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# Nurse Burnout and Patient Satisfaction

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## Abstract

**Background—**Amid a national nurse shortage, there is growing concern that high levels of nurse burnout could adversely affect patient outcomes.

**Objectives—**This study examines the effect of the nurse work environment on nurse burnout, and the effects of the nurse work environment and nurse burnout on patients' satisfaction with their nursing care.

**Research Design/Subjects—**We conducted cross-sectional surveys of nurses (N = 820) and patients (N = 621) from 40 units in 20 urban hospitals across the United States.

**Measures—**Nurse surveys included measures of nurses' practice environments derived from the revised Nursing Work Index (NWI-R) and nurse outcomes measured by the Maslach Burnout Inventory (MBI) and intentions to leave. Patients were interviewed about their satisfaction with nursing care using the La Monica-Oberst Patient Satisfaction Scale (LOPSS).

**Results—**Patients cared for on units that nurses characterized as having adequate staff, good administrative support for nursing care, and good relations between doctors and nurses were more than twice likely as other patients to report high satisfaction with their care, and their nurses reported significantly lower burnout. The overall level of nurse burnout on hospital units also affected patient satisfaction.

**Conclusions—**Improvements in nurses' work environments in hospitals have the potential to simultaneously reduce nurses' high levels of job burnout and risk of turnover and increase patients' satisfaction with their care.

### Keywords

nurse work environment; burnout; patient satisfaction

The hospital nurse workforce is experiencing greater workloads resulting from shorter hospital stays, rising average patient acuity, fewer support resources, and a national nurse shortage. Higher nurse workloads are associated with burnout and job dissatisfaction, precursors to voluntary turnover that contribute to the understaffing of nurses in hospitals and poorer patient outcomes.[1] Indeed, more than 40% of hospital staff nurses score in the high range for job-related burnout, and more than 1 in 5 hospital staff nurses say they intend to leave their hospital

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jobs within 1 year.[2] The understaffing of nurses and the overwork of health professionals in hospitals are ranked by consumers as major threats to patient safety,[3] and more patients are bringing their own caregivers to the hospital with them.[4]

Research on job-related burnout among human service workers, nurses in particular, suggests that organizational stressors in the work environment are important determinants of burnout and subsequent voluntary turnover.[5-9] A largely separate research literature on patient satisfaction documents the importance of patients' satisfaction with nursing care in their overall ratings of satisfaction with their hospital care.[10-13] This article examines the association between nurse burnout and patient satisfaction, and explores whether the factors that account for nurse burnout also account for patient dissatisfaction. The findings are important to understanding how to simultaneously stem the flight of nurses from hospital bedside care and improve patient satisfaction with care.

## BACKGROUND AND SIGNIFICANCE

This article builds on and extends a body of research by investigators at the University of Pennsylvania School of Nursing's Center for Health Outcomes and Policy Research to determine the effects of modifiable organizational features of the hospital clinical practice environments on nurse and patient outcomes. The conceptual framework that guides this body of research is the Quality Health Outcomes Model[14,15] developed by the American Academy of Nursing and informed by the research of Donabedian.[16,17] The Quality Health Outcomes Model posits that the effects of healthcare interventions are mediated by characteristics of the organizations in which care takes place. The Center's series of large-scale studies of outcomes of hospital care suggest that features of the practice setting, including nurse autonomy, staffing adequacy, and relationships between nurses and physicians, as well as characteristics of the nurses, influence patient outcomes by their effects on care processes, including nurse surveillance, continuity of care, patient-centeredness, and preparation of patients and their families to successfully manage their care after discharge. Hospital nurse work environments that devolve greater autonomy and control to nurses at the bedside, provide administrative support for nursing care, have adequate staff, and facilitate good relationships between nurses and physicians are associated with lower risk-adjusted Medicare mortality[18]; higher patient satisfaction[19,20]; lower nurse burnout[5]; and lower rates of needlestick injuries to nurses.[21-23] A recent 5-country study of more than 700 hospitals, 43,000 nurses, and hundreds of thousands of patients provides evidence suggesting that nurses working in hospitals that are below average on nurse staffing and on organizational support for nursing have significantly higher levels of nurse job dissatisfaction and burnout and more frequent adverse patient events such as falls with injuries, patient complaints, and poorer nurse-assessed quality of care.[2,24]

The Institute of Medicine proposed, in its landmark report *Crossing the Quality Chasm*, 6 performance characteristics that, if addressed and improved, would lead to better health care: safety, effectiveness, patient-centeredness, time-liness, efficiency, and equitableness.[25] Patient satisfaction is a global outcome measure of health system performance.[26-33] Donabedian[17] argued that “patient satisfaction or dissatisfaction reflects the patient's judgment on all aspects of care, including the technical process, the interpersonal process, and the outcomes of care, as well as the structural attributes of the settings in which care is provided.” Decades of research have resulted in the identification of several dimensions of patient satisfaction: the art of care, technical quality of care, nursing care, medical care, accessibility/convenience, finances, physical environment, availability, efficacy, continuity, education, and trust.[34-37] Patient satisfaction with nursing care has been found to be one of the most important predictors of overall satisfaction with hospital care, and it has consistently been found to be correlated with overall satisfaction with care.[10-13]

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Job-related burnout is described by Maslach as a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment.[8] Emotional exhaustion is described as a feeling of being overextended and exhausted by one's work. Depersonalization is an unfeeling or impersonal response toward recipients of one's service, care, treatment, or instruction. Reduced personal accomplishment describes feelings of incompetence and unsuccessful achievement of one's work with people.[8](p. 2) The Maslach Burnout Inventory (MBI), the most widely used measure of burnout, includes subscales purported to measure each of these 3 dimensions but recommends against combining them into a single measure. Indeed, many researchers have found the emotional exhaustion subscale of the MBI to have the greatest predictive validity.[5,38,39]

Burnout is associated with negative health outcomes for human services workers such as psychologic distress, somatic complaints, and alcohol and drug abuse.[40-42] For organizations, burnout can be costly leading to increased employee tardiness, absenteeism, turnover, decreased performance, and difficulty in recruiting and retaining staff.[6,41-45] It seems unlikely that healthcare organizations with high levels of burnout among health professionals could achieve the performance characteristics such as patient-centeredness set forth by the Institute of Medicine as a strategy to improve quality of care, if for no other reason than their difficulty retaining staff. However, only 2 studies exploring the relationship between nurse burnout and patient satisfaction were found in an extensive review of published research. Gravlin[46] measured burnout using the MBI and found that depersonalization was negatively related to patient satisfaction with nursing care, but emotional exhaustion and personal accomplishment were not. Leiter et al.[45] found negative correlations between nurses' emotional exhaustion and patient satisfaction with 4 dimensions of hospital care (nurses, doctors, information, and outcomes of care).

In this study, we are not only interested in whether there is an association between nurse burnout and patient satisfaction. We are also interested in beginning to explore whether features of the organization climate in which nurses work that are associated with nurse burnout can also be shown to be associated with patient dissatisfaction with their care.

## METHODS

### Sample/Setting

This study uses data collected in 1991 as part of a study of urban hospitals originally designed to assess the impact of hospital organization and nurse staffing on AIDS care outcomes.[47] We sampled and attempted to survey all staff nurses (RNs and LPNs) who worked on 2 units in each of 20 hospitals that were widely dispersed across the United States and as many as 25 patients with AIDS who were consecutively admitted to those 40 units at the time of the nurse surveys. Eight hundred twenty nurses (86% of the nurses sampled) completed a self-administered questionnaire that contained items related to personal characteristics, including burnout, and unit and hospital characteristics, including attributes of the nurse work environment. Of the 722 patients with AIDS who were admitted to the units and stayed on them at least 3 days, and thus were eligible to be surveyed, 621 (86%) agreed to be interviewed. The patient interview provided information on the patient's satisfaction with nursing care, process of care measures, and personal information such as medical history and preferences about care.

### Measures

**Nurse Work Environment—**The nurse work environment was measured using a composite measure developed from 3 subscales of the revised Nursing Work Index,[48] the NWI-R, which has been shown to have high reliability and validity.[49,50] These items asked nurses to indicate

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on a 4-point scale the extent to which they agree or disagree that certain organizational characteristics are present in their job. The NWI-R subscales used to characterize the nurse work environment were 1) Staffing Adequacy (SA), a 4-item subscale reflecting nurses' reports of the extent to which their unit has sufficient staff to accomplish the work, provide quality care, and to spend adequate time with patients; 2) Administrative Support (AS), a 5-item subscale reflecting the extent to which nurses' report the presence of nursing leadership that shows support for nurses' initiative and decision-making; and 3) Nurse–Physician Relations (NP), a 3-item subscale reflecting the quality of working relationships between nurses and physicians. The items in these 3 subscales are presented in Appendix A.

Because the nurse work environment is considered here to be an attribute of hospital units, the 3 subscales were aggregated to the unit level and analyzed according to procedures described by Verran et al.[51] and Aiken and Sloane.[50] Reliability coefficients (Cronbach's alpha) for the aggregate subscales were: Staffing Adequacy, 0.96; Administrative Support, 0.88; and Nurse–Physician Relations, 0.87. Moreover, because these 3 attributes are substantially correlated at the unit level (SA–AS = .78; SA–NP = .63; AS–NP = .67), making it difficult to disentangle their effects statistically, we derived a composite measure by combining the subscales into 3 discrete categories. The 40 hospital units were classified as being above or below average on each of the 3 attributes, and each unit was then characterized, crudely, according to whether the nurse work environment was good, mixed, or poor. Good environments were those in which all 3 subscales were above the average for all units, mixed environments were those in which 1 or 2 of the subscales were above average, and poor environments were those in which all 3 subscales were below the average for all units. By these criteria, 12 of the hospital units had good nurse work environments, 16 had mixed nurse work environments, and 12 had poor nurse work environments.

**Hospital and Unit Characteristics—**To obtain estimates of the effect of the nursing work environment on hospital units on nurse and patient outcomes that were net of and uncontaminated by other hospital characteristics, we suspected that it would be necessary to control for additional hospital and unit characteristics. We had data that allowed us to consider hospital size and the technology available in the hospital, unit size (average daily census), unit staffing (the ratio of RNs to average daily census), and unit skill mix (the ratio of RNs to total nursing staff). None of these variables had a significant effect on patient satisfaction, net of the effect of the nurse work environment, and the only variable among them that affected any of the nurse outcomes was the nurse staffing measure, which was too strongly associated with our nursing work environment measure (r = .78) to permit us to consider them together. The inclusion of these unit characteristics in models did not alter substantially the size of the estimates we report that control only for characteristics of nurses and patients.

**Nurse Burnout and Intent to Leave—**The Maslach Burnout Inventory (MBI), consisting of 22 items, was used to operationalize 3 dimensions of burnout: emotional exhaustion, depersonalization, and personal accomplishment.[8] The items that are summed to create the subscales are 7-point Likert-type items which range from 0 = never to 6 = everyday, so higher scores reflect greater degrees of emotional exhaustion, depersonalization, and personal accomplishment. In the analyses discussed subsequently in which nurse burnout is being predicted, individual-level data are used and nurses are characterized according to whether their score on each of the dimensions is above or below average for all nurses in the sample, which falls within the norm for all healthcare workers.[8] In the analyses in which nurse burnout is used to predict patient satisfaction, the nurse-level data are aggregated to the unit level and hospital units are characterized according to whether their score on each of the dimensions is above or below the average for all units. The reliability and validity of the MBI subscales have been well established by previous researchers.[8,52] In this sample, reliability coefficients (Cronbach's alphas) were 0.89 for emotional exhaustion, 0.73 for depersonalization, and 0.76

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for personal accomplishment in the nurse-level data, and 0.94, 0.71, and 0.80, respectively, in the unit-level data.

Nurse intentions to leave were measured by a single item that asked nurses whether they had any plans to leave their present nursing position in the next 6 months or in the next 12 months. In our analyses, we dichotomized responses to contrast nurses who indicated they had plans to leave within the next year with those who did not.

**Patient Satisfaction—**Patient satisfaction was measured using a 21-item version of the La Monica-Oberst Patient Satisfaction Scale (LOPSS),[53] which was modified slightly to include items pertinent to the AIDS patient population sampled.[20] Patients were asked to indicate on a 4-point scale the extent to which they agree or disagree with each of 21 statements that reflected dimensions of satisfaction (eg, “The nurses make helpful suggestions.”). The items were summed for each patient, and in our analyses, we simply contrasted patients with satisfaction scores above the average for all patients and then indicated general satisfaction with their care with patients whose scores indicated general dissatisfaction. The satisfaction measure had high reliability (Cronbach's alpha = 0.93).

**Nurse and Patient Characteristics—**A number of nurse and patient characteristics were controlled in our analyses. In investigating the effects of the nurse work environment on nurse burnout and intent to leave, we controlled for nurses' sex, race, and age, as well as the number of years they had worked in nursing, and the length of time they had worked on their current unit. Patients' sex, age, and race were also controlled in our analyses of patient satisfaction, as were AIDS risk factors and illness severity measures. The risk factors controlled included whether the patient had a history of homosexual sex, intravenous drug use, or heterosexual sex with high-risk partners. The illness severity measures included a functional status measure, Global Activities of Daily Living (or Global ADL),[54] which includes 4 categories ranging from 1 = self-care to 4 = requires total assistance. A second illness severity measure assessed physiological deficits using the Clinical AIDS Prognostic Staging (CAPS) system, which categorizes severity of illness into 4 stages based on the number of physiological deficits a patient has (eg, severe diarrhea).[55] Both the Global ADL and CAPS measures were treated as interval measures with higher scores reflecting greater illness severity.

## Data Analyses

We first provide descriptive information for the 20 hospitals and 40 hospital units in our study, and for the nurses and patients that were sampled from those hospitals and units. We then show results from robust logistic regression models, which estimate the direct effects of the nurse work environment on nurse burnout and intentions to leave before and after adjusting or controlling individual nurse characteristics. Finally, we show the results of robust logistic regression models that estimate the effects of the nurse work environment, and the overall or aggregate levels of nurse burnout on each unit on patient satisfaction before and after patient characteristics. The logistic regression models we present involve conceptualizing nursing work environments and the nurse and patient outcomes discretely and estimating differences across units with good, mixed, and poor environments in the odds on nurses exhibiting high burnout and intentions to leave, and in the odds on patients being generally satisfied with their care. We chose these procedures simply because of the ease with which they allow us to convey our results. Linear regression models, which treated the nursing work environment and the various dependent variables as continuous measures, were also fitted and were decidedly similar as shown in Appendices B and C. Hierarchical linear models (HLM) were also used to estimate the effects of the nurse work environment on the different dependent variables, and here too results were very similar (see Appendices D and E). We do not have any other compelling reason for favoring the logistic regression results over the HLM results, although

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the models we fit using HLM include controls for 5 hospital/unit characteristics, and we think we are somewhat underpowered (with 40 units and 20 hospitals) to reliably estimate those effects simultaneously. The logistic models we used corrected for the clustering and lack of independence of individual nurses and patients within hospital units but did not correct for the nesting of units within hospitals, which we found to be ignorable (ie, the intraclass correlation ranged from 0.037–1.25%, and the maximum likelihood ratio test between the 2- and 3-level models were not significant and did not improve the fit). All analyses were conducted using STATA statistical software, version 7.[56]

## RESULTS

Characteristics of the hospitals and units in our sample are provided in Table 1. The average daily census in the hospitals in our sample ranged from 190 patients to 1110 patients and averaged just under 600 patients. The daily census across the 40 hospital units in the study averaged 26 patients, and on average the units were reasonably well staffed; the registered nurse to average daily census ratio was 0.73, which implies that each nurse, on average, took care of just over 4 patients on a shift. Registered nurses represented 71% of all nursing personnel on average across the 40 study units, although this varied from less than 50% in some units to over 90% in others.

Table 2 provides information on the nurses surveyed on these 40 hospital units. Ninety-three percent of the nurses were female and roughly half of them were white; black nurses comprised more than one fourth of the sample of nurses. The average age of these nurses was 35 years, and the average nurse had worked in nursing for 10 years and on their current unit for 4 years. More than one third of the nurses intended to leave their positions within the next year, and the average levels of burnout, ie, emotional exhaustion, depersonalization, and personal accomplishment, are within the “average” range for healthcare workers that has been reported by Maslach.[8]

Information about the patients with AIDS in our sample is given in Table 3. Eighty-eight percent of the patients were male, slightly over half were white, and the average age of these patients was 37 years. The most common risk factor present among these patients was homosexual sex (69%), although a substantial portion of the patients (28%) were intravenous drug users. At the time of their hospital stay, 43% of the patients studied required at least some assistance with activities of daily living, and 41% of the patients were at stages 3 or 4 of the Clinical AIDS Prognostic Staging (CAPS) measure. The average satisfaction with nursing care score in the patient sample was 63, and in the analyses of patient satisfaction reported subsequently, we contrast patients whose scores were higher than that, and registered general satisfaction (ie, an average item response score of 3 or better), with patients whose scores were lower.

Table 4 presents both the unadjusted and adjusted odds ratios and 95% confidence intervals estimating the effects of the nurse work environment on the 3 burnout scales and on nurses' intentions to leave. Before controlling for nurses' age, sex, race, and experience, it would appear that only emotional exhaustion and intentions to leave are affected by the nurse work environment. After controlling for those confounds, all of the nurse outcomes except for feelings of personal accomplishment are significantly affected. In these models, the work environment variable is treated as ordered and linear in its effect, because additional analyses indicated that the linear constraint was appropriate (see Appendix F). This means that the likelihoods of having higher than average emotional exhaustion and higher than average depersonalization, and the likelihood of intending to leave, are lower in units with good environments than in units with mixed environments, and lower in units with mixed environments than in units with poor environments, by factors of 0.59, 0.68, and 0.63,

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respectively. This implies differences between the nurses on units with good and poor environments that involve ratios of $0.59^2 = 0.35$, $0.68^2 = 0.46$, and $0.63^2 = 0.39$, or that the nurses on units with good environments are only between one third and one half as likely as the units with poor ones to exhibit high emotional exhaustion, high depersonalization, and to intend to leave within the next year. The reciprocals of these ratios (2.9, 2.2, and 2.6, respectively) inform us, conversely, that nurses in units with poor environments are between 2 and 3 times as likely as their counterparts in units with good environments to exhibit these traits.

Table 5 presents the unadjusted and adjusted odds ratios and 95% confidence intervals estimating the effects of the various dimensions of burnout, now aggregated to the unit level, and the effect of the nurse work environment on the odds of reporting “high” patient satisfaction. Both before and after adjusting for patients' sex, age, race, risk factors, and illness severity, the levels of emotional exhaustion and personal accomplishment, which characterize the nurses on the different units, have significant effects on patient satisfaction. After adjusting for patient characteristics, patients on units with higher than average levels of emotional exhaustion among nurses are only half as likely as those on units with lower than average emotional exhaustion to be highly satisfied with their nursing care, whereas patients on units where nurses have higher than average levels of personal accomplishment are more than twice as likely as those on units with lower than average personal accomplishment to be highly satisfied with their nursing care. Moreover, the estimate of the nurse environment effect in Table 4, derived from a model in which the effects of the patient characteristics and the extent of burnout on the various units is controlled, indicates that its effect on patients is both direct and indirect (ie, through its effect on nurse burnout). The coefficient of 1.49 associated with the work environment effect implies that patients on units with good environments are 1.49 times as likely as those on mixed units, and $1.49^2 = 2.2$ times as likely as those on poor units, to be highly satisfied with their nursing care.

## DISCUSSION

We have demonstrated empirically in this article that nurse burnout, as measured by feelings of emotional exhaustion and lack of personal accomplishment, is a significant factor influencing how satisfied patients are with their care. Moreover, we identified modifiable features of nurses' work environments, namely, staffing adequacy, administrative support for nursing practice, and better relations between nurses and physicians, that account for both nurses' emotional exhaustion and patient dissatisfaction. The most obvious implications of these findings are that changes in hospital nurses' work environments would appear to offer the opportunity to simultaneously improve patient satisfaction and stabilize the nurse workforce, because emotionally exhausted nurses are substantially more likely to report intentions to leave their jobs.

Our findings with regard to nurses' feelings of low personal accomplishment and depersonalization, 2 of the components Maslach defines as constituting the burnout syndrome, are puzzling and require further exploration. Nurses' feelings of low personal accomplishment are an important factor in how satisfied patients are with their care. However, low personal accomplishment is not explained by our measures of organizational support, as is the case for emotional exhaustion. We conducted some exploratory analyses to determine whether additional individual items from the NWI such as praise from management for a job well done and opportunities for advancement explained nurses' feelings of personal accomplishment, but we were not able to demonstrate that to be the case. Thus, although we know that nurses' feelings of personal accomplishment are important to patient satisfaction, our work to date does not reveal the organizational features that account for perceptions of personal accomplishment.

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Nurses' feelings of depersonalization related to their patients does not appear to be associated with patients' dissatisfaction with their care. Nurses' professionalism could blunt the manifestation of these feelings in their interactions with patients, or these findings could be the result of the aggregation of burnout scores at the unit level, which diminishes the variance in burnout and thus could reduce our capacity to detect patient satisfaction effects; or, the depersonalization and personal accomplishment subscales of the Maslach Burnout Inventory might not validly measure these phenomena. Indeed, most investigators using this inventory find that emotional exhaustion is the strongest of the 3 subscales in relation to predictive validity.

Although this article has provided new insights into the nature of the relationship between organizational features of the nurse practice environment, nurse burnout, patient satisfaction, and the link between nurse burnout and patient satisfaction, future research will be needed to more fully understand the causal mechanisms that link organizational features and outcomes. More research is needed on how features of organizations affect the process of nursing care, and the interrelationships between nursing care processes and outcomes.[57]

In summary, we have demonstrated the importance of modifiable features of hospital organization in determining patients' satisfaction with their care as well as with nurses' job-related burnout and nurses' intentions to leave their jobs. During times of nursing shortages, hospital management tends to be more accommodating of nurses' requests to improve their working environments than in times of greater workforce stability. The cyclical nature of nursing shortages has failed to provide a consistent force for permanent changes in nurses' work environments. Our findings reinforce the need for change in the workplace that would both reduce nurses' high levels of job burnout and risk of turnover while maintaining patients' satisfaction with their care.

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## Appendix A

Nursing Work Index—Revised (NWI-R) Subscale Items

| | |
|---|---|
| Staffing Adequacy Subscale | |
| **1** | Adequate support services allow me to spend time with my patients. |
| **2** | Enough time and opportunity to discuss patient care problems with other nurses. |
| **3** | Enough registered nurses on staff to provide quality patient care. |
| **4** | Enough staff to get the work done. |
| Administrative Support Subscale | |
| **1** | A supervisory staff that is supportive of nurses. |
| **2** | Support for new and innovative ideas about patient care. |
| **3** | A nurse manager who is a good manager and leader. |

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**4** A nurse manager who backs up the nursing staff in decision-making, even if the conflict is with a physician.

**5** Administration that listens and responds to employee concerns.

Nurse–Physician Relation Subscale

**1** Physicians and nurses have good working relationships.

**2** A lot of teamwork between nurses and physicians.

**3** Collaboration (joint practice) between nurses and physicians.

Note: Response categories: 1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree, 4 = strongly agree.

## Appendix B

Parameter Values Describing the Effects of the Nurse Work Environment on Nurse Outcomes

| | Logistic | Linear |
|---|---|---|
| Emotional exhaustion | 0.59* | −3.79* |
| Depersonalization | 0.68* | −.89* |
| Personal accomplishment | 0.93 | −.03 |

Note: Parameter values from the logistic models are multiplicative (odds ratios) coefficients; values from the linear models are additive (regression) coefficients. Parameter estimates were derived from robust models, which controlled for nurse characteristics, and adjusted standard errors to account for clustering. Asterisks denote effects that are significant at the 0.05 level.

## Appendix C

Parameter Values Describing the Effects of Nurse Burnout and the Nurse Work Environment on Patient Satisfaction

| | Logistic | Linear |
|---|---|---|
| Emotional exhaustion | 0.51* | −0.38* |
| Depersonalization | 1.21 | −0.23 |
| Personal accomplishment | 2.37* | 0.68* |
| Work environment | 1.49* | 1.51* |

Note: Parameter values from the logistic models are multiplicative (odds ratios) coefficients; values from the linear models are additive (regression) coefficients. Parameter estimates were derived from robust models that controlled for patient characteristics and adjusted standard errors to account for clustering. Asterisks denote effects that are significant at the 0.05 level.

## Appendix D

Unadjusted and Adjusted Coefficients from Hierarchical Linear Models Estimating the Effects of Nurse Work Environment on Nurse Burnout and Nurse Intentions to Leave

| | Regression coefficients (95% CI) | | Intraclass Correlation Hospital Unit Level |
|---|---|---|---|
| | Unadjusted | Adjusted | |
| Emotional exhaustion | −1.34*** (−1.80—–0.88) | −2.00*** (—2.71—–1.29) | 11.39% |
| Depersonalization | −0.19 (−0.43–0.05) | −0.71*** (−1.08—–0.34) | 4.43% |
| Personal accomplishment | 0.27 (0.00–0.55) | 0.55* (0.14–0.97) | 3.56% |

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| | Regression coefficients (95% CI) | | Intraclass Correlation Hospital Unit Level |
|---|---|---|---|
| | Unadjusted | Adjusted | |
| | Odds Ratios (95% CI) | | |
| Intention to leave | 0.92* (0.85–0.99) | 0.83** (0.72–0.95) | 14.0% |

Notes: Unadjusted estimates are from bivariate hierarchical linear models (HLM) with random intercepts in which nurses are nested in hospital units. Adjusted estimates are from HLM models that control for nurses' sex, age, race, nursing experience, years on present unit, and hospital and unit characteristics (hospital size and the technology available in the hospital, unit size [average daily census], unit staffing [the ratio of RNs to average daily census], and unit skill mix [the ratio of RNs to total nursing staff]). The intraclass correlation was calculated as the percentage of the variance attributable to the unit level compared with the total variance, from the null model. Single asterisks indicate effects that are significant at the 0.05 level; double asterisks indicate effects that are significant at the 0.01 level; and triple asterisks indicate effects that are significant at the 0.001 level.

CI = confidence interval.

## Appendix E

Undjusted and Adjusted Coefficients from Hierarchical Linear Models Estimating the Effects of Nurse Burnout and Nurse Work Environment on Patient Satisfaction

| | Beta coefficients (95% CI) | | Intra class Correlation Hospital Unit level |
|---|---|---|---|
| | Unadjusted | Adjusted | |
| Emotional exhaustion | −0.40** (−0.68—–0.12) | −0.37** (—0.64—–0.09) | 17.79% |
| Depersonalization | −0.18 (−1.05–0.68) | −0.16 (—0.85–0.52) | 21.76% |
| Personal accomplishment | 0.75** (0.15–1.36) | 0.56** (0.08–1.04) | 18.40% |
| Nurse work environment | 1.16** (0.65–1.67) | 1.52** (0.84–2.19) | 13.40% |

Notes: All estimates are from hierarchical linear models (HLM) with random intercepts in which patients are nested in hospital units. Unadjusted estimates are from bivariate models; adjusted where estimates are from models that control for patients' sex, age, race, risk factors, illness severity, and hospital and unit characteristics (hospital size and the technology available in the hospital, unit size [average daily census], unit staffing [the ratio of RNs to average daily census], and unit skill mix [the ratio of RNs to total nursing staff]). The effect of nurse work environment on patient satisfaction was further adjusted by controlling for the effects of the 3 burnout dimensions. The intraclass correlation was calculated as the percentage of the variance attributable to the unit level compared with the total variance from the unadjusted model. Double asterisks indicate effects that are significant at the 0.01 level.

CI = confidence interval.

## Appendix F

Estimated Differences in Outcomes Between Hospital Units With Good, Mixed, and Poor Practice Environments, Under Linear and Nonlinear Models, and Information Related to the Linear Specification

| | | Estimated Practice Environment Effect | | | | |
|---|---|---|---|---|---|---|
| Dependent Variable | | Mixed vs. Poor | Good vs. Mixed | Improvement Chi-Squared | Difference Chi-Squared | Variation Explained |
| Emotional exhaustion | Linear model | 0.59 | 0.59 | 22.6* | 3.7 | 86% |
| | Nonlinear model | 0.86 | 0.43 | 26.3* | | |
| Depersonalization | Linear model | 0.68 | 0.68 | 12.0* | 0.2 | 98% |
| | Nonlinear model | 0.74 | 0.64 | 12.2* | | |

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| Dependent Variable | | Estimated Practice Environment Effect | | Improvement Chi-Squared | Difference Chi-Squared | Variation Explained |
|---|---|---|---|---|---|---|
| | | Mixed vs. Poor | Good vs. Mixed | | | |
| Personal accomplishment | Linear model | 0.93 | 0.93 | 0.1 | 0.3 | … |
| | Nonlinear model | 1.10 | 0.84 | 0.4 | | |
| Intention to leave | Linear model | 0.63 | 0.63 | 18.0* | 0.1 | 99% |
| | Nonlinear model | 0.64 | 0.60 | 18.1* | | |
| Patient satisfaction | Linear model | 1.49 | 1.49 | 9.2* | 1.2 | 88% |
| | Nonlinear model | 1.26 | 1.83 | 10.4* | | |

Notes: The practice environment effect is estimated by odds ratios under the linear and nonlinear models, which indicate the differences between hospital units with mixed vs. poor environments, and good vs. mixed environments. The improvement chi-squared indicates how greatly these 2 models improve on a baseline model that includes nurse (or patient) characteristics but excludes the practice environment effect. The difference chi-squared represents the difference in the fit of the 2 models with 1 degree of freedom. The variation explained is an R-square analog obtained by dividing the improvement chi-squared for the linear model by the improvement chi-squared for the nonlinear model. Asterisks denote whether models significantly improve on the baseline model, or significantly differ from one another, at the 0.05 level.

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**TABLE 1**

Characteristics of the Study Hospitals and Hospital Units

| | Mean | Standard Deviation | No. |
|---|---|---|---|
| Hospital size (average daily census) | 583 | 276 | 20 |
| Unit size (average daily census) | 26.4 | 10.7 | 40 |
| Unit staffing (RN/ADC) | 0.73 | 0.36 | 40 |
| Unit skill mix (RN/total nurse personnel) | 0.71 | 0.11 | 40 |

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## TABLE 2

Characteristics of Nurses in the 40 Study Units

| | Nurses (N = 820) | |
|---|---|---|
| **Characteristic** | **Percent** | **No.** |
| Sex | | |
| Male | 92.6 | 750 |
| Female | 7.4 | 60 |
| Race | | |
| White | 48.8 | 391 |
| Black | 26.9 | 216 |
| Hispanic | 4.6 | 37 |
| Other | 19.7 | 158 |
| Intend to leave | | |
| No intentions to leave | 64.1 | 516 |
| Intend to leave in next 12 months | 35.9 | 289 |
| | **Mean** | **Standard Deviation** |
| Age | 34.6 | 9.5 |
| Years in nursing | 9.6 | 8.7 |
| Years on present unit | 3.6 | 4.0 |
| Burnout | | |
| Nurse emotional exhaustion | 24.3 | 11.0 |
| Nurse depersonalization | 7.4 | 5.7 |
| Nurse personal accomplishment | 36.6 | 7.1 |

Note: The sum across categories for some characteristics is less than the sum of all nurses owing to small amounts of missing data.

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## TABLE 3

Characteristics of Patients in the 40 Study Units

| | Patients (N = 621) | |
|---|---|---|
| **Characteristic** | **Percent** | **No.** |
| Sex | | |
| Male | 88.1 | 546 |
| Female | 11.9 | 74 |
| Race | | |
| White | 52.5 | 321 |
| Black | 29.7 | 182 |
| Hispanic | 16.0 | 98 |
| Other | 1.8 | 11 |
| HIV risk category | | |
| Homosexual sex | 68.6 | 426 |
| High-risk heterosexual sex | 13.8 | 86 |
| Intravenous drug use | 28.2 | 170 |
| Global activities of daily living (ADL) | | |
| Self-care | 56.7 | 327 |
| Some assistance | 27.9 | 161 |
| Considerable assistance | 11.8 | 68 |
| Total assistance | 3.6 | 21 |
| Clinical AIDS Prognostic Staging (CAPS) | | |
| Stage 1 | 25.0 | 155 |
| Stage 2 | 33.7 | 209 |
| Stage 3 | 24.8 | 154 |
| Stage 4 | 16.6 | 103 |
| | **Mean** | **Standard Deviation** |
| Age | 37.4 | 7.5 |
| Satisfaction with nursing care | 62.9 | 8.8 |

Notes: The sum across categories for some characteristics is less than the sum of all patients owing to small amounts of missing data. The sum of patient HIV risk categories exceeds the sum of all patients because the categories are not mutually exclusive. Global ADL and CAPS are indicators of illness severity and are described in the text.

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## TABLE 4

Unadjusted and Adjusted Odds Ratios Estimating the Effects of Nurse Work Environment on Nurse Burnout and Nurse Intentions to Leave

| | Odds Ratios (95% CI) | |
|---|---|---|
| | **Unadjusted** | **Adjusted** |
| Emotional exhaustion | 0.69** (0.54–0.88) | 0.59** (0.45–0.78) |
| Depersonalization | 0.88 (0.68–1.14) | 0.68** (0.52–0.89) |
| Personal accomplishment | 0.94 (0.75–1.17) | 0.93 (0.76–1.18) |
| Intention to leave | 0.78* (0.61–0.98) | 0.63** (0.47–0.82) |

Notes: Unadjusted estimates are from bivariate robust logistic regression models that allow for clustering and the lack of independence of observations within hospital units. Adjusted estimates are from robust regression models that control for nurses' sex, age, race, nursing experience, and years on present unit. Single asterisks indicate effects that are significant at the 0.05 level; double asterisks indicate effects that are significant at the 0.01 level.

CI = Confidence Intent

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## TABLE 5

Undjusted and Adjusted Odds Ratios Estimating the Effects of Nurse Burnout and Nurse Work Environment on Patient Satisfaction

| | Odds Ratios (95% CI) | |
|---|---|---|
| | **Unadjusted** | **Adjusted** |
| Emotional exhaustion | 0.47* (0.24–0.92) | 0.51* (0.30–0.87) |
| Depersonalization | 0.91 (0.45–1.84) | 1.21 (0.76–1.91) |
| Personal accomplishment | 2.89** (1.56–5.35) | 2.37** (1.37–4.12) |
| Nurse work environment | 2.05** (1.45–3.16) | 1.49* (1.06–2.09) |

Notes: All estimates are from robust logistic regression models that allow for clustering and the lack of independence of observations within hospital units. Unadjusted estimates are from bivariate models; adjusted estimates are from models that control for patients' sex, age, race, risk factors, and illness severity. The effect of nurse work environment on patient satisfaction was further adjusted by controlling for the effects of the 3 burnout dimensions. Single asterisks indicate effects that are significant at the 0.05 level; double asterisks indicate effects that are significant at the 0.01 level.

CI = Confidence Intent