Factors Associated With Work-Related Fatigue and Recovery in Hospital Nurses Working 12-Hour Shifts

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ABSTRACT

Nurse fatigue threatens both nurse and patient safety; fatigue affects nurses' neurocognitive functioning and hinders their work performance. The authors assessed the association of work and non-work factors with acute and chronic fatigue and intershift recovery among hospital nurses working 12-hour shifts. This study used survey data from 80 nurses who provided full-time direct patient care on medical-surgical and critical care units in a large teaching hospital. Psychological job demands (e.g., work load and social support from supervisor or coworker) were significantly associated with acute and chronic fatigue and intershift recovery. Rotating shifts were significantly related to acute fatigue. Findings suggest the need for a comprehensive approach to fatigue management, including organizational support to provide healthful work schedules and favorable nursing work environments, fewer psychological and physical demands, and assistance to improve nurses' sleep quality and quantity. [*Workplace Health Saf* 2014;62(10):409-414.]

Fatigue is defined as a sense of exhaustion, tiredness, or lack of energy that can result in distress or burnout (Raftopoulos, Charalambous, & Talias, 2012; Shen, Barbera & Shapiro, 2006; Valent, 2002). Because fatigue is known to impair physical and cognitive functioning, the impact of fatigue has been studied in various working populations (Dinges, 2004; Roelen, van Rhenen, Groothoff, van der Klink, & Bültmann, 2014).

Nurse fatigue has been nationally recognized as a threat to both nurse and patient safety (American Nurses Association [ANA], 2006a, 2006b). Being fatigued affects nurses' neurocognitive functioning and hinders work performance (Geiger-Brown et al., 2012). Occupational injuries, such as back, neck, and shoulder musculoskeletal disorders and needlestick injuries, have been associated with long work hours (Trinkoff et al. 2006; Trinkoff, Lipscomb, Brady, & Geiger-Brown, 2007), and extreme fatigue (Smith, Mihashi, Adachi, Nakashima, & Ishitake, 2006; Suzuki, Ohida, Kaneita, Yokoyama, & Uchiyama, 2005; Swaen, van Amelsvoort, Bültmann, & Kant, 2003). In addition, fatigued nurses drive when drowsy, exposing them and the public to crash risk (Scott et al., 2007).

Work schedules, especially long work hours, can lead to nurse fatigue. Although the amount of sleep varies by schedule, nurses working 12-hour shifts sleep on average only 5 hours between shifts (Geiger-Brown et al., 2012), shorter than the 7 to 8 hours per day recommended in the sleep guidelines from the National Heart, Lung, and Blood Institute (2012). As nurses continue to get insufficient sleep, both sleep debt and fatigue increase over successive 12-hour shifts (Geiger-Brown et al., 2012). Furthermore, irregular sleep patterns due to rotating shift work affect sleep quality, which also may increase fatigue among nurses. More recently, studies have shown that schedules without sufficient time off from work to rest or restore lead to medication errors (Rogers, 2008) and patient mortality (Trinkoff et al., 2011).

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Applying Research to Practice

Nurse managers must create supportive work environments to prevent nurse fatigue and burnout. In addition, administrators should pay more attention to scheduling and enhancing work group cohesion among nurses and between nurses and physicians, and promote procedural justice to reduce psychological exhaustion at the workplace and increase nurses' quality of care. To enhance recovery between shifts and reduce fatigue, educational interventions can be provided via tailored programs. Further studies investigating factors affecting nurse fatigue and recovery in various work settings and intervening with comprehensive action plans are needed.

In this context, the ANA (2006a) recommends that nurses recognize the impact of fatigue on their ability to practice safely. Furthermore, organizational systems should create a supportive culture for nurses' rights and obligations to refuse to work when they are excessively fatigued (ANA, 2006a, 2006b). More recently, The Joint Commission (2011) also produced a sentinel event alert for addressing health care worker fatigue and preventing patient harm from provider fatigue.

With acknowledgment of the harmful effects of nurse fatigue, many studies have addressed factors related to fatigue. Extended work schedules have potentially harmful consequences such as sleep deprivation and adverse impact on nurse performance (Geiger-Brown & Trinkoff, 2010a, 2010b). A 12-hour shift, which is now a common shift length for staff nurses, actually requires nurses to be engaged in their workplace for more than 13 hours, due to extra tasks such as paperwork (Trinkoff, Geiger-Brown, Brady, Lipscomb, & Muntaner, 2006). This extended time may result in insufficient time to achieve adequate sleep between shifts. In addition, physically demanding work such as lifting and moving heavy objects (e.g., patients and equipment) and constant movement and walking can produce fatigue (Trinkoff, Storr, & Lipscomb, 2001; Winwood & Lushington, 2006). However, despite efforts to mitigate fatigue among nurses, these well-known factors have been difficult to change.

Hospital nurses who deliver direct patient care are often subjected to adverse working conditions (e.g., extended hours, shifts, and physically demanding work) simultaneously, as well as psychological demands (e.g., time pressure and heavy workloads). Although some occupational fatigue can be relieved during work breaks between tasks, the majority of recovery occurs in non-work hours (i.e., between shifts at home) (Winwood, Winefield, Dawson, & Lushington, 2005). But, in addition to adverse work schedules and job demands, nurses experience home demands that further exacerbate work-related fatigue. The combination of extended work schedules with long commutes and domestic responsibilities such as caring for children or elderly relatives and housekeeping chores further deprives nurses of sleep opportunities. These demands can also interfere with nurses' ability to recover from fatigue. Prolonged acute fatigue without sufficient recovery may evolve into chronic fatigue and further maladaptive stress and fatigue-related health outcomes (Winwood et al., 2005; Winwood & Lushington, 2006).

The purpose of this study was to examine the association between work and non-work fatigue-producing factors and self-reported acute and chronic fatigue and intershift recovery among nurses. The researchers examined these factors in hospital nurses working 12-hour shifts on medical-surgical and critical care units, where nurses' fatigue and cognition are crucial for patient and nurse safety.

METHODS

Sample and Data Collection

This study used survey data from the Nurses Sleep Study (NSS) (Geiger-Brown et al., 2012) conducted to investigate sleep, sleepiness, fatigue, and neurocognitive performance among nurses working successive 12-hour shifts. The NSS recruited 175 female registered nurses who provided full-time (≥ 36 hours per week) direct patient care on medical-surgical and critical care units at a large teaching hospital. Of the 138 registered nurses who were eligible for the study (no acute stressors [e.g., deaths or divorce] in the past year, no sedating or activating medication use, and no previously diagnosed sleep disorders), 58 registered nurses were excluded because their work schedules did not comply with the study protocol (restricted to nurses working three or more 12-hour shifts in a row preceded by 2 days off), yielding a final sample of 80 nurses. The NSS protocol was approved by the university's Institutional Review Board.

For this analysis, the authors included all survey data collected on the day off prior to starting the three successive 12-hour shifts (n = 80). Characteristics of the study nurses have been previously described (Geiger-Brown et al., 2012). Briefly, on average, nurses were 37 years old (range: 23 to 64 years) and had 10 years of nursing experience. Regarding work schedules, 41% worked night shifts only and 23% routinely rotated shifts (e.g., days vs. nights). Almost 30% of nurses provided some child or elder care when at home.

Study Variables

Work-related fatigue and recovery between shifts were measured using the Occupational Fatigue Exhaustion Recovery scale (OFER) with psychometric properties validated in a sample of nurses (Winwood et al., 2005; Winwood, Lushington, & Winefield, 2006). The OFER scale includes three 5-item subscales that measure acute and chronic fatigue plus intershift recovery (recovery between shifts), for a total of 15 Likert-type items. These items use a 7-point response ranging from strongly disagree (0) to strongly agree (6), with the central score neutral. The acute fatigue items are: "after a typical work period I have little energy left," "I usually feel exhausted when I get home from work," "my work drains my energy completely every day," "I usually have lots of energy to give my family or friends," and "I usually have plenty of energy left for my

hobbies and other activities after I finish work." The chronic fatigue items are: "I often feel I'm at the end of the rope with my work," "I often dread waking up to another day of my work," "I often wonder how long I can keep going at my work," "I feel that most of the time I'm just living to work," and "too much is expected of me in my work." The intershift recovery items are: "I never have enough time between work shifts to recover my energy completely," "even if I'm tired from one shift, I'm usually refreshed by the start of the next shift," "I rarely recover my strength fully between work shifts," "recovering from work fatigue between work shifts isn't a problem for me," and "I'm often still feeling fatigued from one shift by the time I start the next one." Each subscale sums the five items. Higher scores for acute and chronic fatigue indicate more fatigue, whereas higher scores for intershift recovery reflect better recovery. For this study, the researchers defined nurses with high fatigue or recovery as those with subscale scores above the 75th percentile.

Two types of job demands were assessed: physical and psychological. Physical demands included duration, level, and frequency of physical exertion using 12 items, some of which were adapted from the Job Content Questionnaire (Karasek, 1985) plus additional nurse-specific items (Trinkoff, Lipscomb, Geiger-Brown, Storr, & Brady, 2003). This scale showed high predictive validity for musculoskeletal disorders among nurse samples (Trinkoff et al., 2003). Psychological demands were measured using the Job Content Questionnaire and the Copenhagen Psychosocial Questionnaire (COPSOQ) widely used to comprehensively assess psychological demands on hospital workers (Aust, Rugulies, Skakon, Scherzer, & Jensen, 2007). The Job Content Questionnaire psychological demands measures were six Likert-type items that assessed how often they were required to work: hard, fast, excessively, with intense concentration, with frequent interruption, and with delays from other individuals or departments. In addition, 43 COPSOQ items used a 5-point Likert format in the following domains, some of which slightly overlapped with the Job Content Questionnaire: (1) quantitative (e.g., work accumulating and not enough time to complete tasks); (2) cognitive (e.g., needing to create new ideas and make difficult decisions); and (3) emotional (e.g., emotionally disturbing or demanding situations). Other COPSOQ items measured leadership quality and coworker support, job satisfaction, feedback from boss and coworkers, role conflict, and workplace atmosphere and sense of community (Kristensen, Hannerz, Høgh, & Borg, 2005).

Work schedules were measured for rotation (routinely rotating or fixed shifts) and shift (day or night). For shift, the researchers included responses from nurses who answered "routinely fixed" for the rotation item ($n = 62$). Demographic characteristics included age in years, race/ethnicity (white, African-American, and Asian or other), marital status (married or not), highest degree earned (diploma/associate, bachelor's or higher), years of registered nurse experience and current student status (yes/no). Home demands were measured with one item assessing caring for children or elders (yes/no) (Killien, 2004; Mulsow, Caldera, Pursley, Reifman, & Huston, 2002).

Statistical Analysis

Analyses were accomplished using SPSS version 19.0 (SPSS, Inc., Chicago, IL). To compare work and non-work factors by nurse fatigue and recovery, *t* tests were calculated for continuous variables (e.g., age and job demand scale scores). For categorical variables, Pearson chi-square tests were used, with Fisher exact tests for cell sizes less than 5. An alpha level of 0.05 was chosen for all comparisons.

RESULTS

Table 1 shows the bivariate associations of nurses' work and non-work factors with acute and chronic fatigue and intershift recovery. Nurses with high levels of acute fatigue also had higher psychological demands at work ($t = 2.92$, $p < .01$), more quantitative demands ($t = 2.51$, $p = .01$), less social support ($t = -2.75$, $p < .01$), less feedback from their supervisor and coworkers ($t = -2.95$, $p < .01$), and lower job satisfaction ($t = -2.93$, $p < .01$). In addition, more nurses working rotating shifts had high levels of acute fatigue compared to those on fixed shifts (chi-square = 4.68, $p = .04$).

A similar pattern was seen in the association between demands and chronic fatigue ($t = 2.10$, $p = .04$ for psychological demands; $t = 2.23$, $p = .03$ for quantitative demands). Nurses with high chronic fatigue reported a lower sense of meaning at work ($t = -2.71$, $p = .01$), lower social support ($t = -2.48$, $p = .01$), and lower job satisfaction ($t = -3.74$, $p < .01$) than those with lower chronic fatigue.

Nurses who reported more intershift recovery demonstrated a stronger commitment to the workplace ($t = 2.00$, $p = .04$), lower role conflict with coworkers ($t = -2.16$, $p = .03$), better social support ($t = 2.59$, $p = .01$), more feedback from peers and supervisors ($t = 2.05$, $p = .04$), and higher job satisfaction ($t = 4.13$, $p < .01$) than those with poor recovery. They also were less likely to be married (chi-square = 5.52, $p = .04$).

DISCUSSION

This study demonstrated that psychological job demands are significantly related to occupational fatigue and recovery among hospital nurses working 12-hour shifts. Lower time demands (i.e., quantitative demands), better social support from supervisor or coworkers, and meaningful work were related to less nurse fatigue and better recovery. Winwood and Lushington (2006) reported that psychological stress or demands at work affected sleep quality and recovery among nurses. This finding suggests that reducing psychological stressors is important to improve chronic stress outcomes, including the adverse impact of stress on sleep among nurses. Organizational efforts are also needed to assist nurses to develop strategies for coping with stress; however, the primary emphasis should be on reducing psychological demands and increasing sleep when possible. Furthermore, nurses who reported excessive acute and chronic fatigue or less intershift recovery were less satisfied with their jobs. Job satisfaction is believed to be related to intent to leave and nurse turnover (Laschinger, 2012). Thus, these findings suggest that collective actions at the organizational level that promote nurses' abilities to rest sufficiently after

TABLE 1
Factors Associated With Work-Related Fatigue and Recovery in Hospital Nurses Working 12-Hour Shifts (*n* = 80)

	Acute Fatigue				*Chronic Fatigue*				*Intershift Recovery*			
Factors	***High***	***Low***	***t or X²***	***p***	***High***	***Low***	***t or X²***	***p***	***High***	***Low***	***t or X²***	***p***
Work factors												
Job demands												
Physical job demands (range: 0 to 36), mean (SD)	22.3 (5.3)	21.5 (5.7)	0.56[a]	.58	22.4 (5.9)	21.4 (5.5)	0.66[a]	.51	21.2 (6.1)	21.9 (5.5)	-0.49[a]	.62
Psychological job demands (range: 0 to 18), mean (SD)	14.0 (2.8)	11.7 (3.1)	2.92[a]	< .01	13.6 (3.8)	11.8 (2.8)	2.10[a]	.04	11.5 (3.1)	12.5 (3.2)	-1.26[a]	.21
Quantitative demands (range: 0 to 100), mean (SD)	57.5 (15.9)	47.0 (16.4)	2.51[a]	.01	56.3 (17.3)	47.1 (16.1)	2.23[a]	.03	45.3 (17.9)	51.0 (16.3)	-1.33[a]	.19
Cognitive demands (range: 0 to 100), mean (SD)	74.7 (12.1)	72.8 (17.6)	0.44[a]	.66	74.1 (15.8)	73.0 (16.7)	0.29[a]	.77	75.3 (16.0)	72.6 (16.6)	0.64[a]	.53
Emotional demands (range: 0 to 100), mean (SD)	57.9 (22.4)	51.3 (22.1)	1.16[a]	.25	55.7 (22.9)	51.9 (22.1)	0.68[a]	.50	46.7 (19.2)	55.0 (22.9)	-1.46[a]	.15
Influence at work (range: 0 to 100), mean (SD)	35.3 (12.5)	42.6 (17.0)	-1.76[a]	.08	38.1 (16.2)	41.8 (16.3)	-0.92[a]	.36	46.9 (14.7)	38.8 (16.4)	1.97[a]	.06
Meaning at work (range: 0 to 100), mean (SD)	83.3 (14.8)	87.8 (13.4)	-1.25[a]	.22	79.2 (16.4)	89.5 (11.6)	-2.71[a]	.01	91.3 (12.8)	85.1 (13.9)	1.74[a]	.09
Commitment to the workplace (range: 0 to 100), mean (SD)	54.7 (19.1)	55.0 (21.4)	-0.06[a]	.95	48.6 (21.3)	57.3 (20.2)	-1.70[a]	.09	62.8 (19.1)	52.3 (20.8)	2.00[a]	.04
Role conflict (range: 0 to 100), mean (SD)	43.1 (15.3)	38.6 (20.4)	0.90[a]	.37	41.8 (16.0)	39.0 (20.5)	0.57[a]	.57	31.9 (17.1)	42.4 (19.4)	-2.16[a]	.03
Quality of leadership (range: 0 to 100), mean (SD)	52.1 (26.1)	62.2 (21.6)	-1.90[a]	.06	51.6 (24.2)	61.8 (18.9)	-1.82[a]	.07	61.3 (20.2)	57.7 (21.5)	0.57[a]	.57
Social support (range: 0 to 100), mean (SD)	60.6 (17.5)	72.6 (16.7)	-2.75[a]	< .01	61.9 (21.3)	72.5 (15.2)	-2.48[a]	.01	78.1 (15.8)	66.8 (17.4)	2.59[a]	.01
Feedback from boss and coworkers (range: 0 to 100), mean (SD)	38.7 (19.8)	53.3 (19.0)	-2.95[a]	< .01	42.0 (26.3)	52.6 (16.5)	-1.75[a]	.09	57.5 (17.4)	47.1 (20.4)	2.05[a]	.04
Sense of community (range: 0 to 100), mean (SD)	73.8 (23.9)	78.6 (15.0)	-1.07[a]	.29	73.1 (23.1)	79.0 (14.9)	-1.35[a]	.18	79.6 (15.4)	76.7 (18.3)	0.64[a]	.52
Job satisfaction (range: 0 to 100), mean (SD)	69.4 (13.1)	78.4 (11.6)	-2.93[a]	< .01	68.5 (10.5)	79.1 (12.1)	-3.64[a]	< .01	85.3 (10.4)	73.1 (11.8)	4.13[a]	< .01
Work schedules, rotation, n (%)												
Routinely rotating	8 (40.0)	10 (16.7)	4.68[b]	.04	7 (31.8)	11 (19.0)	1.51[b]	.31	5 (25.0)	13 (21.7)	0.10[b]	.99
Routinely fixed	12 (60.0)	50 (83.3)			15 (68.2)	47 (81.0)			15 (75.0)	47 (78.3)		
Work schedules, shift, n (%)[c]												
Day shift	7 (58.3)	22 (44.0)	3.61[b]	.17	8 (53.3)	22 (46.8)	0.01[b]	.99	6 (40.0)	23 (48.9)	0.37[b]	.57
Night shift	5 (41.7)	28 (56.0)			7 (46.7)	25 (53.2)			9 (60.0)	24 (51.1)		
Non-work factors												
Age in years, mean (SD)	37.0 (11.2)	37.2 (10.2)	-0.08[a]	.94	37.2 (11.6)	37.2 (9.9)	0.01[a]	.99	37.2 (11.3)	37.2 (10.1)	0.02[a]	.99
Race/ethnicity, n (%)												
White	13 (65.0)	34 (56.7)	1.96[b]	.44	12 (54.5)	35 (60.3)	0.47[b]	.83	13 (65.0)	34 (56.7)	0.57[b]	.77
African American	4 (20.0)	8 (13.3)			4 (18.2)	8 (13.8)			3 (15.0)	9 (15.0)		
Asian or other	3 (15.0)	18 (30.0)			6 (27.3)	15 (25.9)			4 (20.0)	17 (28.3)		
Marital status, n (%)												
Married	9 (45.0)	35 (58.3)	0.07[b]	.99	8 (36.4)	26 (44.8)	0.47[b]	.62	4 (20.0)	30 (50.0)	5.52[b]	.04
Not married	11 (55.0)	25 (41.7)			14 (63.6)	32 (55.2)			16 (80.0)	30 (50.0)		
Highest degree achieved, n (%)												
Diploma/associate's	5 (25.5)	17 (28.3)	0.08[b]	.99	7 (31.8)	15 (25.9)	0.28[b]	.78	6 (30.0)	16 (26.7)	0.08[b]	.99
Bachelor's or higher	15 (75.0)	43 (71.7)			15 (68.2)	43 (74.1)			14 (70.0)	44 (73.3)		
Years of RN experience, mean (SD)	7.4 (7.8)	10.6 (10.1)	1.17[b]	.25	7.1 (6.7)	10.8 (10.5)	1.65[b]	.11	13.8 (12.7)	8.4 (8.1)	-1.56[b]	.14
Currently student, n (%)												
Yes	6 (30.0)	11 (18.3)			6 (27.3)	11 (19.0)	0.66[b]	.54	4 (20.0)	13 (21.7)	0.03[b]	.99
No	14 (70.0)	49 (81.7)			16 (72.7)	47 (81.0)			16 (80.0)	47 (78.3)		
Caring for any children and/or elderly, n (%)												
Yes	4 (20.0)	20 (33.3)	1.27[b]	.40	3 (13.6)	21 (36.2)	3.87[b]	.06	5 (25.0)	19 (31.2)	0.32[b]	.78
No	16 (80.0)	40 (66.7)			19 (86.4)	37 (63.8)			15 (75.0)	41 (68.3)		

SD = standard deviation; RN = registered nurse
[a]*t test.*
[b]*Chi-square test.*
[c]*Included responses from nurses who answered "routinely fixed" for rotation item (*n = 62*).*

work and prevent them from becoming tired or exhausted is important for both job satisfaction and retention.

In this study, work schedules, especially shift rotations, were significantly associated with acute fatigue. In comparison, when work schedules are fixed at either day or night, nurses can adapt to their schedules and may find successful strategies to reduce fatigue and increase recovery. Previous studies found nonstandard work schedules, including shift rotation and extended work hours, were related to decreased sleep quality and quantity and fatigue (Flo et al., 2013; Geiger-Brown & Trinkoff, 2010a, 2010b). Because all study nurses were working 12-hour shifts, effects of shift length or combination of shift length and rotation could not be examined.

Physical demands, which were previously found to be significant factors for nurse fatigue and recovery between shifts, did not significantly differ by fatigue in this study. However, exposure to intense physical demands, such as awkward postures with heavy lifts during patient transfers, may leave nurses physically tired or fatigued (Trinkoff et al., 2001). If this situation is combined with lack of sleep between shifts due to extended work hours, fatigue levels are exacerbated (Geiger-Brown, Trinkoff, & Rogers, 2011). Nurse fatigue has been well documented as a strong risk factor for nurse safety and the ability to deliver quality patient care (Bongers, Kremer, & ter Laak, 2002; Hinshaw, 2006; Rosa, 1995). The effect of fatigue on safety suggests a need for a comprehensive approach to fatigue management that includes system supports to provide more healthful work schedules that foster adequate sleep along with favorable nursing work environments to reduce psychological demands.

Study nurses did not show significant differences in nonwork demands (e.g., caring for children and/or elderly relatives at home or if they were students in addition to working full time as a nurse) by fatigue or recovery levels. However, the proportion of those married was higher among nurses with low intershift recovery compared to those with high recovery. This finding might reflect other chores or home demands performed by married nurses, although an Australian study of female nurses reported no difference in domestic responsibilities by fatigue and recovery and suggested that being part of a family structure might aid work-related fatigue and recovery (Winwood, Winefield, & Lushington, 2006). Further research using comprehensive measures of home demands among nurses in relation to their fatigue and recovery is needed.

The findings should be interpreted in light of study limitations. First, the sample size might be too small to have sufficient power to examine the effects of various factors on nurse fatigue and recovery, and the generalizability of study findings may be limited to nurses in similar work situations. Second, data were based on nurses' self-reported responses, which could be affected by recall bias or denial. Nonetheless, data from survey questionnaires have been found to be consistent with direct observations of work environments and demands (Torgen, Winkel, Alfredsson, & Kilbom, 1999). Finally, because the study was cross-sectional, it was not possible to determine causal relationships between work and nonwork–related factors and nurse fatigue and recovery. The possibility of reciprocal relationships also should be considered. Because previous studies found that psychological and emotional stress, and fatigue and recovery, are co-occurring (Bültmann et al., 2002; Winwood et al., 2006), results might reflect that excess fatigue and lack of recovery led nurses to perceive more demands and less support.

Implications for Practice

Research findings suggest that psychological aspects of work affect fatigue and the need for recovery among hospital nurses working 12-hour shifts. A growing body of research supports nurse fatigue as a key contributor to nursing staff shortages and adverse patient outcomes (Djukic, Kovner, Brewer, Fatehi, & Cline, 2012; Geiger-Brown et al., 2012; Hinshaw, 2006; Laschinger, 2012). To prevent nurse fatigue and related adverse nurse and patient outcomes, more practical or feasible aspects of work systems should be redesigned (e.g., more healthful scheduling permits better quality sleep and promotes support for these initiatives by supervisors and coworkers). A recent review article reported that creating a supportive work environment, especially by nurse managers, can prevent nurse fatigue and burnout (Epp, 2012). In addition, administrators should enhance work group cohesion among nurses and between nurses and physicians; procedural justice can be used to reduce psychological exhaustion in the workplace and increase the quality of care provided by nurses (Djukic et al., 2012). Regular team meetings with physicians and efforts to promote collaborative relationships could decrease psychological demands on nurses.

Tailored educational programs also may help to enhance recovery between shifts and reduce fatigue. For example, for nurses working 12-hour rotating shifts, evidence-based approaches for improving sleep and sleep hygiene and adaptation to work schedules can be delivered online to efficiently address nurses' needs. Considering the negative effects of unfavorable work schedules on nurse fatigue, modifications are needed (e.g., ensuring enough time for recovery). Providing choices on starting time, length of shift, and number of duties can improve recovery from work and health (Garde et al., 2012). Further studies for investigating factors affecting nurse fatigue and recovery in various work settings and for interventions that include comprehensive fatigue prevention plans are needed.

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