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Linking the Work Environment to Missed Nursing Care in Labor and Delivery

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Abstract

Aim.—To measure the association between the nurse work environment (NWE) and missed nursing care on labor and delivery (L&D) units.

Background.—L&D units provide a sizable fraction of acute hospital services to a unique population that is a national and global priority. L&D nurses are the frontline providers during labor. Maternal morbidity and mortality may be influenced by the NWE and missed care.

Methods.—This cross-sectional study utilized secondary data from 1,313 L&D staff nurses in 247 hospitals from a four-state nurse survey collected in 2005–2008.

Results.—Half of nurses missed care (range: zero to 100% across hospitals). Nurses on average missed 1.25 of 10 activities. The most commonly missed activities were comforting/talking with patients and teaching/counseling. In better as compared to poor NWEs, the odds and frequency of missed care were significantly lower.

Conclusions.—L&D nurses routinely miss necessary nursing activities. Laboring women's psychosocial, comfort, and educational needs are compromised most often, likely impacting quality and outcomes. Nurse communication with colleagues and managers about missed care is warranted.

Implications for Nursing Management.—The L&D NWE is modifiable and appears to influence missed care. Managers should discuss missed care with staff and measure their NWE to identify actionable weaknesses.

Introduction

Labor and delivery (L&D) registered nurses (RNs) are the frontline providers during labor. They provide continuous bedside care that is instrumental to labor progression and critical to achieving optimal birth outcomes (Association of Women's Health Obstetric and Neonatal Nurses, 2018). Childbirth is the most common reason for hospitalization, with 4 million women giving birth each year, comprising 1 in 9 hospitalizations (McDermott, Elixhauser, &

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Conflict of Interest Statement:

The authors listed below certify that they have NO affiliations with or involvement in any organization or entity with any financial interest, or non-financial interest (such as personal or professional relationships, affiliations, knowledge or beliefs) in the subject matter or materials discussed in this manuscript.

Equipment is not applicable to this project.

Sun, 2017). Maternal mortality in the U.S. has climbed over the past two decades (Kassebaum et al., 2016). Half of maternal mortality is considered preventable (Main & Menard, 2013). Nursing care is critical in the prevention of maternal morbidities, which may be fatal (Bingham, 2012).

Maternal morbidity and mortality may be influenced by the nurse work environment (NWE) and missed nursing care, as has been demonstrated in other populations (Jones, Hamilton, & Murry, 2015; Lee & Scott, 2018; Papastavrou, Andreou, & Efstathiou, 2014). While these topics have been largely ignored in L&D, recent qualitative research suggests that missed care is problematic in this setting, threatening outcomes for laboring women and their newborns (Simpson & Lyndon, 2017). There is, however, a notable lack of evidence about the NWE and missed care in L&D. The purposes of this study are to provide the first quantitative description of, and to determine the associations between, the NWE and missed care on L&D nursing units, which provide a sizable fraction (over ten percent) of acute hospital services in the United States.

Background

The NWE is an organizational construct that has been the focus of empirical and managerial attention for over two decades (Lake, 2007; Swiger et al., 2017; Warshawsky & Havens, 2010). It has been defined as the “organizational characteristics of a work setting that facilitate or constrain professional nursing practice” (Lake, 2002, p. 178). Consistent with the quality framework proposed by Donabedian (Donabedian, 1966) in which health care structures influence health care processes, which, in turn, influence health care outcomes, the NWE is considered a health care structure. The NWE, therefore, is theorized to influence nursing care quality (a health care process), and consequently, patient outcomes.

A commonly used instrument to measure the NWE is the Practice Environment Scale of the Nursing Work Index (PES-NWI), developed in 2002 (Lake, 2002) from the Nursing Work Index (Kramer & Hafner, 1989). The PES-NWI, a survey instrument, has been endorsed as a national performance standard by the National Quality Forum since 2004 (National Quality Forum, 2017). The PES-NWI includes five subscales measuring different NWE domains: Nurse Participation in Hospital Affairs, Nursing Foundations for Quality Care, Nurse Manager Ability, Leadership and Support; Staffing and Resource Adequacy, and Collegial Nurse-Physician Relations.

Multiple literature reviews (Lee & Scott, 2018; Swiger et al., 2017; Warshawsky & Havens, 2010) and a meta-analysis (Lake et al., 2019) describe NWEs globally and their associations with nurse job outcomes, patient outcomes and experiences, and quality and safety. Available nurse time and attention may be compromised by poorly organized environments adding layers of communication. A description of the NWE and its association with care processes and outcomes has been reported in various inpatient settings, such as neonatal intensive care unit (ICU) (Hallowell, Spatz, Hanlon, Rogowski, & Lake, 2014), pediatric ICU (Blake, Leach, Robbins, Pike, & Needleman, 2013), adult critical care (Boev, 2012), psychiatric (Hanrahan, 2007), medical-surgical (Roche & Duffield, 2010), and oncology (Shang, Friese, Wu, & Aiken, 2013). A description of the NWE in L&D is lacking.

Missed care is another construct that has received empirical and managerial attention recently (Jones et al., 2015; Papastavrou et al., 2014). The construct, defined as “any aspect of required patient care that is omitted (either in part or in whole) or delayed” (Kalisch, Landstrom, & Hinshaw, 2009, p. 1510) also has been referred to as unmet nursing care needs (Lucero, Lake, & Aiken, 2009), unfinished nursing care (VanFosson, Jones, & Yoder, 2016), and rationed care (Schubert M., 2007). Whereas the NWE is considered a health care structure, missed care is considered to reflect a health care process, i.e., nursing care. Because nursing care quality is difficult to define and measure directly, the construct missed care, which can be measured consistently by self-report, can represent the process component in the quality framework. The theoretical proposition linking the NWE to missed care is that in poorly organized NWEs nurses miss required care due to time constraints.

Considerable evidence reveals that missed care in hospitals is common and is associated with both poor NWEs and negative patient outcomes (Jones et al., 2015; Papastavrou et al., 2014). Two secondary analyses of survey data from 2005 to 2008 from a large sample of U.S. hospital nurses provide descriptive statistics for missed care in adult and pediatric units. In one study, medical-surgical and adult ICU nurses in 409 hospitals missed, on average, 2.7 of 12 activities (Lake, Germack, & Viscardi, 2016). In another, nurses working in pediatric and neonatal units in 223 hospitals reported lower rates of missed care: 1.5 of 12 (Lake et al., 2017). Three quarters of nurses in adult settings missed one or more activities, ranging across hospitals from 25% to 100% (Lake et al., 2016), as compared to half of pediatric nurses (Lake et al., 2017). A review of 54 publications on missed care showed that activities missed most frequently “addressed patients’ emotional and psychological needs rather than physiological needs, they had a less direct or immediate impact on patient health, they were more time consuming or the time required was unpredictable, and they were less often subject to audit” (Jones et al., 2015, p. 1131–1132). These missed care characteristics were confirmed in the two large-scale U.S. studies. A consistent pattern was observed across adult and pediatric settings. The most frequently missed activities were comforting/talking with patients, care planning, and teaching/counseling; missed least frequently were treatments and procedures, and pain management (Lake et al., 2017; Lake et al., 2016).

The only published evidence on missed care in L&D is from qualitative studies. Focus groups with 71 labor nurses from 6 hospitals explored types, causes, and consequences of missed care (Simpson & Lyndon, 2017). Nurses reported that missed care was a safety concern, and potential poor outcomes were cesarean delivery, depressed infants at birth, hemorrhage, poor maternal satisfaction, and poor breast-feeding success (Simpson & Lyndon, 2017). Another study identified missed care in a thematic analysis from a specialty association survey about staffing guidelines (Simpson, Lyndon, & Ruhl, 2016). No quantitative empirical work has been done to describe missed care in L&D. This study addresses these gaps.

L&D is a unique care setting. Patients’ needs change more rapidly on L&D units as compared to other unit types. Staffing needs vary depending on medication utilization, stage of labor and development of complications. When emergencies arise during delivery, recognizing danger signs and obtaining care quickly is critical (Bailit, 2007; Weil, Javet, Rebold, & Donnay, 2003). All L&D patients require one-to-one nursing during some period

of their hospitalization based on guidelines (Association of Women's Health Obstetric and Neonatal Nurses, 2011) and care standards. There are multiple admissions and discharges per shift. Evidence about the NWE and missed care from adult and pediatric medical–surgical or ICUs is not necessarily relevant to L&D because of its dynamic nature. This setting warrants specific studies dedicated to evaluating organizational aspects of L&D care and associated care processes. Thus, examining the NWE and missed care is a foundational step to inform L&D nurse managers.

The study purposes are to describe L&D NWE and missed care and to examine whether missed care varies with NWE. Research focused on NWE and missed care have never been addressed in L&D, despite the potential vulnerability of laboring women, as well as of their newborns. We hypothesized that nurses in units with better NWEs would miss less care. This study has the potential to transform the delivery of obstetric care received by millions of women and their families by influencing previously unaddressed environmental and care aspects of L&D units, which are likely to influence obstetric outcomes.

METHODS

Design, Data Sources, and Sample

This cross-sectional study utilized secondary data from the Multi-State Nursing Care and Patient Safety Study (2005–2008) (Aiken et al., 2011). Surveys were sequentially sent to the home addresses of random samples of nurses licensed in California, Florida, New Jersey, and Pennsylvania (response rate 39%). Nurses indicated their place of employment from a hospital list. A non-respondent survey showed no bias on key variables (Smith, 2009). The university institutional review board granted approval.

This study utilized data from L&D staff nurses. Hospitals with fewer than three L&D nurses were excluded to ensure reliable estimates of the hospital-level aggregate NWE measure. Three respondents yielded acceptable intra-class correlation coefficients (Glick, 1985), as reported below. Our sample included adult, non-federal, acute-care, general hospitals. Hospital and nursing unit variables were derived from the American Hospital Association Annual Survey. Although the survey data are from 2005 to 2008, they provide new information to the growing literature about work environment and missed nursing care on an understudied population.

Measures

Nurses completed the missed care question, developed by survey methodologists and nurse researchers to capture essential nursing care activities. The missed care question has been used in five international samples (Aiken, Sloane, Bruyneel, Van den Heede, & Sermeus, 2013; Al-Kandari & Thomas, 2009; Ausserhofer et al., 2014; Ball, 2013; Zhu et al., 2012). Nurses answered whether 12 nursing care “activities were necessary but left undone because you lacked the time to complete them” on the most recent shift worked. These activities are listed in Table 3. Two items were omitted due to lack of clinical relevance in the unique L&D setting: preparing for discharge and oral care. Missed care prevalence was the

percentage of nurses who missed at least one activity. Missed care frequency was the number of activities missed, which was summed for each nurse and averaged.

Nurses also completed the 31-item PES-NWI (Lake, 2002), a National Quality Forum-endorsed nursing performance measure (National Quality Forum, 2017) with five subscales (Table 2). Data were aggregated to the hospital-level after reliability and stability were established. Hospitals were classified as better (4 or 5 subscales above the median), mixed (2 or 3) or poor (0 or 1 subscale) NWE.

The survey included whether the nurse held a Bachelor of Science degree in Nursing (BSN) and the number of years of RN experience. Hospital and unit characteristics (bed size, technology status, teaching status, level of obstetric care) were derived from hospital association data. Bed size was classified into three categories. Teaching status was based on the medical resident-to-bed ratio and descriptively categorized into major, minor, and none and dichotomized in regressions. High technology status indicated the capacity for open heart surgery or major organ transplant. Three levels of obstetric care, defined as in Table 1, were used for descriptive purposes only due missing values for 30% of L&D units.

Analysis

Descriptive statistics were used to describe the nurse respondents and hospitals, NWE, and missed care measures. Regression models, accounting for the nurses clustered within hospitals, estimated the association of nursing-unit-level NWE to nurse-level missed care. ANOVA was conducted to compare differences in nurse-level missed care by NWE subgroups. Unadjusted and adjusted regression models were used to estimate the association of nurse-level missed care on NWE, with poor as the NWE reference category. Logistic regression models assessed whether any care was missed. Linear regression models assessed the missed care frequency. Models controlled for nurse education and experience, and hospital characteristics. Statistical significance was set at $p < .05$ for a two-tailed test. Analyses were conducted using STATA version 12.1.

RESULTS

The nurse respondent inclusion criteria yielded a sample of 1,313 L&D nurses in 247 hospitals (Table 1). Most hospitals were under 500 beds (82.2%) and had teaching capacity (55%). Half of hospitals had high technology. An average of five nurses represented each hospital (range 3–18). The nurses were almost all female, with a mean age of 43.7 years. Nearly half of the nurses surveyed had a BSN degree or higher. The mean years of RN experience was 18.2.

Table 2 displays NWE statistics. All subscales had good internal consistency, with Cronbach's alphas of 0.80 or higher. ICC measures exceeded 0.60 except for two subscales that were slightly lower. The PES-NWI composite was 2.84. The mean values for each subscale ranged from 2.62 (nurse participation in hospital affairs) to 3.06 (nursing foundations for quality care). The average hospital-level composite SD was .56, representing a fifth of the scale range (.56/3=.19). This degree of typical variation indicates that L&D environments vary across hospitals and are modifiable.

Missed care statistics are reported in Table 3. The average missed care frequency was 1.25 (SD 1.70; range 0–10) at the nurse-level and 1.25 (SD 0.86; range 0.0 to 4.6) at the unit level. Missed care prevalence was just under 50 percent. Prevalence of specific missed care activities ranged from 2.3% to 30.5%. The most commonly missed care activities were “comfort/talk with patients” (30.5%), “teach/counsel patients and family” (22.2%), and “develop and update care plans” (20.8 %). The least commonly missed were “treatments and procedures” (2.3%), “skin care” (3.3%), and “pain management” (4.0%). Nurses in hospitals with poor NWEs had over double the frequency of missed care activities of nurses in good environments (1.80 vs. 0.85). In good NWEs, 39% of nurses missed one or more activity, whereas in poor NWEs, 62% of nurses did so. The prevalence of each missed care activity differed significantly by NWE category, except the “administer medications on time” item.

Similar proportions of L&D units had good (38%) and poor (36%) NWEs; fewer (26%) had mixed environments (Table 3). The NWE composite score varied significantly across NWE categories, from 2.4 for poor NWEs to 3.2 for good NWEs.

Results of unadjusted and adjusted models regressing missed care on NWE categories are shown in Table 4. Adjusted models control for nurse, unit, and hospital characteristics. Since the adjusted results closely resemble the unadjusted results, only adjusted models are described. The odds of missed care were significantly lower in good NWEs (OR of 0.38) and mixed NWEs (OR of .57), compared to poor NWEs, the reference group, and for 7 and 8 out of 10 missed care activities for good and mixed NWEs, respectively (individual missed care activity results not shown). The mean OR across significant missed care activities was 0.39 for good NWEs and 0.47 for mixed NWEs, indicating that the odds of missed care are less than half in good and mixed NWEs compared to poor NWEs. Pain management was the missed care activity on which the NWE had the largest effect (OR of 0.30). Other significant activities included care planning, comforting/talking with patients, teaching/counseling patients and families, care documentation, patient surveillance, and care coordination. The missed care frequency was 0.89 lower in better environments compared to poor environments.

Discussion

We were motivated to examine the NWE and missed care in L&D to provide evidence for managers in this unique setting and uniquely vulnerable population. We find that missed care is common on L&D units. Both prevalence and frequency of missed care in L&D demonstrated considerable variation across this geographically diverse sample. Nearly half of nurses missed at least one necessary care activity. The prevalence of missed care across the 247 L&D units was 51.4% and exhibited the complete possible range from 0% to 100%. Nurses missed 1.3 necessary care activities on average. In the unit with the highest frequency, nurses missed 4.6 necessary activities.

In nursing units classified as having better versus poor NWEs, nurses had less than half the odds (OR of 0.38) of missing any necessary care activity. Similarly, the frequency of missed care was significantly associated with the NWE. In better NWEs, nurses missed approximately one less necessary care activity. This association between the NWE and

missed care, which has been documented in other populations (Lake et al., 2017; Lake, Staiger, Cramer, et al., 2018), provides a feasible organizational target, i.e., the NWE, to prompt improvements in obstetric care and outcomes.

The nursing care activities missed most often by L&D staff nurses are comforting/talking with patients (31%) and teaching/counseling patients and family (22%). In L&D, comforting and talking with patients involves being physically present at the bedside to provide continuous labor support. Continuous labor support is a central role in this setting as acknowledged by the Association of Women's Health, Obstetric, and Neonatal Nurses (Association of Women's Health Obstetric and Neonatal Nurses, 2018). L&D nurses teach/counsel patients and families about breathing, relaxation, maternal movement and repositioning, expectations of phases of labor, induction vs. augmentation, signs and symptoms of infection development, and depending on mode of delivery, perineal care or incision care (Erickson & Dumonceaux, 2017).

These results on missed care revealed a moderate prevalence and low frequency in L&D. The L&D prevalence of about 50% is lower than in adult medical-surgical and ICUs (73% prevalence) (Lake et al., 2016), in pediatrics (53% prevalence), (Lake et al., 2017), and higher than in neonatal ICUs (44% prevalence) (Lake, Staiger, Edwards, Smith, & Rogowski, 2018). L&D missed care frequency of 1.3 in this sample was lower than observed in adult settings in Europe (3.6) (Ausserhofer et al., 2014) and the U.S. (2.7) (Lake et al., 2016), but similar to pediatrics (1.5) (Lake et al., 2017) and neonatal ICU (1.2) (Lake, Staiger, Edwards, et al., 2018).

The pattern of care activities that are missed more and less often in L&D mirrors the pattern observed in other settings. That is, activities in the psychological/emotional/educational domain are more commonly missed while technical activities are less commonly missed (Jones et al., 2015). How women give birth – and how that birth is managed – differs by country. Although the evidence about missed care is consistent globally (Ausserhofer et al., 2014; Jones et al., 2015; Papastavrou et al., 2014), the relationships explored here deserve country-specific attention. Acknowledging the importance of fundamental nursing care activities in the era of electronic health records that reinforce technical nursing functions is essential as we seek to mitigate missed care. The likely outcomes of these missed care patterns in this vulnerable population are unmet psychological, emotional, and educational needs, which could influence obstetric outcomes including delivery mode, morbidities, as well as maternal satisfaction. These questions should be addressed in future research.

The results regarding the NWE in L&D, with a mean composite score of 2.84 indicate that nurses tend to agree that desirable organizational traits are present. For reference, a score of 2.50 is neutral and 3.00 indicates agreement but not strong agreement, which is 4.00. The subscales considered to most represent unit characteristics pertain to the nurse manager, staffing and resources, and collaboration between nurses and physicians (Lake, 2002). In this L&D sample, the lowest and highest rated of these subscales was the manager ability and support of nurses (mean = 2.64) and collegial nurse-physician relations (3.03), respectively, similar to results in pediatric inpatient units (Lake et al., 2017). These ratings indicate that interventions focused on the NWE should target development and support of L&D nurse

managers. The psychometric results demonstrate that NWE measurement in the L&D setting is feasible.

Evidence that half of L&D nurses missed necessary activities on their last shift should prompt managers to raise the issue of missed care with their staff and other members of the care team. Managers should support and reinforce key nursing care activities. Managers could measure their NWE by nurse survey to identify actionable weaknesses. For L&D staff nurses, awareness that their colleagues as well as themselves are missing care routinely should lead to open communication with managers and discussions among staff nurses on how to mitigate missed care. Educating staff nurses about the prevalence, frequency, and types of missed care is an essential first step in reducing missed care. Specialty organizations for L&D nurses, such as the Association of Women's Health, Obstetric, and Neonatal Nurses, could issue an evidence brief based on this paper and recent qualitative evidence (Simpson & Lyndon, 2017) to stimulate attention by staff nurses and managers.

Our study strengths include a large number of L&D units in diverse geographic regions of the country. The measures have been widely used internationally. The NWE measure, which has National Quality Forum endorsement, exhibited satisfactory psychometric properties. Our study addressed an understudied topic in a vulnerable population with proposed actionable solutions for managers. The rising rates of maternal morbidity and mortality in the United States make our study particularly salient (Kassebaum et al., 2016). Several study limitations should be noted. The cross-sectional design precludes causal inference regarding the effect of the NWE on missed care. The nurse survey data, collected in the mid-2000s, is not current. While some nursing units may have changes in their NWEs in the ensuing years, the association with missed care should remain the same. Much of the current evidence on missed care dates from the same time period, providing relevant context for our findings. Survey measures of missed care rely on self-report, which is potentially biased.

Conclusion

This research in a geographically diverse sample of L&D units provides evidence of missed care in a unique population that is a priority of both Healthy People 2020 ("improve maternal, infant, and child health") (Healthy People 2020, 2010) and the World Health Organization Millennium Development Goals ("improve maternal health") (World Health Organization, 2016). L&D nurses routinely miss one or more required nursing activities. Laboring women's psychosocial, comfort, and educational needs are compromised most often, likely compromising care quality and maternal outcomes. The L&D NWE is a modifiable organizational feature that appears to influence missed care prevalence and frequency. Our findings have the potential to transform the delivery of obstetric care received by millions of women and their families by leveraging the NWE to reduce missed care.

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TABLE 1**Characteristics of Hospitals and Nurses**

	N (%)	Mean (SD)
Hospital characteristics		
Bed size (<i>n</i> = 246)		
250 beds	86 (35.0)	
>250 & 500 beds	116 (47.2)	
> 500 beds	44 (17.8)	
Teaching hospital (<i>n</i> = 246)		
Non	111 (45.1)	
Minor	111 (45.1)	
Major	24 (9.8)	
High technology (<i>n</i> = 247)	133 (53.9)	
Obstetric level of care (<i>n</i> = 173)		
Uncomplicated maternity and newborn cases	34 (19.6)	
All uncomplicated and most complicated cases	70 (40.5)	
All serious illnesses and abnormalities	69 (39.9)	
Nurse Characteristics		
Female (<i>n</i> = 1,313)	1,311 (99.9)	
Age (<i>n</i> = 1,306)		43.7 (10.6)
Bachelor of Science or higher degree in Nursing (<i>n</i> = 1,264)	547 (43.3)	
Years of RN experience (<i>n</i> = 1,056)		18.2 (10.7)

Abbreviations: RN=Registered Nurse

TABLE 2Descriptive and psychometric statistics for the Practice Environment Scale of the Nursing Work Index[†]

Subscale	Mean	SD	Alpha	ICC
Staffing and resource adequacy	2.74	0.74	0.83	0.68
Nurse manager ability, leadership, and support of nurses	2.64	0.84	0.82	0.73
Nursing foundations for quality of care	3.06	0.52	0.81	0.58
Nurse participation in hospital affairs	2.62	0.65	0.80	0.64
Collegial nurse-physician relations	3.03	0.70	0.86	0.54
Composite	2.84	0.56	0.85	0.65

Abbreviations: SD= standard deviation; ICC = intraclass correlation coefficient.

[†]n = 1,297 nurses.

TABLE 3

Distributions of missed nursing care in labor and delivery units, by quality of nurses' work environment

Variable	Work Environment Quality				<i>p</i> [‡]
	All	Poor [†]	Mixed [†]	Good [†]	
Number of hospitals	247	90	65	92	
Percent of hospitals	100	36.4	26.3	37.3	
PES-NWI composite [§]	2.8	2.4	2.8	3.2	< 0.001
Number of missed care activities [§]	1.3	1.8	1.2	0.85	< 0.001
Missed Nursing Care Activity	Prevalence (%) [¶]				
One or more activities	49.2	61.8	48.0	38.5	< 0.001
Comfort/talk with patients	30.5	41.3	29.2	21.4	< 0.001
Teach/counsel patients and family	22.2	30.1	22.3	14.8	< 0.001
Develop or update care plans	20.8	28.4	17.6	15.8	< 0.001
Adequately document nursing care	20.1	28.4	18.2	13.7	< 0.001
Adequate patient surveillance	12.1	17.1	12.9	6.7	< 0.001
Administer medications on time	5.2	6.9	4.1	4.4	0.12
Coordinating patient care	4.9	7.7	3.1	3.3	< 0.001
Pain management	4.0	6.5	3.1	2.1	< 0.001
Skin care	3.3	4.8	1.9	2.7	0.05
Treatment and procedures	2.3	3.6	0.94	1.9	0.04

Abbreviations: PES-NWI= Practice Environment Scale of the Nursing Work Index.

[†]Poor = 0 or 1 subscale above sample median; Mixed = 2 or 3 subscales above sample median; Good = 4 or 5 subscales above sample median.[‡]*p* values are from an analysis of variance for PES-NWI composite and number of activities missed and Chi-square test for missed care prevalence.[§]Values are means.[¶]The prevalence of each missed nursing care activity is the proportion of nurses who reported the required care was not done.

TABLE 4

Unadjusted and adjusted logistic and linear regression models with results displaying the relationships the quality of the nurse work environment and missed nursing care^{†,‡,§,¶}

	Unadjusted Joint Model (n = 1,318)	Joint Model Adjusting for Nurse and Hospital Characteristics (n = 1,318)
Missed care prevalence	OR (95% CI)	OR (95% CI)
Mixed environment	0.57 ^{**} (0.41 – 0.78)	0.57 ^{***} (0.41 – 0.78)
Better environment	0.39 ^{***} (0.29 – 0.51)	0.38 ^{***} (0.29 – 0.51)
Missed care frequency	Coefficient (95% CI)	Coefficient (95% CI)
Mixed environment	–0.62 ^{***} (–0.87 – –0.36)	–0.64 ^{***} (–0.90 – –0.38)
Better environment	–0.88 ^{***} (–1.1 – –0.65)	–0.89 ^{***} (–1.1 – –0.66)

Abbreviations: OR=odds ratio; CI=confidence interval.

[†]Models control for *nurse characteristics* (BSN or higher degree; years of RN experience) and *hospital characteristics* (bed size, technology status, teaching status).

[‡]Work environment variables are hospital level.

[§]The dependent variable is nurse level.

[¶]For the work environment, the reference group is the “poor” work environment subgroup of hospitals with 0 or 1 subscale above the sample median.

*
p<0.05

**
p<0.01

p<0.001 = results were considered statistically significant at p<0.05 for a two-tailed test.