (adult and pediatric inpatient medical-surgical units and intensive care units) and licensed registered nurses (RNs) who provide direct care on those units were eligible to participate. The number of subjects for this exploratory study was based upon convenience sampling methodology. Our sample aim was a 50% response rate from 574 eligible nurses working on 38 inpatient units in five Mid-Atlantic hospitals in one health care system.

Instruments

Three instruments or data sources were used. PSC was measured with the Agency for Healthcare Research and Quality (AHRQ) Hospital Survey on Patient Safety Culture (HSOPS).[9] The 44-item survey is extensively used extensively to measure 12 dimensions of patient safety culture: (1) teamwork across units, (2) staffing, (3) supervisor/manager expectations and actions promoting safety, (4) non-punitive response to errors, (5) care handoffs and transitions, (6) feedback and communication about error, (7) communication openness, (8) overall perceptions of patient safety, (9) management support for patient safety, (10) organizational learning and continuous improvement, (11) teamwork within units and (12) frequency of events reported.[9] Items are measured using a 5-point Likert scale so that a 1 represents a low score and a 5 a high score and a composite score per dimension is obtained. The HSOPS has acceptable psychometric properties including Cronbach's alpha 0.63–0.84, and there is an extensive and explicit Survey User's Guide, including instructions for items that are reverse coded and guidance for modifying and administering the tool.[9]

Hospital unit data was aggregated and analyzed in accordance with AHRQ survey procedures.[9]

The second instrument was the MISSCARE survey which asks nurses to identify how frequently elements of care (e.g. ambulation, turning, patient assessment, teaching, discharge planning, medication administration) are missed using a 5-point Likert scale from 1 (always missed) to 5 (never missed), so that a lower score indicates more missed care.[21] In addition to the individual item measures, a composite measure was constructed as an indicator of nursing care quality, as the care needs left undone cannot be directly matched to individual patient outcomes. The composite measure was calculated as the average count of the 24 nursing care activities left undone by each nurse respondent. These individual composite measures were then aggregated for each hospital unit resulting in a percentage of unmet nursing care needs per hospital unit. The psychometric properties of this tool are well established and include content validity and internal reliability (Cronbach alpha 0.64 to 0.86).[20] In the survey of nurses, we asked several demographic questions, such as certification status, highest earned degree, and tenure on the unit.

The third data source used for outcome measures was the adverse reporting systems used in this setting, CareLink© (version 6.6.1).[6] This system is used nationally in many hospital settings, and includes categorization of main event types as recommended following establishment of hospital guidelines for reporting. These guidelines for reporting and classification of event types follow standard and national guidelines per each event type.[6] From this system four events were selected: (a) patient falls, (b) medication variance, (c) quality of care concern, and (d) vascular access device (VAD) events. These were selected as they are nurse sensitive indicators available in the adverse event reporting system and there is theoretical and empiric support that these outcomes may be associated with missed nursing care.

Falls were operationalized by the National Database of Nursing Quality Indicators ® definition as a sudden, unintentional descent with or without injury to the patient that results in the patient coming to rest on the floor, or on or against a surface, object, or person.[21] Medication variance was operationalized as the potential or actual medication error in prescribing, transcribing/documenting, dispensing or administering that could result in inappropriate medication use, medication omission, and/or harm to the patients, as defined by the National Coordinating Council for Medication Error Reporting and Prevention, the US standard (http://www.nccmerp.org/vision-and-mission).

Quality of care concerns were defined as: delays/lack of response to patient conditions, communication issues, inappropriate treatment, handoff issues and similar such incidents. VAD events were defined as an untoward events related to the insertion, maintenance, use or removal of any VAD device (including but not limited to peripheral IVs, central lines, and implanted ports) such as phlebitis, infiltration, infection, malposition or multiple attempts at insertion. These data were aggregated to the unit level to create a unit event rate/1,000 patient days, and one year of each type of event data was collected per unit.

Data collection

Following Institutional Review Board approval and pretesting the electronic survey link, an invitation to participate was sent via email to all eligible nursing staff (N=574) on participating units (N=38). Surveys were completed using the web based survey link over 3 months; 4 reminders were sent every 2 weeks in accordance with AHRQ survey procedures. Units that achieved a greater than 50% participation rate received a nominal token of appreciation (insulated lunch totes). One year of existing adverse patient safety data were requested from the appropriate administrative staff to encompass 6 months pre- and post-survey data. All data were collected between December 2016 and April 2017.

Statistical analysis

Standard descriptive statistics to gain familiarity with the distributions and frequencies of the data were followed by bivariate analyses to describe relationships among the key variables and correlations as appropriate. Differences in average missed nursing care by nurse and hospital characteristics were assessed using ANOVA testing. No nurse level differences in missed nursing care by hospital teaching status, bed size, Magnet® status, nurse education, tenure in role or unit, staffing levels (number of patients cared for last shift), or number of hours worked per week were found, and therefore our models were not adjusted for these potential confounders.

Differences in missed nursing care were found between specialty certified nurses compared to those who were not specialty certified ($F_{1,258}=5.73$, $p<.05$), indicating more care was reported missed by those certified; therefore the unit proportion of certified nurses was adjusted for in the missed nursing care models. Differences in unit ratings of PSC dimensions (the predictor variables) were assessed using ANOVA, and statistically significant differences ($p<.05$) were noted across units for all dimensions except communication openness ($F_{1, 28}=1.21$, $p>.05$), lending to greater precision of parameters.

Data from the HSOPS and the MISSCARE survey were pooled with adverse event outcomes data and used to determine whether hospital units with a more positive PSC had less missed nursing care and fewer adverse event patient outcomes. Ordinary least squares (OLS) and multivariate regression analyses were conducted using Huber-White robust standard errors. The power calculations for this exploratory study with regression analyses, using $\alpha=0.05$, $\beta=0.80$, indicated 25 units would be needed to detect a large (0.35) and 54 units to detect a medium (0.15) effect difference in adverse outcomes. All statistical tests were conducted using STATA/*MP* v.15.0 (StataCorp. College Station, TX).

RESULTS

Descriptives

A total of 385 (67% response rate) nurses responded to the survey. Nurse and hospitals characteristics are shown in Supplemental Digital Content, Table 1. For unit level analyses, we retained data from a) nurses who responded "yes" they provide direct care and selected the unit on which they work (n=333) and b) the units with greater than 5 and/or greater than 20% response rate (n=29). The nurses on these units totalled 311. The average unit response

rate was 45% (range 7–100%). The distribution of unit level adverse event rates per 1,000 patient days in descending order was: quality of care concerns (M=6.35, SD=4.85); medication variance (M=5.46, SD=4.50; VAD events (M=3.14, SD=2.03); and falls (M=2.74, SD=1.1).

Nurses on average reported features of a positive PSC (ie, agree/strongly agree, always/ often) were present by unit aggregate PSC score (M=3.52, SD=0.30). Unit level ratings were highest for teamwork within units (M=4.02, SD=0.34), followed by organizational learning/ continuous improvement (M=3.90, SD=0.33) and feedback and communication about error (M=3.90, SD=0.40). In this sample, the HSOPS demonstrated internal reliability by Cronbach alpha of 0.92.

Most nurses (211, 77.9%) reported occasionally to always missing some aspect of nursing care. On a scale of 1–5, the average unit (N=29) composite score was M=3.44 (SD=0.24), indicating the unit aggregate of all care missed was occasionally. The items most frequently missed in descending order included: ambulation 3 times per day or as ordered (M=2.74, SD=0.96), turning patient every 2 hours or as ordered (M=2.89, SD=0.97), and medications administered 30 minutes before/ after schedule (M=2.90, SD=0.94). Items least frequently missed in descending order included: patient assessments performed each shift (M=4.43, SD=0.70), bedside glucose monitoring as ordered (M=4.15, SD=0.72), and IV/central line site care/assessments per policy (M=4.07, SD=0.75). In this sample, the MISSCARE survey demonstrated internal reliability by Cronbach alpha of 0.95.

Dimensions of PSC that Predict Missed Nursing Care and Adverse Patient Safety Events

Addressing Aim 1, to determine if any dimensions of PSC predict missed nursing care, the unadjusted robust OLS regression models indicated the aggregate PSC explained 15% of the variance in missed nursing care; when adjusted for nursing specialty certification the relationship was non-significant. In unadjusted models 6 dimensions were positive, independent predictors of missed care by OLS ($p<$ .05): handoffs and transitions (R^2=30%), overall perceptions of safety (R^2=24%), management support for patient safety (R^2=23%), staffing (R^2=21%), teamwork across units (R^2=20%) and organizational learning/continuous improvement (R^2=9%). When models were adjusted for nursing specialty certification, handoffs and transitions (R^2=30%), overall perceptions of safety (R^2=24%), and management support for patient safety (R^2=25%) remained significant predictors of missed nursing care (Table).

Addressing Aim 2, to determine if missed nursing care predicts adverse patient safety events, missed nursing care was a statistically significant predictor of reported patient falls (R^2=13%) in unadjusted models. The relationship was non-significant after adjusting for nursing specialty certification (Supplemental Digital Content, Table 2).

Addressing Aim 3, to determine the relationships among PSC and adverse patient safety event rates controlling for missed nursing care and other hospital and nurse characteristics, we first tested if the PSC dimensions were independent or aggregate predictors of each of the 4 adverse events (Supplemental Digital Content, Table 3). In unadjusted models, statistically significant ($p<$.05) relationships were found between non-punitive response

(R^2=26%), frequency of events reported (R^2=21%), feedback and communication about error (R^2=4%), and quality of care concerns. None remained significant after adjusting for missed nursing care and nursing certification. The PSC dimension management support for patient safety was a predictor of VAD events in unadjusted (R^2=15%) and adjusted models (R^2=20%). There were no relationships among PSC dimensions and the adverse events of medication variance or patient falls.

DISCUSSION

In this first known study to link PSC directly to missed nursing care and patient outcomes, we advanced our understanding of the interrelationships of these important factors in the following ways. First, we found the majority of nurses reported missing some aspect of nursing care, these included ambulation, turning patients, and feeding and nutrition, notably these are opportunities for direct contact with patients where patient assessment, education and evaluation could occur. These activities are general in scope and require coordination and teamwork, by example with physical therapy or nursing assistants. This finding is in concordance with literature that has demonstrated the importance of teamwork is a predictor of missed nursing care.[12, 22, 23]

Unexpectedly, nursing care was more frequently missed by those who were speciality certified compared to those who were not certified. Certified nurses may be focused on overarching health outcomes of patients rather than attending to discrete patient care needs where the appearance of an adverse outcome may be delayed. By example, omitting a patient assessment during the shift would be evident as it essential to all subsequent care planning whereas the impact of not turning and positioning a patient may not be evident until discharge or a pressure ulcer develops. Of concern to hospital administrators, these missed activities are also linked to hospital acquired conditions that are mandated to report, such as pressure ulcers and falls. Conversely, specific functions that are typically performed independently by nurses were rated as rarely to never missed and included patient assessments performed each shift, bedside glucose monitoring as ordered, and IV/central line site care/assessments per policy. These findings add to the growing body of literature documenting the urgent and widespread problem of missed nursing care and the importance of overall unit composition, teamwork and organizational support.

Second, we identified that the unit aggregate PSC is a predictor of the frequency of missed nursing care, explaining a small (15%) but reliable amount of the variance in missed care. This is important in and of itself as an indicator of the influence of organizational culture on discrete nursing functions and processes of care. To our knowledge this is the first study to directly link PSC to processes of nursing care. Moreover, specific dimensions of the PSC, including handoffs and transitions, overall perceptions of safety, management support for patient safety, staffing, teamwork across units and organizational learning/continuous improvement were particularly relevant indicators, each uniquely and independently explaining 9–30% of the variance in missed nursing care. These findings suggest organizations focused on reducing the amount of missed nursing care should optimize these particularly clinically relevant domains. While PSC explained some of the missed nursing care, it is possible that unmeasured organizational factors, such as high patient turnover, unit

level workload, and presence of support staff, or unmeasured individual factors such as nurse burnout, may be contributing to the variance in missed nursing care.[12, 13, 23–25]

Third, we found that missed nursing care was positively and statistically associated with nurse reports of patient falls, a leading patient safety indicator with high associated morbidity, mortality, and cost.[26] While falls are multicausal, demonstrating that missed nursing care as an aggregate measure is associated with patient falls suggests efforts to support the completion of all nursing care activities is an essential prevention strategy. This affirms what is known in the literature and adds to our appreciation of nurse reported outcomes as an important source of health services data.[7, 8, 27–29]

Last, we found that PSC dimensions were a direct, positive predictor of nurse sensitive reported adverse events with and without controlling for missed nursing care. Specifically, non-punitive response, frequency of events reported, feedback and communication about error predicted quality of care concerns, and management support for patient safety was a predictor of VAD events. To our knowledge this is the first study to identify these relationships using nurse sensitive indicators and a voluntary adverse event reporting system. While prior studies have demonstrated the relationship between features of the PSC and adverse patient outcomes, they have largely been limited to global outcomes measures, such as readmissions and mortality.[10,28] Our findings are consistent with the literature that suggests these PSC characteristics are correlated with nurses' intention to report errors.[29]

This adds to understanding of the relationship between PSC and missed nursing care and suggests to nurse leaders that both the perception of PSC by nurses on the unit and the frequency of omitted care are important to monitor. Moreover, placing emphasis and action on providing staff feedback, setting expectations, and assuring a non-punitive environment and open communication about errors may influence the voluntary reporting of adverse events and the prevention of such events.

Limitations

This study is cross-sectional, and the 5 hospitals are part of 1 large health care system in the mid-Atlantic region of the US. Causality cannot be established. The response rate per unit limited our abilities to include enough units to identify if important relationships exist. Despite our individual response rate of 67%, the average response rate per unit was 45%, and we dropped units with a low response rates from our analyses, thus limiting the sample to 29 units, (or 74% of all units). This may have limited our ability to detect important relationships. Nurses' self- reports of missed care may also present a limitation, however we found the distribution consistent with existing literature. An additional limitation is the use of nurse reported adverse outcomes. Though institutional policy requires clinicians to complete these reports, the rates may be too low at the unit level to detect differences, despite the extensive individual consequences of each outcome. However, the distribution of these events indicates they are being reported, and as the measure includes near misses, this measure may have greater sensitivity and actionable consequence than administrative data.

CONCLUSIONS

Higher ratings of PSC were associated with less missed nursing care, and missed nursing care was associated with falls, an important patient outcome. Health care administrators and nurse leaders have a powerful opportunity to improve the conduct and impact of nursing care by taking discrete actions to enhance the unit PSC. Implications for nurses providing direct care include actively and transparently engaging with unit leadership and administrators to identify and address concerns, specifically as they relate to unit management style and support and open and non-punitive communication. Recommended actions include quantifying unit PSC to address weak areas and conducting periodic audits of unit level missed care to target efforts to support the full provision of safe care and reduce the impact on patient outcomes. Implications for future research include examining these relationships using a robust probability sample, examining other factors that influence missed nursing care including additional measures of organizational support for the provision of nursing care such as team composition, and broadening nurse sensitive outcomes to include for example pressure ulcers.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments:

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Table.

Regression Results of Patient Safety Culture (PSC) Predictors of Missed Nursing Care (*N*=29 units)

PSC Dimensions	Mean (SD)	*Adjusted R²* (*p* value)
Teamwork Within Units	4.02 (0.34)	0.09 (.23)
Organizational Learning- Continuous Improvement	3.90 (0.33)	0.09 (.13)
Feedback & Communication About Error	3.90 (0.39)	0.06 (.25)
Supervisor/Manager Expectations & Actions Promoting Patient Safety	3.87 (0.47)	0.07 (.92)
Frequency of Events Reported	3.81 (0.41)	0.00 (.94)
Overall Perceptions of Patient Safety	3.25 (0.38)	0.24 (.04)
Communication Openness	3.75 (0.30)	0.05 (.43)
Management Support for Patient safety	3.42 (0.52)	0.25 (.01)
Teamwork Across Units	3.42 (0.40)	0.21 (.06)
Non-punitive Response to Errors	3.04 (0.48)	0.04 (.68)
Handoffs & Transitions	2.99 (0.45)	0.30 (.02)
Staffing	2.79 (0.47)	0.21 (.06)
Aggregate PSC Score	3.52 (0.30)	0.16 (.06)

Notes: PSC measured on 5-point Likert scale so that 1 represents a low score and 5 a high score. Models adjusted for unit proportion nurse specialty certification.