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Acute and chronic fatigue in nurses providing direct patient care and in non-direct care roles: A cross-sectional analysis

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Abstract

Nurses are at risk for work-related fatigue, which can impact their health, well-being, and job readiness. The purpose of this study was to examine the levels, types, and factors associated with fatigue in registered nurses (RNs) in direct patient care (DCRNs) and in non-direct patient care (non-DCRNs) roles. A cross-sectional survey was administered to 313 RNs. Measures included: Multidimensional Fatigue Symptom Inventory, Occupational Fatigue Exhaustion Recovery, Brief COPE, PROMIS® Global Sleep Disturbance, Job Content Questionnaire. Acute fatigue levels in RNs were similar to those in diseased populations, and nearly 50% reported moderate/high levels of chronic fatigue. DCRNs reported higher levels of acute and chronic fatigue than non-DCRNs, but the differences were small and disappeared when accounting for other factors associated with fatigue including sleep disturbance, job strain, workplace support, maladaptive coping, and especially intershift recovery, which accounted for 20–41% of fatigue variability. This study suggests that it may not be only nurses providing direct patient care who are at risk for acute and chronic fatigue. Intershift recovery may be particularly important in alleviating acute and chronic fatigue in nurses.

Keywords

Fatigue; Nurses; Recovery; Sleep; Workplace

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1 INTRODUCTION

Nurses are at increased risk for work-related fatigue, which may impact nurses' safety, health, well-being and readiness to perform assigned duties (Caruso et al., 2019). Fatigue in nurses is associated with burnout (Khamisa, Peltzer, & Oldenburg, 2013), sickness/absenteeism (Brborović, Daka, Dakaj, & Brborović, 2017), medical errors (Bae & Fabry, 2014), job-related injury and reduced job performance (Caruso, 2014; Sagherian, Clinton, Abu-Saad Huijer, & Geiger-Brown, 2017). Acute work-related fatigue is common in nurses, with prevalence rates of moderate to high levels around 75–80% (Chen, Davis, Daraiseh, Pan, & Davis, 2014; Wolf, Perhats, Delao, & Martinovich, 2017). When acute fatigue is coupled with insufficient recovery, it leads to chronic fatigue, which is associated with impaired performance and diminished physical health and well-being (Gifkins, Johnston, Loudoun, & Troth, 2020). Unmitigated fatigue can be so incapacitating that it becomes a driving force behind the decision to leave nursing practice (MacKusick & Minick, 2010).

The Theory of Unpleasant Symptoms is frequently used to illustrate the complex nature of the symptom experience (Lenz, Pugh, Mulligan, Gift, & Suppe, 1997). According to the theory, variables including physiologic, situational, and psychologic factors interrelate and contribute to symptoms such as fatigue. The impact of physiologic factors such as sleep disturbances and poor physical health on fatigue is well established, and there is good evidence that poor sleep predicts higher levels of fatigue in nurses (Çelik, Taşdemir, Kurt, İlgezdi, & Kubalas, 2017; Jones, Hocine, Salomon, Dab, & Temime, 2015; Knupp, Patterson, Ford, Zurmehly, & Patrick, 2018).

Situational factors that may influence fatigue in nurses may be both work and non-work related. Work-related factors associated with higher fatigue in nurses include: inexperience (Yu, Somerville, & King, 2019), workplace strain, in particular high job demands and/or low job control (Fang, Qiu, Xu, & You, 2013; Johnston et al., 2019), and poor workplace social support (Jones et al., 2015; Knupp et al., 2018). Across several studies, nurses who have rapid turnarounds and do not have adequate time to rest and recover between shifts, are at high risk for fatigue (Min, Min, & Hong, 2019b). A recent review of the literature found that the evidence associating workplace schedule characteristics such as night shift, hours worked, and/or shift length with fatigue in hospital nurses was inconsistent (Min et al., 2019b). Outside of work, many nurses are double or even triple duty caregivers, providing unpaid care for a dependent child and/or adult in addition to their nursing job (DePasquale et al., 2016), and such double duty caregiving appears to increase a nurse's risk for fatigue (Smith-Miller, Shaw-Kokot, Curro, & Jones, 2014; Yu et al., 2019).

Researchers have examined fatigue in nurses, particularly the relationships between shiftwork and sleep with fatigue, but there are gaps in the literature. First, past studies have focused on fatigue as a general concept (Min et al., 2019b), with only a small number of studies distinguishing between acute and chronic fatigue or examining subtypes of fatigue such as physical and mental fatigue (Barker & Nussbaum, 2011; Kwiecień-Jaguś & Wujtewicz, 2016; Rostamabadi, Zamanian, & Sedaghat, 2017; Steege, Drake, Olivas, & Mazza, 2015). Second, very few studies have examined psychological factors that are associated with fatigue in nurses. This is problematic, because an individual's emotional

predisposition or coping style, specifically the propensity to experience negative emotions, may predispose individuals to fatigue (Techera, Hallowell, Stambaugh, & Littlejohn, 2016). Finally, nearly all studies have used hospital bedside nurses to study predictors and effects of occupational fatigue (Smith-Miller et al., 2014). Very little is known about the many nurses who work outside of direct patient care such as administrators, educators, and researchers, for whom job characteristics may differ despite being in the same profession. Indeed, one study found that the role expectations and 24-hour accountability of nursing managers and administrators appears to place nursing leaders at particular risk for fatigue (Steege, Pinekenstein, Arsenault Knudsen, & Rainbow, 2017). Thus, a better understanding of the factors that are associated with fatigue and its subtypes in nurses working in diverse roles is warranted.

1.1 Aims

The purpose of this study was to examine the levels, types, and factors associated with fatigue in registered nurses (RNs) in direct patient care (DCRNs) and in non-direct patient care (non-DCRNs) roles. Specific research questions addressed in this study included: What are the levels of acute and chronic fatigue in DCRNs and non-DCRNs, and do these levels differ? What physiologic, psychologic, and situational factors are associated with fatigue in RNs?

2 METHODS

2.1 Design, participants and data collection

This study used cross-sectional survey design to examine fatigue in a convenience sample of RNs at the NIH Clinical Center. Eligibility criteria included: RNs age 18 or older, able to read and speak English, able to complete online surveys. Participants were NIH Clinical Center credentialed RN staff members including staff/direct care nurses, research nurse coordinators, nurse practitioners and nurses in leadership or administrative roles working at the NIH Clinical Center. The NIH Clinical Center is a facility dedicated strictly to clinical research with 200 inpatient beds, 93 outpatient day hospital stations and 15 outpatient clinics for research participants, most enrolled in early phase clinical trials. Because the focus at the NIH Clinical Center is dedicated to research and not exclusively on the delivery of patient care, the nursing staff is composed entirely of RNs, with nearly half working outside of direct patient care in advanced practice, administration, research and/or education. This provides a unique opportunity to explore fatigue in nurses in different roles. Prior to conducting research, this study received ethical approval by the Institutional Review board of the National Institutes of Health (#NCT03789188). Permission was sought and obtained for all questionnaires that required permission prior to recruitment. Recruitment took place over a three-week period in April/May 2019. Recruitment efforts were via email, announcements at nursing units/clinics, large meetings such as nursing practice council and posting of approved flyers. All announcements regarding the study, both oral and via flyers, provided a description of the study that emphasized that the study was voluntary. With the assistance of the NIH Clinical Center Nursing department, a list of emails was developed that included all NIH Clinical Center credentialed RNs but no other recipients. Eligible participants (N =1,176) were sent a blind-copied link to an anonymous online survey,

followed by two reminder emails. In all email communications, a detailed description of the research study was provided to the recipients. This email also informed recipients that the study was voluntary and that consent was implied if the RNs accessed the survey link and completed the online survey.

2.2 Measurement

Measures used in this study are described in Table 1.

2.2.1 Demographic and workplace variables—Demographic questions collected information about age, sex, marital status, race, ethnicity, and educational level. Workplace information included: years of nursing, years in current position, shift length and type (days, evenings, nights, rotating), hours worked per week, and nursing role (staff nurse, research nurse coordinator, administrator/manager, educator, and advance practice nurse). Questions were collected about outside demands including commute time and whether participants were serving as an outside caregiver for dependent children or family member/friend.

2.2.2 Multidimensional Fatigue Symptom Inventory- Short Form (MFSI-SF)—The MFSI-SF uses s a 5-point Likert-scale to assess various dimensions of acute fatigue. Developed for cancer patients, it has been validated and performed reliably in other clinical populations and in healthy individuals (Donovan et al., 2015). The 30-item MFSI-SF asks participants to rate their fatigue in the past week on a scale ranging from 0 (not at all) to 4 (extremely). It consists of five subscales: general, physical, vigor, emotional, and mental. Total scores, ranging from −24 to 96, are calculated by subtracting the vigor score from the sum of the other subscales. Higher scores indicate higher levels of fatigue, with the exception of vigor, which indicates higher energy levels. In this study, vigor was used to calculate total scores, but it was not included as a subscale in the analyses. Total scores in populations with fibromyalgia, sickle cell, cardiometabolic conditions and pregnancy have been moderate to severe (14.8 to 47.8), compared with very low scores (3.4) in healthy controls (Ameringer et al., 2016). Cronbach's alpha values in this study ranged from 0.85 to 0.95.

2.2.3 Occupational Fatigue Exhaustion Recovery (OFER)—The OFER is a 15-item questionnaire that measures acute and chronic fatigue and inter-shift recovery that has been found to be valid and reliable across numerous work populations (Winwood, Winefield, Dawson, & Lushington, 2005). In this study, we examined chronic fatigue and intershift recovery. Chronic fatigue captures persistent mental, physical, and emotional components. Intershift recovery subscale measures the extent to which one recovers from work-related fatigue by the next time that work commences. Each five-item subscale uses a seven-point Likert scale ranging from 0 "strongly disagree" to 6 "strongly agree." Higher scores indicate higher levels of the concept measured. Scores can be divided into quartiles to represent low, low/moderate, moderate/high, and high levels of fatigue and recovery. Cronbach's alpha values in this study were 0.87 (intershift recovery) and 0.90 (chronic fatigue).

2.2.4 Brief Coping Orientation to Problems Experienced (COPE)—The 27-item Brief COPE scale uses a Likert scale, ranging from 1 (I usually don't do this at all) to 4

(I do this a lot) to assesses 14 coping strategies including: self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame (Carver, 1997). Based on the work of Furman et al (Furman, Joseph, & Miller-Perrin, 2018), we computed maladaptive (humor, self-distraction, denial, venting, substance use, behavioral disengagement, self-blame) and adaptive coping (active coping, planning, positive reframing, acceptance, religion, use of emotional support, and use of instrumental support). Cronbach's alpha values were 0.74 (maladaptive) and 0.90 (adaptive).

2.2.5 PROMIS® Global Physical Health and Sleep Disturbance.—

PROMIS® are well-studied measures with demonstrated reliability and construct validity of patients' self-reported health outcomes that are supported by moderate to strong correlations with legacy measures (Cella et al., 2010). PROMIS® measures of global physical health and sleep disturbance were used in this study. Individual items are rated using a 5-point Likert scale ranging from "1" to "5". PROMIS® global physical was measured using a 2-item questionnaire and sleep disturbance was measured using a 4-item questionnaire. Higher scores in the physical scale indicate greater physical health, and higher scores on the sleep disturbance scale reflect worsening sleep disturbance. PROMIS® measures generate a raw score which are converted to T-scores, which are standardized scores that are normed to the general population with a mean of 50 and a standard deviation (SD) of 10.

2.2.6 Job Content Questionnaire (JCQ)—

The JCQ, is a well-validated and reliable 49-item scale, based on the demand/control model of job strain, that measures decision latitude, psychological and physical demands, and coworker and supervisor social support (Karasek et al., 1998). Items are rated on a Likert scale, ranging from 1 (totally disagree) to 4 (totally agree), with higher scores indicating more of each concept. Cronbach's alpha values in this study ranged from 0.73 to 0.91.

2.3 Data Analysis

Descriptive statistics (mean and SD for normally distributed continuous data, median and interquartile range for ordinal and non-normal data, frequencies and percentages for categorical data) were used to describe the levels of fatigue, as well as the physiologic, psychologic, and situational/workplace factors that potentially were associated with fatigue. Based upon our review of the scientific literature, the following factors potentially could be associated with fatigue and were therefore included in the analyses: physiologic factors including age, sex, race, ethnicity, physical health, and sleep disturbance; psychologic factors including emotional coping; and work related and non-work related situational factors including years of nursing experience, hours/week, shift length, shift type (days, nights, rotating), decision latitude, psychological and physical job demands, supervisor and coworker social support, intershift recovery, marital status, commute time, and providing care for dependent children and/or family member. Correlations matrices, parametric (t test and ANOVA) and non-parametric (Wilcoxon rank sum and Kruskal Wallis test) tests were used to examine relationships between physiologic, psychologic, and situational factors with fatigue for DCRNs and non-DCRNs. Because we were interested in seeing whether being a DCRN versus a non-DCRN was associated with fatigue, we included nursing role (DCRN

versus non-DCRN) in all regression models. Otherwise, factors that were related to each outcome at $p < 0.20$ in the bivariate analysis were entered in the multiple linear regression models and stepwise selection with entering criteria of 0.05 and removing criteria of 0.10 were used to select the final models. Multiple linear regression models were then used to assess which factors predict fatigue and its subscales. Normality and homoscedasticity were checked by residual and normal plot. Multicollinearity was checked by tolerance and variance inflation factor (VIF). All data analyses were conducted using IBM SPSS statistics. A p-value less than 0.05 was considered statistically significant. Bonferroni correction was used to control familywise type I error rate for all acute fatigue analyses using the MFSI-SF.

3 RESULTS

Of 1176 RNs invited, 313 (26.6%) responded to the survey and are included in these analyses. Demographic characteristics of participants are shown in Table 2. Approximately 45% (n = 135) were staff nurses/DCRNs; the remainder included research nurses (29.6%, n = 90), advanced practice nurses (9.2%, n = 28), administrators/managers (9.2%, n = 28), and educators/consultants (7.6%, n = 23). Participants were predominantly white (65.4%), non-Hispanic (96.2%), employed full time (87.5% working 30+ hours/week) and highly educated, with all holding a bachelor's degree or higher. Nearly all (85.3%) worked day shift, and the total daily commute time was long (mean = 78.2±50.5 minutes).

3.1 Levels and types of fatigue in DCRNs and non-DCRNs

Levels of fatigue and influencing factors, along with T test differences between DCRNs and non-DCRNs are shown in Table 3. DCRNs had higher overall acute fatigue, as evidenced by MFSI total scores (21.40 ± 19.31 vs. 14.5 ± 19.19, $p = 0.002$), and significantly higher levels of general fatigue (11.95 ± 5.96, vs. 9.63 ± 5.77, $p = 0.001$), physical fatigue (6.65 ± 5.01 vs. 4.87 ± 4.13, $p = 0.001$) and chronic fatigue (51.69 ± 27.82 vs. 43.66 ± 27.9, $p = 0.019$) than non-DCRNs. No group differences were noted in emotional and mental fatigue. Overall, 49.2% (n = 135) of the nurses had moderate to high levels of chronic fatigue, including 53.5% (n = 64) of DCRNs and 46.2% (n = 71) of non-DCRNs.

3.2 Factors associated with fatigue in RNs

Final models from the regression analyses examining factors associated with fatigue in RNs are shown in Table 4. Multicollinearity of independent variables showed that tolerance and VIF ranged from 0.65 – 0.97, and 1.03 – 1.54 respectively in all models. The models accounted for 62% of the variability in chronic fatigue, 59% in total acute fatigue, and between 36 to 50% of the variability in the acute fatigue subtypes. Intershift recovery was the only factor that predicted every type of acute as well as chronic fatigue in this sample of RNs. Intershift recovery had the strongest effect size of any other factor in predicting all types of fatigue, accounting for 32% of the variability in chronic fatigue and between 20–41% of the variability in acute fatigue and its subtypes. Higher maladaptive coping was associated with higher chronic fatigue and every subtype of acute fatigue except physical fatigue. Higher sleep disturbance was associated with higher levels of total acute fatigue and its subtypes, with the exception of mental fatigue, although it did not significantly predict levels of chronic fatigue. Sleep disturbance accounted for 10% of the variability in total

acute fatigue, and it accounted for one to seven percent of the variability of the acute fatigue subtypes. Higher workplace strain, consisting of higher psychological job demands and lower decision latitude, was associated with increased chronic fatigue in these nurses, while higher coworker support was associated with lower chronic, physical and emotional fatigue. After controlling for all other variables in the models, there were no longer significant differences in levels of acute or chronic fatigue in DCRNs and non-DCRNs.

4 DISCUSSION

DCRNs experienced higher total levels of acute and chronic fatigue than non-DCRNs, with total scores for the MFSI in DCRNS being higher than those found in individuals with insomnia (Thorndike et al., 2013). Both groups experienced levels of acute fatigue, as measured by total MFSI scores, that were much higher than levels of acute fatigue previously found in healthy individuals (Ameringer et al., 2016); levels of acute fatigue in both groups of nurses were more similar to clinical populations of women undergoing breast cancer treatment (Bower et al., 2013) and other medical conditions (Ameringer et al., 2016). More than half of the DCRNs had moderate to high levels of chronic fatigue. Levels of chronic fatigue in all nurses were higher than those found in a sample of New Zealand intensive care nurses working 12-hour shifts (Yu et al., 2019), but lower than those found in Lebanese direct care nurses (Sagherian et al., 2017) and in Korean direct patient care nurses working rotating shifts (Min et al., 2019a). It is interesting to note that the differences in levels of acute and chronic fatigue in DCRNs compared with non-DCRNs were small, and those group differences disappeared once other factors were considered in the regression models. This suggests that it is the physiological, psychological and situational factors that contribute to fatigue and not necessarily the nurses' role that place nurses at high risk for fatigue.

In this study, sleep disturbance was associated with total acute fatigue, but not with chronic fatigue. Unlike Min et al. (2019b), who found an association between total hours worked and shift length with fatigue, shift length did not significantly predict acute or chronic fatigue in this group of nurses, and hours per week predicted only mental fatigue. In this study, intershift recovery accounted for the highest amount of variability in chronic fatigue and every type of acute fatigue. While sleep, shift length and hours worked explained little variability in fatigue in this study, it should be noted that all of those factors could contribute to poor recovery (Gifkins et al, 2020). This highlights the very complex and interconnected nature of the factors associated with fatigue.

Unlike Fang et al. (2013), who found that higher job strain was associated with higher general acute fatigue, we found that lower decision latitude but not job demands predicted higher general fatigue. Fang et al. (2013) also found that higher job demands predicted higher chronic fatigue, while we found that both higher job demands and lower decision latitude were significantly associated with higher levels of chronic fatigue. In this study, higher coworker social support significantly predicted lower chronic and total acute fatigue, particularly emotional fatigue. Similarly, emotional coping, specifically higher use of maladaptive coping, was significantly associated with higher levels of chronic and total

acute fatigue. Yet, the topics of social support and emotional coping in nursing, specifically as it relates to fatigue, has received very little research attention to date.

Perhaps the most important contribution of this study was the inclusion of nurses in a broad range of roles, as well as multiple subtypes of acute fatigue. The findings suggest that it is not necessarily providing direct patient care that places nurses at risk for acute and chronic fatigue. Rather, it is a cumulation of factors including including workplace strain, sleep, workplace social support, emotional coping, and most importantly, the ability to recover between shifts. Past research on acute fatigue primarily focused on fatigue in general. This is problematic because questionnaires such as the MFSI general fatigue subscale measure overall feelings of being tired, worn out, and run down, but they do not collect information about emotional or mental fatigue. However, in this group of nurses, emotional fatigue was at least as problematic for all nurses as physical fatigue and even more problematic than mental fatigue. These findings underscore the need for future research to better understand the complex nature of fatigue in nurses, and to develop interventions specific to the different subtypes of fatigue, particularly emotional fatigue. Such research would be beneficial to all nurses, not just those providing direct patient care at the bedside.

4.1 Limitations

This study conducted an anonymous online survey. Unlike studies that rely on objective data, studies that rely on self-reports of a subjective concept such as fatigue will be at risk of deception, recall and response bias. The low response rate is another limitation of the study. The cross-sectional nature of the study allows us to see associations between variables, but it makes it impossible to draw definitive conclusions regarding the *causation* of fatigue in nurses. Additionally, this study did not include all possible confounders, such as psychological resilience and/or the practice of health-promoting or health risk behaviors, and these should be examined in future studies. The study subjects included a convenience sample of RNs from the NIH Clinical Center, which is a unique research hospital with a nearly all-RN staff, many of whom are highly educated. Thus, the findings might not be generalizable to other nursing environments that include a more diverse mix of nurses, and assistants/technicians.

5 Relevance for clinical practice

These findings underscore the importance of recovery in alleviating acute and chronic fatigue in all nurses, not just those providing direct patient care. Recovery is not only physical but psychological in nature (Verbeek et al., 2019). In order for nurses to adequately recover from work-related fatigue, they must physically and psychologically detach from work (Wendsche & Lohmann-Haislah, 2016). However, a recovery paradox exists whereby the greater job strain an individual experiences, the less likely they are to be able to detach from work during nonwork time (Sonnetag, 2018); individuals who are unable to detach from work are more likely to experience deterioration in mood and impaired sleep. As a result, they may return to work the next day functioning at reduced capacity, putting them more at risk for fatigue, interpersonal conflict, and further job stress (Sonnentag, 2018).

Interrupting this cycle of job stress coupled with lack of recovery necessitates physically and emotionally distancing oneself from work, yet strategies to improve recovery between shifts has received very little research attention in nursing. Most studies examining intershift recovery in nurses have focused on the lack of recovery between shifts, and these have been cross-sectional or descriptive in nature versus interventions (Gifkins et al., 2020). Fortunately, recovery is modifiable, and interventions to improve recovery have been successfully implemented in many work settings outside of nursing (Verbeek et al., 2019); These interventions have been person-directed, including improving sleep, increasing physical activity and training in stress reduction and/or relaxation, as well as work-directed interventions that target task variation, work-break schedules, and participatory management. Research is needed to assess the impact of such interventions on intershift recovery in nurses, as well as on how such interventions increase nurses' resilience to acute and chronic fatigue. Because nurses may be at particular risk for the recovery paradox, additional research is needed to regarding how to increase uptake of these behavioral interventions among nurses.

4.2 Conclusion

Nurses providing direct patient care in this study had significantly higher levels of acute and chronic fatigue than did nurses outside of direct care, but the differences were mostly small. These group differences disappeared when accounting for other factors that were associated with fatigue such as sleep disturbance, workplace strain, workplace social support, emotional coping, and especially intershift recovery. These findings highlight the importance of intershift recovery and emphasize the need for novel interventions to increase recovery in all nurses, not just those providing direct patient care.

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Key Points

- Workplace fatigue is common in nursing, and nurses providing direct patient care as well as those in non-direct care roles may be at risk.
- Workplace social support, particularly peer support, may be beneficial in reducing acute and chronic fatigue in nurses.
- Recovery between shifts is associated with lessening acute and chronic fatigue in nurses.

Table 1.

Measures used in survey

Measure	Objective	Responses	No. Items	Range/ category	Cronbach's α
Multidimensional Fatigue Symptom Inventory – Short Form (MFSI-SF) General Physical Vigor Emotional Mental Total †	Patient-reported outcome of acute fatigue	Likert Scale; 0 (not at all) – 4 (extremely)	30	24 – 96	0.84–0.93 (Donovan et al., 2015)
Occupational Fatigue Exhaustion Recovery (OFER) Acute Fatigue Chronic Fatigue Intershift Recovery	Evaluation of work-related fatigue	Likert Scale; 0 (strongly disagree) – 6 (strongly agree)	15	0–90	0.75–0.93 (Winwood, Winefield, Dawson, & Lushington, 2005)
Brief Coping Orientation to Problems Experienced (Brief COPE) ‡ Maladaptive Coping Adaptive Coping	Evaluation of various coping strategies to demands and stress	Likert Scale; 1 (I usually don't do this at all) – 4 (I do this a lot)	27	7–28	0.50–0.90 (Carver, 1997)
PROMIS® Global Physical Health	Patient-reported overall general evaluations of physical health	Likert Scale; 1 (Excellent; Completely) – 5 (Poor; Not at All)	2	2–10	0.81 (Cella et al., 2010)
PROMIS® Sleep Disturbance	Patient-reported evaluation of sleep quality	Likert Scale; 1 (not at all) – 5 (very much)	4	4–20	0.84 (Cella et al., 2010)
Job Content Questionnaire (JCQ) Decision Latitude Psychological Demands Physical Demand Coworker Support Supervisor Support	Evaluation of job strain and workplace social support and	Likert Scale; 1 (totally disagree) – 4 (totally agree)	49	49–196	0.58–0.86 (Karasek et a., 1998)

† Total calculated by sum of all subscales subtracted by Vigor

‡ For the Brief Cope (Furman et al., 2018), Adaptive Coping includes the subscales: Acceptance, Active Coping, Emotional Support, Instrumental Support, Planning, Positive Reframing, and Religion. Maladaptive Coping includes the subscales: Behavioral Disengagement, Denial, Humor, Self-Distraction, Venting, Self-Blame, and Substance Use.

TABLE 2

Descriptive characteristics of participants (N = 313)

Descriptive Characteristics	Mean (SD) Range
Age in Years (n = 237)	47.59 (11.52) 23 – 74
	n (%)
Sex (n = 241)	
Female	222 (92.1)
Race (n = 246)	
White	161 (65.4)
Black/African American	43 (17.5)
Asian	27 (11.0)
Multiracial	5 (2.0)
Other/Not Specified	10 (4.1)
Ethnicity (n = 239)	
Non-Hispanic	230 (96.2)
Marital Status (n = 247)	
Married/Partnered	181 (73.3)
Never Married/Single	37 (15.0)
Divorced/Separated	28 (11.3)
Widowed	1 (0.4)
Education (n = 247)	
Diploma/Associate's Degree	16 (6.5)
Bachelor's Degree	135 (54.6)
Master's Degree	82 (33.2)
PhD/Doctoral Degree	14 (5.7)
Nursing Role (n = 304)	
Direct Patient Care	135 (44.4)
Research Nurse/Case Manager	90 (29.6)
Administrator/Manager	28 (9.2)
Advanced Practice †	28 (9.2)

Educators/Consultants	23 (7.6)

Note. Numbers may not sum to total due to missing data.

[†]Advanced practice nurses include nurse practitioners, clinical nurse specialists, nurse anesthetists, and nurse scientists

TABLE 3

Fatigue and potential influencing factors with comparisons between RNs providing direct patient care and those outside of direct patient care†

	All Nurses (N = 313)	Direct Care (N = 135)	Non-Direct Care† (N = 169)		Effect size
		Mean (SD) Range Skewness/Kurtosis n		*t*	Cohen's *d*‡
Fatigue Variables					
General Fatigue §	10.66 (5.95) 0 – 24 0.51/−0.62 n=297	11.95 (5.96) 0 – 24 0.15/−0.81 n=132	9.63 (5.77) 0 – 24 0.85/−0.03 n=164	3.383**	0.40
Physical Fatigue §	5.65 (4.62) 0 – 24 1.04/0.86 n=297	6.65 (5.01) 0 – 24 0.92/0.64 n=132	4.87 (4.13) 0 – 19 1.05/0.63 n=164	3.286**	0.39
Emotional Fatigue §	6.19 (4.69) 0 – 23 0.92/0.45 n=299	6.65 (4.89) 0 – 20 0.75/−0.10 n=132	5.83 (4.52) 0 – 23 1.06/1.08 n=166	1.483	0.17
Mental Fatigue §	4.80 (4.04) 0 – 22 1.20/1.49 n=297	5.03 (4.13) 0 – 22 1.07/1.40 n=132	4.63 (3.96) 0 – 19 1.31/1.67 n=164	0.832	0.10
Total Fatigue §	17.54 (19.49) −20 – 76 0.63/0.10 n=297	21.40 (19.31) −14 – 70 0.51/0.04 n=132	14.50 (19.19) −20 – 76 0.77/0.33 n=164	3.065**	0.36
Chronic Fatigue ¶	47.24 (28.06) 0 – 100 0.16/−1.08 n=275	51.69 (27.82) 0 – 100 0.11/−1.08 n=120	43.66 (27.90) 0 – 100 0.22/−1.10 n=154	2.369*	0.29
Physiologic Variables					
Physical Health #	49.65 (7.30) 23.4 – 63.3 −0.23/0.00 n=257	48.48 (7.03) 23.4 – 63.3 −0.47/0.75 n=113	50.52 (7.42) 33.2 – 63.3 −0.11/−0.58 n=143	−2.237*	0.28
Sleep Disturbance #	52.99 (8.40) 32.0 – 73.3 0.16/0.02 n=251	53.42 (9.35) 32.0 – 73.3 0.09/−0.31 n=110	52.63 (7.61) 32.0 – 73.3 0.19/0.31 n=140	0.713	0.09
Psychologic Variables					

Maladaptive Coping ††	24.69 (5.52) 14 – 39 0.43/−0.06 n=243	25.17 (5.72) 14 – 38 0.22/−0.16 n=105	24.34 (5.37) 14 – 39 0.60/0.12 n=137	1.166	0.15
Adaptive Coping ††	36.03 (8.90) 14 – 56 −0.04/−0.28 n=242	36.05 (8.93) 14 – 56 −0.03/−0.17 n=104	36.05 (8.95) 14 – 56 −0.05/−0.34 n=137	−0.003	0.00
Work Situational Variables					
Years of Nursing Practice	19.90 (11.65) 0 – 45 0.36/−0.88 n=312	15.28 (10.47) 0 – 45 0.79/−0.01 n=134	23.51 (11.49) 0 – 45 0.08/−1.08 n=169	−6.510***	0.74
Years in Current Position	6.24 (6.59) 0 – 33 1.56/2.34 n=307	6.62 (7.17) 0 – 33 1.53/2.15 n=133	5.90 (6.12) 0 – 31 1.57/2.42 n=168	0.921	0.11
Hours/Week Worked	39.32 (9.87) 3 – 80 −1.17/3.53 n=305	36.45 (10.16) 8 – 72 −1.04/1.86 n=134	41.63 (9.08) 3 – 80 −1.39/6.63 n=169	−4.618***	0.54
Shift Length/Hours per Day	9.32 (1.70) 4 – 13 0.74/−0.52 n=305	10.33 (1.85) 8 – 13 −0.13/−1.63 n=134	8.51 (1.01) 4 – 12 1.06/5.50 n=169	10.209***	1.26
Decision Latitude ‡‡	65.87 (12.48) 23 – 94 −0.43/0.65 n=283	61.35 (11.16) 24 – 88 −0.52/0.66 n=123	69.41 (12.36) 24 – 94 −0.66/1.25 n=159	−5.662***	0.68
Physical Exertion ‡‡	6.21 (2.36) 3 – 12 0.58/−0.34 n=284	7.85 (2.21) 3 – 12 −0.06/−0.42 n=123	4.93 (1.55) 3 – 12 0.89/1.74 n=160	12.542***	1.57
Psychologic Job Demands ‡‡	34.12 (6.06) 17 – 48 0.10/−0.40 n=281	34.51 (5.83) 20 – 48 −0.02/−0.55 n=122	33.81 (6.25) 17 – 48 0.21/−0.28 n=158	0.954	0.12
Supervisor Social Support ‡‡	12.14 (3.93) 4 – 32 0.88/4.84 n=281	11.21 (4.13) 4 – 32 1.36/5.93 n=121	12.84 (3.64) 4 – 32 0.64/5.42 n=159	−3.488**	0.42
Coworker Social Support ‡‡	11.98 (2.04) 4 – 16 −0.47/1.64 n=282	11.66 (1.90) 4 – 16 −0.60/2.49 n=123	12.23 (2.11) 5 – 16 −0.48/1.31 n=158	−2.338*	0.28
Non-work Situational Variables					

Total Minutes Commute/day	78.16 (50.53) 0 – 300 0.82/0.53 n=305	74.87 (53.29) 6 – 300 1.29/1.90 n=135	81.18 (48.05) 0 – 190 0.37/−0.79 n=169	−1.083	0.13
Intershift Recovery ¶	45.64 (23.61) 0 – 100 0.11/−0.67 n=275	40.84 (23.63) 0 – 96.67 0.21/−0.59 n=119	49.32 (23.07) 0 – 100 0.07/−0.73 n=155	−2.984 **	0.36
		n (%)		x^2	**Odds ratio**
Shift Rotating/Variable				26.467 ***	0.03
No	287 (92.6)	113 (83.7)	168 (99.4)		
Yes	23 (7.4)	22 (16.3)	1 (0.6)		
Double Duty Caregiver §§				1.279	0.77
No	147 (49.3)	60 (45.8)	87 (52.4)		
Yes	151 (50.7)	71 (54.2)	79 (47.6)		

Note: Numbers may not sum to total due to missing data.

†Non-direct care RNs include advanced practice nurses, administrators/managers, nurse scientists, educators, and research nurse coordinators/research nurses.

‡Cohen's *d* effect size = 0.20 small, 0.50 medium, and 0.80 large.

§Assessed using the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF).

¶Assessed using the Occupational Fatigue Exhaustion Recovery (OFER).

#Assessed using Patient-Reported Outcome Measurement Information System (PROMIS).

††Assessed using the Brief COPE.

‡‡Assessed using the Job Content Questionnaire (JCQ).

§§Double duty caregiver: providing unpaid care for dependent children and/or family member.

*$p < 0.05$;

**$p < 0.01$;

***$p < 0.001$

TABLE 4

Final models of regression analyses examining factors that influence fatigue in RNs

General fatigue†						
Variables	**Unadjusted B (SE)**	**B (SE)**	**R^2**	**Cumulative R^2**	**t**	**Bonferroni-adjusted *p***
(Constant)		5.55 (3.60)			1.54	0.50
Role of the nurse‡	−2.32 (0.69)	−0.83 (0.67)	0.03	0.03	−1.24	0.86
Intershift recovery§	−0.15 (0.01)	−0.10 (0.02)	0.31	0.34	−6.61	< 0.01
Sleep disturbance¶	0.35 (0.04)	0.16 (0.04)	0.07	0.41	3.63	< 0.01
Decision latitude#	−0.16 (0.03)	−0.12 (0.03)	0.02	0.43	−4.09	< 0.01
Maladaptive coping††	0.38 (0.07)	0.16 (0.06)	0.02	0.45	2.63	0.04
Psychologic job demands#	0.27 (0.06)	0.13 (0.06)	0.01	0.45	2.38	0.07
Supervisor social support#	−0.30 (0.09)	0.19 (0.10)	0.01	0.46	1.99	0.19
Physical fatigue†						
Variables	**Unadjusted B (SE)**	**B (SE)**	**R^2**	**Cumulative R^2**	**t**	**Bonferroni-adjusted *p***
(Constant)		16.45 (3.23)			5.10	< 0.01
Role of the nurse	−1.78 (0.53)	−0.81 (0.51)	0.03	0.03	−1.59	0.46
Intershift recovery§	−0.09 (0.01)	−0.06 (0.01)	0.20	0.23	−4.77	< 0.01
Physical health¶	−0.27 (0.04)	−0.16 (0.04)	0.08	0.31	−4.56	< 0.01
Sleep disturbance¶	0.21 (0.03)	0.10 (0.03)	0.03	0.34	2.84	0.02
Coworker support#	−0.73 (0.13)	−0.35 (0.13)	0.02	0.36	−2.68	0.03
Emotional fatigue†						
Variables	**Unadjusted B (SE)**	**B (SE)**	**R^2**	**Cumulative R^2**	**t**	**Bonferroni-adjusted *p***
(Constant)		1.66 (2.63)			0.63	> 0.99
Role of the nurse‡	−0.81 (0.55)	−0.16 (0.48)	0.01	0.01	−0.33	> 0.99

Intershift recovery[§]	−0.10 (0.01)	−0.05 (0.01)	0.26	0.27	−4.65	< 0.01
Maladaptive coping[‡‡]	0.46 (0.05)	0.29 (0.04)	0.14	0.40	6.43	< 0.01
Coworker support[#]	−1.01 (0.13)	−0.54 (0.12)	0.07	0.47	−4.46	< 0.01
Sleep disturbance[††]	0.27 (0.03)	0.13 (0.03)	0.04	0.50	4.05	< 0.01

Mental fatigue[†]

Variables	Unadjusted B (SE)	B (SE)	R^2	Cumulative R^2	t	Bonferroni-adjusted *p*
(Constant)		−2.14 (2.22)			−0.97	> 0.99
Role of the nurse[‡]	−0.39 (0.47)	1.42 (0.56)	0.00	0.00	2.51	0.05
Intershift recovery[§]	−0.09 (0.01)	−0.06 (0.01)	0.23	0.23	−5.64	< 0.01
Maladaptive coping[††]	0.31 (0.04)	0.19 (0.04)	0.08	0.31	4.16	< 0.01
Long shifts (11+ hours)	1.40 (0.55)	2.04 (0.66)	0.03	0.35	3.09	0.01
Sleep disturbance[¶]	0.18 (0.03)	0.07 (0.03)	0.01	0.36	2.17	0.12
Years nursing practice	−0.08 (0.02)	−0.05 (0.02)	0.01	0.37	−2.13	0.14

Total fatigue[†]

Variables	Unadjusted B (SE)	B (SE)	R^2	Cumulative R^2	t	*p*
(Constant)		4.31 (9.94)			0.43	0.67
Role of the nurse[‡]	−6.90 (2.25)	−2.89 (1.80)	0.02	0.02	−1.60	0.11
Intershift recovery[§]	−0.53 (0.04)	−0.35 (0.04)	0.41	0.43	−8.32	< 0.01
Sleep disturbance[¶]	1.26 (0.13)	0.60 (0.12)	0.10	0.53	5.02	< 0.01
Maladaptive coping[††]	1.69 (0.20)	0.78 (0.17)	0.04	0.57	4.62	< 0.01
Coworker support[#]	−3.88 (0.53)	−1.56 (0.46)	0.02	0.59	−3.42	< 0.01
Double duty caregiver[‡‡]	7.76 (2.26)	3.76 (1.76)	0.01	0.59	2.13	0.03

Chronic fatigue[§]

Variables	Unadjusted B (SE)	B (SE)	R^2	Cumulative R^2	t	*p*

(Constant)		45.29 (13.09)			3.46	< 0.01
Role of the nurse‡	−8.04 (3.39)	1.87 (2.59)	0.01	0.01	0.72	0.47
Intershift recovery§	−0.69 (0.06)	−0.34 (0.06)	0.32	0.33	−5.85	< 0.01
Coworker support#	−7.26 (0.71)	−3.01 (0.71)	0.12	0.45	−4.25	< 0.01
Maladaptive coping††	2.39 (0.29)	1.42 (0.23)	0.08	0.53	6.13	< 0.01
Psychologic job demands#	2.10 (0.25)	1.41 (0.22)	0.06	0.59	6.57	< 0.01
Decision latitude#	−0.83 (0.13)	−0.50 (0.12)	0.03	0.62	−4.25	< 0.01

Abbreviation: B, unstandardized coefficient; SE, standard error

† Assessed using the Multidimensional Fatigue Symptom Inventory-Short Form (MFSI-SF).

‡ Role coded 0 = direct care RN, 1 = non-direct care RN.

§ Assessed using the Occupational Fatigue Exhaustion Recovery (OFER).

¶ Assessed using Patient Reported Outcome Measurement Information System (PROMIS).

Assessed using the Job Content Questionnaire (JCQ).

†† Assessed using the Brief Coping Orientation to Problems Experienced (COPE).

‡‡ double duty caregiver = providing unpaid care for a dependent child or adult. Coded 0 = not double duty caregiver, 1 = double duty caregiver