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The Impact of Shift Length on Mood and Fatigue in Pediatric Registered Nurses☆,☆☆,★

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Editor's note

The following is an article from a novice author and demonstrates SPN's commitment to assisting first time authors in the process of getting a manuscript published. The process involves multiple iterations as frequently the work originally was an academic assignment. For various reasons, the topic selected was of interest to the author and the learning involved both the study/project activity and the major ways of communicating that activity.

The demands of dissemination to a broad audience require greater clarification of the available literature and, where there are gaps, rationale for instrument selection and subject identification.

In the subsequent article, the author sought to revisit earlier findings related to consecutive hours worked and nurse-reported fatigue and the relationship of fatigue to mood and work/life balance at a pediatric setting. The findings were interesting and did provide direction for potential mitigation strategies to reduce nurse fatigue in general and specifically for a unique population.

Background/introduction

Nurses who work >12 h at a time are three times more likely to make a patient error than those who work eight hours (Rogers, Hwang, Scott, Aiken, & Dinges, 2004). In 2011, The Joint Commission issued a Sentinel Event Alert regarding nurse fatigue and an increased risk to patient safety. Given the supporting literature that directly links nurse fatigue to patient errors, organizations need to have a mitigation plan to decrease nurse fatigue.

As the understanding of the physiology of sleep evolves, there is a growing body of literature related to nurse fatigue. The aim of this study was to obtain a baseline measurement of sleep, physical activity, and work hours and to relate these to the fatigue and mood states of registered nurses working either a 12-h or 8-h shift in a pediatric medical center hospital. Study results will be used in future studies designed to test mitigation strategies to decrease nurse fatigue, improve mood, and improve work/life balance.

Overview of the literature

Many hospitals offer nurses the opportunity to work either 12-h or 8-h shifts. Research has shown that 12-h shifts, as compared to 8-h shifts, adversely affect nurse job performance and increase patient care errors (Geiger-Brown & Trinkoff, 2010).

Nurse experience/risk

The research has found that nurses working longer shifts or overtime experienced fatigue and poor quality of sleep, which affected their vigilance, alertness, reaction time and decision-making ability that resulted in an increased likelihood of sustaining an injury (Bae & Fabry, 2014). According to Rogers et al. (2004), in a population-based sample of 393 staff nurses covering 5317 shifts, nurses working 12 h or more (due to overtime) reported over three times the odds of making errors versus nurses working 8-h shifts. In a study looking at nurse satisfaction and burnout, Stimpfel, Sloane, and Aiken (2012) reported that nurses working shifts of ten hours or longer were two and a half times more likely to experience burnout and job dissatisfaction. Although some evidence supports that errors increase with extended work hours, researchers have also reported that nurses prefer working 12-h shifts and/or like having the choice to work extended hours (Harris et al., 2015). The gap between what is healthy staffing for nurses and what nurses prefer becomes a challenge when exploring potential mitigation strategies for fatigue.

Patient experience/risk

Rogers et al. (2004) found nurses that worked longer than 12.5 h were more likely to commit patient-related errors with adverse patient outcomes and had a three time greater risk of making medical errors. In a more recent study, Han, Trinkoff, and Geiger-Brown (2014) found long work hours during nurses' typical work schedules were significantly related to patient mortality. Stimpfel and Aiken (2013) found

☆ The mission of the Society of Pediatric Nurses is to support its members in their practice. One means of accomplishing this mission is to keep membership informed of innovative initiatives involving the board, committees, and members that promote research, clinical practice, education, and advocacy within the larger pediatric healthcare community. This department serves that purpose.

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that the odds of nurses' reporting poor quality of care and a poor hospital safety grade increased for nurses working 10-h or longer compared with nurses working 8–9 h and were highest for nurses working 12-h or more. The literature supports that longer work hours are associated with patient errors and adverse patient outcomes.

Study aim

The aim of this study was to obtain a baseline measurement of sleep, physical activity, and work hours and to relate these to the fatigue and mood states of registered nurses working either a 12-h or 8-h shift in a pediatric medical center hospital.

Study questions

The study questions were:

1) How do nurses working 8-h shifts compare to nurses working 12-h shifts on physical activity, sleep quality, body mass index (BMI), work immersion, and social support.
2) How well do the factors of physical activity, work immersion, social support and sleep quality predict chronic fatigue, acute fatigue, inter-shift recovery and mood in nurses working either an 8-h or 12-h shift?
3) Is there a difference among 8-h day shift, 12-h day shift, 8-h evening shift and 12-h night shift for fatigue (chronic and acute), inter-shift recovery and mood state?

Methods

Design

A two-group design with nurses working either an 8-h shift or a 12-h shift was used. Each shift had two levels, day/night (12−h) and day/evening (8-h). Due to a lack of funding 8-h night shift nurses were not included in the study. Demographic data on participant's age and participant reported BMI were collected. Mood states were measured before and after each shift using the Profile of Mood States (POMS). Activity and sleep data were collected electronically 24 h per day for seven days using the Fitbit Flex®. Data were up-loaded to the Fitbit website and subjects gave permission to the Fitbit website administrator to download the data to the research team. The transferred data had no identifiable participant information and were identified only by a participant identification number. Fatigue data were collected once at the end of the study using the Occupational Fatigue Exhaustion Recovery (OFER) survey. Work immersion was collected once during the week measured by a three-question survey (Siegrist, 2001; Siegrist et al., 2004).

Setting and sample

The study was conducted in a 500-bed tertiary pediatric hospital located on a Midwest regional medical campus. A convenience sample of eighty nurses with a Bachelor of Science in Nursing (BSN), and a minimum of one year of experience who worked at least 32 h per week were recruited for this study. All nurses worked on one of six inpatient medical/surgical units in the hospitals. All units had a similar layout but the acuity level and age of patients did vary with the typical nurse to patient ratio of one to four patients. Twenty nurses were recruited from each of the defined shifts: dayshift (0700–1930), nightshift (1900–0730), dayshift (0700–1530), and evening shift (1500–2330).

Ethical considerations

Study approval was granted by the Institutional Review Boards of the University of Cincinnati and the participating hospital. Research flyers were posted in the nursing staff lounge for two weeks prior to the study to recruit participants (See Fig. 1). Prior to data collection, participants read and signed the consent forms. Confidentiality of participant responses on the study instruments was maintained throughout the study. All data (paper forms and disks) were kept in a locked file cabinet in a private office and stored in a security enabled and protected computer files. Data was available to only the principal investigator and research associates.

Measurements

Physical activity was measured as the average number of steps per day. Sleep quality was computed using an algorithm based on sleep onset latency, number of awake times, and total sleep time.

Work immersion, defined as the persistent thoughts of work, was measured by a three-question survey (Siegrist, 2001; Siegrist et al., 2004). A sum score was computed based on the four-point Likert-scale from strongly disagree to strongly agree. The Cronbach's alpha ranged between 0.77 and 0.79. Work immersion is associated with fatigue ($r = 0.52$), and individuals with high immersion scores have a higher probability of fatigue than those with low work immersion scores (OR = 4.17)

Social support at work is the degree of support from co-workers and manager. Social support was assessed using a five-item questionnaire (Unden, Orth-Gomer, & Elofsson, 1991). The items were rated on a 4-point scale from strongly disagree to strongly agree. Scores were totaled to generate a sum ranging from 5 to 20, with higher scores indicating greater social support. The Cronbach's alpha for the scale was 0.76 thus indicating a high level of internal consistency.

Work fatigue and inter-shift recovery from work fatigue were measured using the 15-item occupational fatigue exhaustion recovery (OFER) scale. OFER consists of three subscales, chronic fatigue (an enduring trait of maladaptive fatigue), acute end-of-shift fatigue (energy left after a worker completes a given work shift and which is available in non-work time), and inter-shift recovery (extent to which a worker recovers energy expended during the previous shift). Each item was rated on a 7-point scale of zero to six with zero indicating strongly disagree and six indicating strongly agree. Positive items were reverse scored. Responses for each subscale were summed, divided by 30 and multiplied by 100 to provide values between 0 and 100 for each subscale. Higher scores for chronic and acute fatigue indicate more fatigue and less recovery between shifts (Winwood, Lushington, & Winefield, 2006; Winwood, Winefield, Dawson, & Lushington, 2005).

Mood states of the nurse were measured using the POMS survey. The survey consisted of six subscales, “tension-anxiety”, “anger-hostility”, “fatigue-inertia”, “confusion-bewilderment” and “vigor-activity.” Overall mood was computed by adding the first four scales (negative mood) and subtracting the vigor score (positive mood) for a total mood disorder (TMD) score. The TMD is recommended as a single global estimate of mood. Lower TMD scores indicate a more positive mood. The normative score for adult females is 20.3 (± 33.1 SD) (McNair & Heuchert, 2005).

Data analysis

Statistical analyses were completed using Statistical Package for Social Sciences 22.0 for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics were used to describe the demographic variables. Independent Samples *t*-test was used to compare nurses working 8-h or 12-h shifts on the dependent variables of physical activity, sleep quality, BMI, work immersion and social support. Multiple regression was used to analyze the relationship of total sleep time, sleep quality, and work and leisure activity levels of nurses working in the pediatric hospital. Multiple Analysis of Variance (MANOVA) was used to analyze the differences of work hours (8-h versus 12-h shift) on fatigue and mood states. A Pearson Correlation was conducted to determine the relationship between physical activity, sleep quality, work immersion and social support and fatigue and mood states.

Fig. 1. Recruitment flyer.

Results

Seventy-nine nurses completed the study. All nurses were female. There were 20 nurses in the 12-h day shift, 20 in the 12-h night shift, 19 in the 8-h day shift and 20 in the 8-h evening shift (See Table 1). There was a loss of one of the day shift nurses due to a medical leave and four nurses did not provide the demographic information (age and BMI).

There were no differences in the average number of daily steps, $t(77) = 1.34$, $p = .187$, work immersion $t(77) = 1.35$, $p = .179$, social support $t(77) = 0.002$, $p = .999$, or BMI, $t(73) = 0.937$, $p = .352$ for nurses working either an eight or twelve hour shift. There was a difference in sleep quality, $t(77) = -2.113$, $p = .035$, and age $t(73) = 3.21$, $p = .002$. Nurses working 8-h shifts had a lower sleep quality score (M = 91.89, SD = 11.7), than nurses working a 12-h shift (M = 95.00, SD = 2.6). Nurses working an 8-h shift were older (M = 36.72, SD = 11.41) than nurses working a 12-h shift (M = 30.15, SD = 5.50). Nurses working 8-h shifts averaged 8260.60 (SD = 2639.79) steps per day (4.1 miles) and nurses working 12-h shifts averaged 7485.74 (SD = 2514.10) steps per day (3.7 miles). The mean POMS for this study were 3.60.

Table 1
Demographic characteristics for registered nurses working 12-h day and night shifts and 8-h day and evening shifts.

	Shift Type	Mean	SD	N
	12-h AM	31.26	3.856	19
	12-h PM	29.41	6.672	20
	8-h Day	43.11	11.448	18
Age	8-h Evening	30.33	7.129	18
	12-h AM	36.25	6.79	19
	12-h PM	26.85	6.35	20
	8-h Day	28.55	7.27	18
BMI	8-h Evening	27.31	4.91	18

Four Multiple regression analyses were conducted to predict chronic fatigue, acute fatigue, inter-shift recovery and mood (TMD). Independent variables were average daily steps (physical activity), sleep quality, work immersion, and social support: 1) Higher work immersion and lower sleep quality, but not average daily steps predicted chronic fatigue ($R2 = 0.26$, $F(4, 72) = 6.33$, $p < .001$); 2) Higher work immersion was a significant predictor for acute fatigue, however, physical activity, sleep quality and social support were not significant predictors ($R2 = 0.158$, $F(4,72) = 3.37$, $p = .014$); 3) none of the independent variables predicted inter-shift recovery ($R2 = 0.114$, $F(4, 72) = 2.31$, $p = .06$), or 4) mood state ($R2 = 0.08$, $F(4, 72) = 0.08$, $p = .158$).

MANOVA was conducted to determine the effect of shift length (12 h. vs 8 h.) on chronic and acute fatigue, inter-shift recovery and mood state. A significant difference was found, Wilks Lambda = 0.76, $F(4, 74) = 5.68$, $p < .000$. To identify where the difference existed, Scheffe's post hoc pairwise comparison was conducted. The only difference was inter-shift recovery $F(1, 77) = 10.90$, $p < .000$, between 8-h shift (M = 35.3) compared to 12- h shift (M = 46.33). There was less inter-shift recovery for the 12-h shift RNs (Table 2/Fig. 1). There were no differences for mood, chronic, or acute fatigue for the 8 vs 12-h shifts (Table 3).

Discussion

Registered nurses perform an important role in providing safe care to their patients, literature suggested that shift length and inter-shift recovery can impact the quality of care. Findings from our study did not show a difference in the average number of steps (physical activity), BMI, work immersion, or social support for nurses working eight or twelve hour shifts but there were differences in age and sleep quality. The difference in age may be related to the practice of hiring new graduate nurses for the night shift at this facility allowing more senior nurses to work a straight day position. The 8-h day shift had the highest average age while the 12-h night shift nurse had the lowest average age.

Table 2
Mean and standard deviation of fatigue and mood scores for registered nurses working 12-h day and night shifts and 8-h day and evening shifts.

Shift Type	OFER Chronic		OFER Acute		OFER Recover		Total POMS Ave	
	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	n
12-h, AM	41.83 (22.97)	20	54.83 (12.90)	20	44.00 (15.16)	20	0.08 (9.32)	20
8-h, Days	49.12 (19.27)	19	49.82 (17.44)	19	36.84 (15.92)	19	2.41 (8.17)	19
8-h, Eve	35.83 (26.55)	20	48.33 (17.08)	20	33.83 (18.23)	20	7.58 (10.71)	20
12-h, PM	43.83 (23.47)	20	51.33 (9.13)	20	48.66 (8.67)	20	4.27 (8.86)	20

Older nurses also demonstrated a lower sleep quality which can perhaps be associated with higher work immersion scores or that they work more days in the week than those that work twelve-hour shifts.

This study showed that social support, higher work immersion and lower sleep quality predicted chronic fatigue. Twenty-six percent of the variance for chronic fatigue was predicted by the three independent variables. This indicates that nurses who don't have good social support or sleep and are highly immersed in their work experience chronic fatigue. The degree of physical activity did not predict chronic fatigue.

Higher work immersion was a predictor for acute fatigue even though physical activity, sleep quality and social support were not predictors. The independent variables (shift length, work immersion, sleep quality, and physical demands) did not predict inter-shift recovery or mood state.

This study found a difference between inter-shift recovery for 8-h shift recovery compared to 12-h shift recovery. There was less inter-shift recovery for the 8-h shift nurses; however, there no difference was found in mood, chronic or acute fatigue. These findings indicate that 12-h shifts may not recover as well as 8-h shifts. Mitigation strategies to explore for improving the inter-shift recovery could include a change in organizational scheduling guidelines, the development of a relaxation room, or education on how to help decrease nurse fatigue.

Limitations

The study sample represented the typical characteristics of a single site nursing workforce; mostly female that worked either 12-h or 8-h shifts but did not include the 8-h night shift nurses. In addition, the small sample size may have limited the ability to detect statistically significant relationships. Another limitation was that not all the surveys were completed in a timely manner, which primarily occurred when the nurse worked a 12-h shift and then had several days off. This was of most concern for the POMS questionnaire when recalling a specific mood sensation was required.

Table 3
Pearson correlations (r) for independent variables.

	OFER-C	OFER-A	OFER-R	POMS
Ave Steps	.017 (.442)	.156 (.088)	.031 (.393)	.096 (.203)
Sleep quality	.262 ** (.011)	.116 (.158)	.188 ** (.051)	.228 ** (.023)
Work Immersion	.444 ** (.000)	.338 ** (.001)	.295 ** (.005)	.158 (.084)
Social Support	.251** (.014)	.120 (.150)	.136 (.120)	.001 (.498)

**$p \leq 0.01$.
*$p \leq 0.05$.

Conclusion

The impact of shift length on mood and fatigue in nurses was the focus of this study. The significant finding of interest is the impact of recovery time between shifts and its potential effect on patient care. Nurse recovery time is a factor that organizations need to examine to decrease the risk of nurse fatigue. The fact that age was a factor on 8-h dayshift inter-shift recovery, mitigation strategies need to focus on the needs of the that (often older) population. Learning the perspective of bedside nurses must be the first step in the development of mitigation strategies to decrease fatigue. Any change in organizational guidelines should be based on what the point-of-care nurses identify as potentially helpful.

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