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The relationship between nurses' stress and nurse staffing factors in a hospital setting

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Aim The present study objective was to examine the relationships between nurses' stress and nurse staffing in a hospital setting.
Background Nurses have many job-related stressors. There is a lack of research exploring the relationship between job stressors to staffing and day of week worked.
Methods The sample consisted of registered nurses (RNs) (N = 197) providing direct patient care. Data were collected via electronic software. Variables included demographic information, work setting information, Perceived Stress Scale (PSS) scores and Nursing Stress Scale (NSS) scores. Data analysis included descriptive statistics, correlations and analysis of variance.
Results Among respondents, a positive correlation (r = 0.363, $P < 0.05$) was found between the NSS and PSS and between age and patient work load (i.e. number of patients the nurse cared for) (r = 0.218, $P < 0.05$). A negative correlation (r = −0.142, $P < 0.05$) existed between NSS and respondents' age. Analysis of variance showed that younger nurses had more nursing stress than older nurses ($F_{1,195}$ = 4.283, $P < 0.05$).
Conclusions Age, patient work load and day of the week worked are important factors affecting nurses' stress levels.
Implications for Nursing Management Nurse managers should consider scheduling as a potential stressor for nurses.

Keywords: acute care stress, job stress, nursing stress, staffing patterns

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Introduction

Nurses have many job-related stressors including stress as a result of dealing with death and dying (Hoffman & Scott 2003), emotional exhaustion (Vahey *et al.* 2004), stress owing to working conditions (Golubic *et al.* 2009) and less than adequate staffing mixes or abilities (Brooks & Anderson 2004, Donaldson *et al.* 2005). Although there are notable research studies related to stress and nurse burnout (Blythe *et al.* 2008, Sasaki *et al.* 2009) and job satisfaction related to burnout (Aiken *et al.* 2002), there is a lack of research relating job stressors to specific nurse staffing and such realities in practice as: days of week worked, presence of unto-ward events during a shift and nurses' ages.

The present study will add to the body of knowledge about the relationships between nursing stress and staffing factors. It was hypothesized that staffing factors such as shift length, days of week worked and cumulative nursing work hours will increase nursing stress. It was anticipated that the findings of the present study could be used toward planning and improving the

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nursing workplace. The aim was to examine the relationships between nurses' stress and nurse staffing in one hospital setting.

Literature review

According to the (American Hospital Association, 2006), there were 118 000 registered nurse (RN) vacancies as of December 2005. By 2020 the RN vacancy rate is anticipated to reach 1 000 000 nurses (American Hospital Association 2006). There were over 19 000 RN vacancies in long-term nursing care positions (American Health Care Association 2008). The nursing shortage has had a significant impact in the United States, including job stresses for nurses. Many qualified entry-level bachelor's nursing students have been turned away from nursing schools owing to a lack of faculty and resources (Staffing Watch 2010). Although nursing shortages and stressors exist for nurses in other countries, the literature review in the present study focuses on describing a series of recent studies published in the United States and highlights the key points from more recent international publications.

Staffing, burnout and patient outcomes in the USA

In their classic research about nursing staffing, burnout and patient outcomes, Aiken *et al.* (2002) performed a cross-sectional study within the state of Pennsylvania (N = 210 hospitals). Emotional exhaustion and job satisfaction were risk adjusted to patient mortality and nurses' burnout. Aiken *et al.* (2002) reported that among hospitals with the highest patient work load (i.e. number of patients the nurse cared for), surgical patients had higher risk adjusted mortality and nurses had higher burnout than those nurses with less of a work load. This previous study sparked nationwide interest in relationships between nursing staffing patterns and patient outcomes.

The following year, Aiken *et al.* (2003) conducted a cross-sectional study from the acute care hospitals within the state of Pennsylvania (N = 168 hospitals; N = 234 342 surgical patients). Nursing work factors (nurses' highest levels of credentials, nurses' workload and mean years of experience) and hospital characteristics (size, teaching status and technological abilities) were the focus of interest with outcomes such as mortality and failure to rescue (i.e. deaths in surgical patients with serious complications). Aiken *et al.* (2003) found that each 10% increase in the proportion of nurses with higher educational degrees decreased the risk of mortality and of failure to rescue by 5%. Although this previous study did not directly measure nursing stressors, the findings illuminated the relationships between nurses' education and workload to patient outcomes.

That same year, Hoffman and Scott (2003) performed a descriptive cross-sectional study among staff nurses working in the state of Michigan (N = 208). The focus of interest were the nursing work shifts (8- *vs.* 12-hours shift), the nursing stress [measured using the Nursing Stress Scale (NSS)], work satisfaction and career satisfaction. Hoffman and Scott (2003) found a linear relationship between stress and career satisfaction and an inverse relationship between stress and satisfaction. They also found that less-experienced nurses were remarkably more stressed than experienced nurses.

In the same year, Staten *et al.* (2003) conducted research among staff nurses in the state of California (N = 248) with the purpose of identifying factors related to job satisfaction and retention. Staten *et al.* (2003) specifically focused on the perceptions among RNs with different ethnic backgrounds, age groups and the work environment. The researchers found no statistical differences amongst age groups in perceptions of the work environment (e.g. goals, relationships and system changes). A difference was noted between the perceptions of managerial control over the work environment (Staten *et al.* 2003).

The following year, Brooks and Anderson (2004) conducted an exploratory study among staff RNs working in the hospital setting (N = 341) across the state of Illinois. Their purpose was to explore the way acute care nurses rated their quality of work life. Several problems were reported by nurses, including feelings of overwhelming stress. Nurses indicated a lack of perceived support to decrease burnout. Other problems included being exhausted with little energy left after work, having insufficient or inadequate help from unlicensed assistive personnel (UAPs) and being negatively affected by rotating shift schedules.

In the same year, Dr Aiken was involved in two studies using nationwide sampling of nurses. Rogers *et al.* (2004) specifically examined shift patterns and sleep/wake patterns to determine their impact on making errors during a shift (coded as a binary 'yes' or 'no' response). Rogers *et al.* (2004) found that fewer than 20% of nurses were able to leave work at the end of the scheduled time; many worked longer shifts and many stayed later to finish up work not completed during the shift. The longest shift reported by this nationwide sample (N = 393) was 23 hours and 40 minutes. Rogers *et al.* (2004) also found that 30–32% of nurses

reported having made an error or a near miss error. Nurses were three times more likely to make an error if they had worked more than 12.5 hours.

In the second nationwide study, Vahey *et al.* (2004) performed cross-sectional surveys of hospitals in the United States (N = 20 hospitals). A measure developed from the Nursing Work Index (NWI-R) was used to study environmental characteristics (i.e. staffing adequacy, administrative support and nurse–physician relationships). The other focuses of interest were such characteristics as: the hospital and unit size, staffing ratio and skill mix. The Maslach Burnout Inventory (MBI) was used to study nurses' burnout. The researchers also surveyed the nurses' intentions to leave, patient satisfaction and nurse/patient characteristics. Vahey *et al.* (2004) found that nurses reporting good working environments (e.g. adequate staffing, administrative support and better relationships between nurses and physicians) were less likely to experience burnout, emotional exhaustion, depersonalization and intent to leave within the year.

The following year, Donaldson *et al.* (2005) used a convenience sample of hospitals from California to examine the impact of mandated nurse-to-patient ratios on staffing and patient outcomes. The patient outcomes were based on national quality indicators of fall rates, pressure ulcer rates and restraint rates. Donaldson *et al.* (2005) found no statistical difference in patient outcomes with the improved nursing–patient ratio mandated in California. While Donaldson *et al.* (2005) did not directly study stressors, the authors studied patient outcomes relative to RN nursing care hours. Another study on this topic was published in 2010 and had different results. Aiken *et al.* (2010) found that staff ratios mandated in California did impact patient care and predictors of nursing outcomes, such as turnover and burnout. It was noted that lower nursing–patient ratios decreased mortality.

Nursing stress in the international research

More recently, there has been an increase also in international studies on the topic of nursing stress. A study of nursing work demands on sleep was published by Winwood and Lushington (2006) from Australia. A large sample (N = 760) of nurses reported data on work demands, sleep quality, fatigue and recovery between shifts. It was found that a rapid work pace increased psychological strain on work demand, effected sleep quality and impaired recovery between nursing shifts.

Further, a study from Japan was conducted to assess the effects of a web-based assertion training programme on hospital nurses. Nurses completed the training programme and data were collected post-training and 1 month later. Results indicated increased assertion knowledge and a decreased mental workload with regards to job stress (Yamagishi *et al.* 2007).

Another Japanese study found that job-related stress factors are unique per hospital department. Full-time nurses at four acute care hospitals completed questionnaires regarding stress factors, psychological symptoms and somatic symptoms. Notable relationships included nurses working in the operating room with fatigue, the intensive care unit with anxiety and surgery–internal medicine with anxiety and depression (Kawano 2008).

A Chinese study indicated that workload was the most frequent workplace stressor among intensive care nurses. The most commonly reported coping strategy was planning. Various relationships were identified between workplace stressors, coping strategies, job satisfaction factors and demographic characteristics. (Li & Lambert 2008).

A study of Italian mental health nurses found that empowerment (structural and global) was related to job satisfaction. Empowerment was also found to have a negative relationship with job stress. Nurses who were part of the study worked in hospital wards and health agencies. Data were collected via questionnaires and nursing stress was assessed via a five-point scale (Lautizi *et al.* 2009).

In summary of the recent literature, multiple reasons are contributing to nursing stress. Nurses have higher error rates when overworked (Rogers *et al.* 2004); they are emotionally exhausted (Aiken *et al.* 2002, Brooks & Anderson 2004, Vahey *et al.* 2004); they perceive differences in work control based on their ethnicity (Staten *et al.* 2003); they perceive more stress with longer work shifts (Hoffman & Scott 2003); they see worse patient outcomes related to work load (Aiken *et al.* 2002) but they do not see improvement with mandated staffing ratios in California (Donaldson *et al.* 2005). And finally, it appears as although the nursing shortage is projected to increase exponentially as the baby boomer generation of nurses mature into senior citizens (American Hospital Association 2006).

Methods

The study design was a descriptive (cross-sectional), correlational study that utilized self-reported survey data. Data were collected from a convenience sample of 1300 staff nurses from multiple patient care areas of a large teaching hospital in the Southeastern United

States. The data were collected in 2008. Historical analyses of earlier studies from the hospital indicated that an average response rate of 30% was commonly achieved in this organization. Software for electronic data collection via the internet was used to allow for an ample number of responses and convenience of the nurses completing the survey. After institutional review board (IRB) approval was obtained, recruitment flyers were placed in nursing stations and the responding nurses initiated their password protected survey on Survey Monkey®. Completion of the survey indicated informed consent as stated in the introductory page of the questionnaire.

Inclusion criteria were RNs who provided direct patient care, were able to read and write in English and willing to complete the survey. Nurses were excluded from the study if they worked in non-patient care units, were not employed by the hospital, were in leadership/administrative positions, had not worked directly in patient care within the previous 7 days, or were not licensed as RNs.

Instruments

Instruments used in the present study included the Nurse Stress Scale (NSS) (Gray-Toft & Anderson 1981) and the Perceived Stress Scale (PSS-14) (Cohen *et al.* 1983). The NSS is a 34-item questionnaire designed to measure job-related stress for nurses. The NSS is a summated Likert-type instrument with each item scored 0 (never), 1 (occasionally), 2 (frequently) to 3 (very frequently). The seven subscales of the NSS are workload (Six items), death and dying (Seven items), inadequate preparation (Three items), lack of support (3 items), uncertainty concerning treatment (5 items), conflict with physicians (Five items) and conflict with other nurses (Five items). Initial tests of internal consistency produced a coefficient of 0.89 (Gray-Toft & Anderson 1981).

The PSS-14 is a 14-item questionnaire used to measure the situations in the nurse's life that are deemed stressful. The PSS is a summated Likert-type instrument with each item scored 0 (never), 1 (almost never), 2 (sometimes), 3 (fairly often) to 4 (very often). Initial evaluation of the instrument revealed a test–retest correlation of 0.85. Cronbach's alpha was 0.84, 0.85 and 0.86 in the three samples (Cohen *et al.* 1983).

The total scores of NSS (range: 0–102) and PSS (range: 0–56) are the sums of the individual items with higher scores indicating higher levels of stress. Other study variables reported by the subjects included shift length (i.e. 8- or 12-hours shift), nursing work hours (i.e. number of hours worked during the last shift), day of week worked (i.e. days within the previous week that the nurse worked) and patient work load (i.e. number of patients the nurse cared for).

Data analysis

Data were analysed using PASW 17 (SPSS, Inc., Chicago, IL, USA). Measures of central tendency were conducted for descriptive statistics of the sample including mean, standard deviation (SD) and variance. Pearson's correlation coefficients were analysed to determine the strength of the relationship between nursing stress and other study variables. Analysis of variance (ANOVA) tests were used to determine differences between nursing stress and age of the nurse. The significance level was set a priori at $P < 0.05$.

Results

There were 321 surveys returned, although many respondents completed the demographic portion of the surveys without completing the stress scales. Missing data points left 197 surveys with complete data. The response rate of the completed surveys was 15%. Demographic results from the respondents ($N = 197$) were female (92.4%), with an average age of 38.7 years, average of 10.5 years of nursing experience and an average of 38 hours worked weekly. The majority of nurses were married (54.3%), about half (50.3%) had no children living with them and 7.6% lived with their parents. The most frequent educational level reported was a Bachelor's degree (43.7%). The majority (45.7%) worked day shifts, most frequently on Monday and Tuesday. The respondents' background characteristics are shown in Tables 1 and 2.

Overall, the results of the stress scales were NSS (mean = 89.6, SD = 21.5) and PSS (mean = 36.6, SD = 8.0). Nurses were categorized as younger or older via a median split which occurred at the age of 37 years. Older nurses (mean = 48.0, SD = 7.1) reported caring for a greater number of patients than younger nurses (mean = 29.6, SD = 4.6), especially with a patient load of greater than six patients. NSS scores for older nurses (mean = 86.4, SD = 21.6) were lower than those of younger nurses (mean = 92.7, SD = 21.0). PSS scores for older nurses (mean = 35.7, SD = 8.3) were also lower than those of younger nurses (mean = 37.4, SD = 7.7). Although these differences were not statistically significant, they are notable. Stress scale scores are in Table 3.

Among the respondents a moderately strong and statistically significant positive correlation ($r = 0.363$,

Table 1
Respondents' background characteristics

	n	%
Gender		
Male	14	7.1
Female	182	92.4
Marital status		
Married	107	54.3
Divorced	37	18.8
Single (never married)	49	24.9
Separated	2	1.0
Widowed	2	1.0
Education level		
Diploma (nursing)	12	6.1
Associate's degree (nursing)	74	37.6
Bachelor's degree (nursing)	86	43.7
Graduate school (nursing)	6	3.0
Associate's degree (non-nursing)	1	0.5
Bachelor's degree (non-nursing)	15	7.6
Graduate school (non-nursing)	3	1.5
Shift worked, hours		
07.00–15.00	8	4.1
15.00–23.00	7	3.6
23.00–07.00	5	2.5
07.00–19.00	90	45.7
19.00–07.00	71	36.0
Other	14	7.1
Day of week worked		
Monday	106	53.8
Tuesday	105	53.3
Wednesday	104	52.8
Thursday	99	50.3
Friday	92	46.7
Saturday	86	43.7
Sunday	78	39.6

Table 2
Respondents' background

Variable	*N*	*Min*	*Max*	*Mean*	*SD*
Age	197	21	68	38.65	10.99
RN years	188	0	48	10.53	10.16
Weekly work hours	191	3	80	38.32	8.30
Parents at home	193	0	4	0.10	0.42
Children at home	194	0	5	0.89	1.06

SD, standard deviation; RN, registered nurse.

Table 3
Respondent data

Variable	*n*	*Min*	*Max*	*Mean*	*SD*
Overall NSS	197	40	154	89.60	21.50
Overall PSS	197	16	57	36.56	8.04
Age: older nurses*	97	38	68	48.02	7.08
Age: younger nurses	100	21	37	29.56	4.57
NSS: older nurses*	97	40	152	86.41	21.65
NSS: younger nurses	100	55	154	92.70	20.99
PSS: older nurses*	97	16	54	35.67	8.32
PSS: younger nurses	100	19	57	37.42	7.70

NSS, Nurse Stress Scale; PSS, Perceived Stress Scale.
*Older nurses are >37 years.

$P < 0.05$) was found between the total scores of NSS and PSS as well as between age and the highest number of patients assigned during the respondents' last shift ($r = 0.218$, $P < 0.05$). A significant, but weak negative correlation ($r = -0.142$, $P < 0.05$) existed between NSS and respondents' age. No significant correlations were noted between PSS and the average weekly worked hours. There was a weak, but significant positive correlation between age and the total number of patients cared for during the last shift worked ($r = 0.193$, $P < 0.05$). Correlation coefficients are shown in Table 4.

Analysis of variance showed that younger nurses had significantly more nursing stress than the older nurses ($F_{1,195} = 4.283$, $P < 0.05$). Variability in PSS and NSS scores were significantly affected by the age of the nurse and working the weekend (Friday, Saturday and Sunday) using a one-way ANOVA. ANOVA results are shown in Table 5.

Discussion

Key limitations of the present study were the overall response rate and the number of respondents with complete surveys on the stress scales. At the time of this

Table 4
Correlations between Nurse Stress Scale (NSS), Perceived Stress Scale (PSS) and background variables

Variables	*1*	*2*	*3*	*4*	*5*
PSS					
NSS	0.363*				
Age	−0.126	−0.142*			
Work hours	−0.063	−0.099	0.168*		
Total patients	−0.029	−0.108	0.193*	0.003	
Highest no.	0.007	−0.088	0.218*	0.024	0.813*

Total number of patients cared for on the last shift worked.
Highest number of patients cared for on the last shift worked.
*A significant correlation at the 0.05 level.

Table 5
Analysis of variance

Predictor variable	*Dependent variable*	*F*	*P*
Older nurses*	NSS	4.283	0.040
	PSS	2.349	0.127
Weekend work†	NSS	7.606	0.006
	PSS	6.164	0.014
Weekend work†, age	NSS	6.004	0.003
	PSS	4.783	0.009
Weekday work†, age	NSS	4.570	0.011
	PSS	3.018	0.051

*Older nurses are >37 years.
†Weekend work includes Friday, Saturday and Sunday.

study, the institution had recently implemented a new system for email for all nursing staff. It is possible that the response rate may have been higher had the survey been disseminated after nurses became more comfortable with this method of communication.

The results indicate that age and the day of the week worked are important factors affecting nurses' stress levels. Nurses reported higher stress levels when they worked the weekend. This may be due to several factors. Anecdotal knowledge of the hospital shows that many of the nurses work primarily on weekends and therefore may not be as engaged in the culture of the unit. In addition, several of the nursing staff that serve in managerial/supportive roles and provide resources to staff (clinicians, nurse mangers, advanced practice nurses and educators) do not routinely work weekends. Also, the staffing level of medical residents is lower on weekend days. The present study adds to the body of knowledge of the nurse–stress relationship within acute care. Further research is needed to understand the intricacies of various stresses that nurses encounter today and their potential clinical consequences.

An interesting finding of the present study was the positive correlation between age and the total number of patients cared for. Older nurses reported greater numbers of patients (mean = 4.75, SD = 2.67) cared for than younger nurses (mean = 3.89, SD = 2.23). Therefore, older nurses had a higher patient work load. Younger nurses reported greater nursing stress than did older nurses. There may be various reasons for this finding. The immediate and surrounding areas of the study site include urban, suburban and rural locations. Almost 20% of the population of this area is between the ages of 18–34 years. The high number of young adults in the area lends toward many unique social opportunities. It may be speculated that younger nurses have greater nursing stress than the older nurses as a result of activities outside of the hospital, especially when working the weekends.

The stress levels reported by the nurses may also be affected by the length of time in which the nurses have been working. A recent study noted that as nurses 'progress in expertise' in their nursing roles they function more appropriately with patient care situations such as organization, interruptions, anticipating patient care needs, communication and integration of nursing roles (Burger *et al.* 2010). Staff development programmes may assist in nurses transitioning from the novice role to that of the expert (Haag-Heitman 2008).

Findings that nurses of various ages report multiple causes of stress can be supported by previous research. Blythe *et al.* (2008) found that nurses of diverse generations have different career commitment, job satisfaction, stress and emotional exhaustion. Moreover, Golubic *et al.* (2009) noted that older age was a predictor related with low work ability. More research is needed on the topic of age-related nursing stressors in acute care institutions to assist management with proper staffing.

Other causes of nursing stress include the area worked and patient work load. Mrayyan (2009) concluded that stressors were higher in intensive care units (ICUs) than in wards. Furthermore, the shift worked was a predictor of nursing job stressors in the ICUs and wards. Once these stressors have been identified, interventions are essential to decrease or assist nurses with coping techniques. The value of strategies needed to prevent hospital nursing stress from becoming chronic and leading to burnout have been documented (Sasaki *et al.* 2009).

Implications for Nursing Management

The importance of the nursing workforce to patient outcomes has been documented. The projected RN vacancy rate has significant implications for healthcare and poses a challenge for hospital administration related to quality and cost of care. For example, a recent study has demonstrated that increased work hours, work stress and poor collaboration among staff are related to hospital-acquired infections among those patients (Virtanen *et al.* 2009). Therefore, actions of the staff, in addition to patient care, can affect the health of the patient.

It has been reported that the turnover cost to replace an RN ranges from $12 000 to $67 000 (Jones 2004, 2005). It is also possible to assume that these costs will be increasing because of to the decreasing workforce in the very near future. As nurse managers continually struggle to maintain adequate staffing levels, the burden of stress among nurses who provide direct patient care cannot be understated. An imperative step in addressing this well-documented issue is to identify the sources of nursing stress related to staffing. A greater understanding of those stressors will lead to appropriate strategies for nursing stress reduction and coping which may result in a healthier, more satisfied and effective nursing workforce.

Conclusions

Job-related stress remains an issue in the nursing workforce. The effects of stress experienced by the

nurse impact job satisfaction and retention. Recognizing and understanding the job-related stressors of nurses can help nurse leaders to implement strategies that are more efficiently aimed at reducing nurse's stress and subsequently improve patient outcomes. Although patient work load and day of week worked are important factors within nursing, age is a significant factor affecting nurses' stress levels. More research that includes nurses within a variety of practice settings is needed to further explore these findings.

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