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Shift Work in Nursing: Is it Really a Risk Factor for Nurses' Health and Patients' Safety?

EXECUTIVE SUMMARY

- ▶ There is evidence in the scientific literature of the adverse physiological and psychological effects of shift work, including disruption to biological rhythm, sleep disorders, health problems, diminished performance at work, job dissatisfaction, and social isolation.
- ▶ In this study, the results of health problems and sleep disorders between female and male nurses, between daytime and shift nurses, and between sleep-adjusted and non-sleep-adjusted shift nurses were compared. Also the relationship between adjustment to shift work and organizational outcomes (errors and incidents and absenteeism from work) was analyzed.
- ▶ Gender, age, and weight were more significant factors than shift work in determining the well-being of nurses.
- ▶ Shift work by itself was not found to be a risk factor for nurses' health and organizational outcomes in this study.
- ▶ Moreover, nurses who were identified as being "non-adaptive" to shift work were found to work as effectively and safely as their adaptive colleagues in terms of absenteeism from work and involvement in professional errors and accidents.
- ▶ This research adds two additional findings to the field of shift work studies. The first finding is that female shift workers complain significantly more about sleep disorders than male shift workers. Second, although high rates of nurses whose sleep was not adapted to shift work were found, this did not have a more adverse impact on their health, absenteeism rates, or performance (reported errors and incidents), compared to their "adaptive" and "daytime" colleagues.

SHIFT WORK IS NOW A MAJOR feature of work life across a broad range of industries. Over 20% of workers in industrialized nations are shift workers, and about 10% of them are diagnosed as having sleep disorders. However, the health and safety issues associated with shift work in general (Basent, 2005; Drake, Roehers, Richardson, Walsh, & Roth, 2004) and with nurses' health and patient safety in particular have been poorly explored (Muecke, 2005). Moreover, most of the research in the field of shift work and sleep disorders does not take into account the roles of ethnicity, age, and gender. The present study attempts to fill this gap by examining the impact of shift work on the quality of performance (e.g., work absenteeism, errors, and adverse clinical incidents) among nurses and by comparing males and females in the same profession.

Effects of Shift Work

Shift work can have an impact on sleep, well-being, performance, and organizational outcomes. The existing scientific studies indicate that shift work affects both sleep and waking by disrupting circadian regulation, familial and social life (Gordon, Cleary, Parker, & Czeisler, 1986; Labyak, 2002; Lee, 1992). Sleep obtained during the day or at irregular times is of poorer quality than that obtained during normal

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NOTE: The research reported herein was supported by a grant from the Israel National Insurance Institute.

nighttime sleep. Chronically restricted sleep patterns and the subsequent sleep debt that accumulates over time may be most pervasive in such professions as health care delivery that function 24 hours a day, 7 days a week.

Evidence of high risk for significant behavioral and health-related morbidity is associated with sleep disorders among shift workers. Shift workers with sleep disorders have higher rates of cardiovascular diseases and digestive tract problems. Research into the impact on professionals has consistently identified a range of negative outcomes in physical, psychological, and social domains (Akerstedt, 1988; Costa, Lievore, Casaletti, Gaffuri, & Folkard, 1989; Kogi, 2005; Paley & Tepas, 1994). The morbidity associated with sleep disorders among shift workers was significantly greater than that experienced by daytime workers with identical symptoms, such as sleep-related accidents, depression, absenteeism, and missed family and social activities (Drake et al., 2004).

There is growing concern about the ability of individuals to maintain adequate levels of performance over long work shifts, particularly when those shifts span nighttime hours. Research results are mixed on this issue. Gold and colleagues (1992) reported that the main factor associated with medical errors was shift work. Rouch, Wild, Anisau, and Marquie (2005) demonstrated short-term memory disturbances related to circadian rhythm disruption caused by shift work. However, 4 years after workers stopped working shifts, performance seemed to improve, which suggests a possible reversibility of effects.

Kawada and Suzuki (2002) found that rotating shift work affects the amount of sleep, but not the rate of errors among workers on a three-shift schedule. Suzuki, Ohida, Kaneita, Yokoyama, and Uchiyama (2005) found that professional mistakes, such as drug administration errors, incorrect operation of medical equipment in hospitals by nurses,

and needlestick injuries were associated with the complaint of excessive sleepiness. Suzuki and colleagues (2004) presented no association between shift work and occupational accidents, but rather found an association between mental health and medical errors.

Most of the nursing studies rely heavily on the general scientific literature in the field of shift work and sleep disorders. Assuming that shift work is associated with sleep disorders, the focus of the nursing literature has been on improving the design of the shift system and on offering strategies for coping with rotating shift work.

Various recommendations have been made in regard to the design of the shift work system, such as length of shift (8-12 hours); principles of rotation (day, night, evening); scheduling (clockwise, number of shifts); and adjustment to individual needs ("morning people" vs. "night people") (Thurston, Tanguay, & Fraser, 2000). Recommendations for dealing with shift work include taking a nap prior to the shift; shift breaks; bright lighting; healthy snack food; and avoiding coffee, alcohol and smoking before daytime sleep (Cooper, 2003).

Definition of Terms

For the purpose of the present study, we defined "shift work" as a rotating 8-hour shift schedule, including morning, evening, and night shifts. This definition excludes daytime nurses who permanently work only morning shifts. A "non-adaptive shift worker" is defined as a shift worker (in our study, a rotating shift nurse) who complains of "difficulties falling asleep after evening, morning or night shift" and in addition complains about "multiple awaking during day sleep after a night shift." These definitions were used by the authors in previous research studies (Lavie et al., 1989).

Goal and Objectives

The goal of this study was to explore and describe the health

complaints and sleep patterns of hospital nurses who are working rotating shifts and to examine the impact of shift work on nurse absenteeism and patient safety.

The specific aims of the current study were:

1. To compare subjective medical complaints and sleep disorders between female nurses and male nurses.
2. To compare subjective medical complaints and sleep disorders between daytime nurses and shift nurses.
3. To identify the scope of "non-adaptive shift nurses."
4. To compare subjective medical complaints and sleep disorders between "adaptive shift nurses" and "non-adaptive shift nurses."
5. To compare rates of clinical errors and adverse incidents between "adaptive shift nurses" and "non-adaptive shift nurses."
6. To compare rates of absenteeism between "adaptive shift nurses" and "non-adaptive shift nurses."

Methodology

Subjects. Researchers investigated 738 hospital nurses in a major teaching hospital in northern Israel during the year 2003. The sample comprised all nurses working only daytime shifts or rotating shifts. A total of 688 nurses (93.2%) completed all the questionnaire data, including 589 females (85.6%) and 99 males (14.4%). Of the total sample, 195 nurses (175 females and 20 males) worked only days and 493 nurses (414 females and 79 males) worked flexible rotating shifts (mornings, evenings, and night shifts in accordance with the units' and nurses' needs).

The study was approved by the Helsinki Research Ethics Committee of Rambam Medical Center. All subjects agreed to participate after they were fully informed about the nature of the study and of their right to leave at any stage.

Measurements. All nurses com-

Table 1.
Study Variables and Groups

Medical History and Complaints		Reported Sleep Disorders	
Male nurses	Female nurses	Male nurses	Female nurses
Day nurses	Shift nurses	Day nurses	Shift nurses
Adaptive nurses	Non-adaptive nurses	Adaptive nurses	Non-adaptive nurses
Nurses' Absenteeism		Errors and Incidents	
Adaptive nurses	Non-adaptive nurses	Adaptive nurses	Non-adaptive nurses

Table 2.
Demographic Data of Male and Female Nurses (N=688)

Gender	Males N = 99	Females N = 589	p
	Mean ± SD	Mean ± SD	
Age	37.0 ± 9.6	40.4 ± 9.9	0.0009
BMI	26.82 ± 3.45	25.17 ± 4.68	0.0001
Family status			0.02
Single (%)	21.0	11.9	
Married (%)	74.7	75.3	
Divorced (%)	4.2	8.8	
Children			0.03
None (%)	21.5	16.0	
1-2 (%)	49.5	50.0	
3 or more (%)	29.0	34.0	
Age of youngest			0.0002*
<4 (%)	48.6	24.6	
4-8 (%)	21.4	22.8	
>8 (%)	30.0	52.6	
Years at work			0.04
0-5 (%)	42.9	27.9	
6-10 (%)	22.4	22.6	
>10 (%)	34.7	49.5	

* Significant after adjustment for age and BMI

pleted self-administered questionnaires that included items on demographics; health history and complaints; and sleep habits and disorders.

The sleep questionnaires consisted of a 10-question Sleep Disorder Questionnaire, which was rated on a 7-point Likert scale ranging from "never" to "all the time" (α Cronbach=0.74) (Zomer, Peled, Rubin, & Lavie, 1985), and a sleep habit questionnaire reflecting respondents' perceptions of sleep time and sleep quality. In both sleep questionnaires, there were ques-

tions about daytime fatigue and sleepiness, as well as overall well-being.

In addition, data about incidents and errors at work were obtained for each participant from an ongoing systematic database gathered by the risk management nurse for the purpose of quality improvement. Absenteeism was also obtained from a hospital data source based on medical letters.

Statistical analysis. All analyses were performed using SAS program. The data were analyzed using T-test, ANOVA, and Chi Square (χ^2)

to compare the different groups (females vs. males, daytime vs. shift nurses, and adaptive vs. non-adaptive nurses) in relation to the study variables (medical history and complaints, sleep disorders, incidents, and absenteeism), as shown in Table 1.

Results

Sample demographics. Significant differences were found between male and female nurses in all the demographic variables. In comparison to the male nurses, the female nurses were significantly older, had higher rate of divorce, more children, older children, and longer seniority at work. Body Mass Index (BMI) was significantly higher in the males, and more male nurses were single than female nurses (see Table 2). Assuming that family status, number, and age of children and seniority at work are age dependent, the observed demographic findings indicate significant differences in age and BMI. Of a total 688 nurses, 70% (414) of the female nurses were working rotating shifts, compared to 80% (79) of the male nurses.

Medical history and complaints: Gender comparison. The first aim of the study was to compare medical complaints and sleep disorders between female and male nurses. The results of the reported medical history and complaints revealed that the female nurses complained significantly more about thyroid problems ($p<0.002$), backaches ($p<0.0008$), and leg pain ($p<0.0005$) than the male nurses, even after adjusting for age and BMI (see Table 3).

Sleep disorders: Gender comparison. Results of the sleep disorder questionnaire showed that the female nurses complained more about difficulties falling asleep ($p < 0.03$), mid-sleep awakenings ($p < 0.0002$), headaches after awakening from sleep ($p < 0.0006$), and morning fatigue ($p < 0.0001$) than the male nurses, who complained more about snoring ($p < 0.0002$). After adjusting for age and BMI (see Table 3), the following differences remained significant: snoring, mid-sleep awakenings, headache on awakening, and fatigue.

Medical history and complaints: Daytime vs. shift work nurses. The second aim of the study was to compare medical complaints and sleep disorders between daytime versus shift work nurses. The results revealed that the group of daytime nurses were older ($p < 0.0001$), had higher BMI ($p < 0.02$), and had longer seniority ($p < 0.0001$) in comparison to the shift nurses. More shift nurses were single and had more young children than the daytime nurses. The daytime nurses complained significantly more about hypertension ($p < 0.0007$), thyroid ($p < 0.004$), intestinal disease ($p < 0.006$), diabetes ($p < 0.003$), leg pain ($p < 0.003$), and medicine usage ($p < 0.0001$) (see Table 4). After adjustment for age, BMI, and gender, no significant differences remained, indicating that these variables accounted for the differences between daytime and shift nurses rather than the type of work.

Sleep disorders: Daytime vs. Shift work nurses. The shift work nurses complained more than the daytime nurses about difficulties falling asleep ($p < 0.04$), headaches on awakening ($p < 0.05$), morning sleepiness ($p < 0.0001$), and excessive daytime sleepiness ($p < 0.02$). The daytime nurses complained more about snoring ($p < 0.0001$), early morning awakening ($p < 0.02$), and mid-sleep awakenings ($p < 0.02$). After adjustment for age, BMI, and gender, the differences in difficulties falling asleep ($p < 0.003$) remained higher for the shift work nurses

Table 3.
Medical History, Complaints, and Sleep Disorders:
Comparison Between Female and Male Nurses

Medical History and Complaints (%)	Males (n = 99)	Females (n = 589)	p
Heart disease	2.0	1.6	NS
Hypertension	11.2	8.5	NS
Thyroid	1.0	4.7	0.002*
Asthma	3.1	4.7	NS
Intestinal disease	1.0	3.1	NS
Diabetes	4.1	1.6	NS
Backache	25.5	40.3	0.0008*
Leg pain	18.6	35.9	0.0005*
Sleep Disorders		Mean ± SD	Mean ± SD
Difficulty falling asleep	3.05 ± 1.77	3.39 ± 1.58	0.03
Early morning awakening	3.15 ± 1.72	3.24 ± 1.68	NS
Sleeping pills	1.23 ± 0.78	1.32 ± 0.90	NS
Excessive daytime sleepiness	2.25 ± 1.40	1.99 ± 1.28	NS
Morning sleepiness	3.12 ± 1.59	3.34 ± 1.62	NS
Snoring	3.01 ± 1.92	2.27 ± 1.54	0.002*
Mid-sleep awakenings	2.96 ± 1.42	3.58 ± 1.50	0.002*
Headaches on awakening	2.07 ± 1.32	2.44 ± 1.36	0.006*
Fatigue	2.54 ± 1.46	3.23 ± 1.63	0.001*
Restless sleep	2.36 ± 1.82	2.44 ± 1.62	NS

* Significant after adjustment for age and BMI

Table 4.
Medical History, Complaints, and Sleep Disorders:
Comparison Between Day and Shift Work Nurses

Medical History and Complaints (%)	Day Nurses (n = 195)	Shift Nurses (n = 493)	p
Heart disease	2.0	1.1	NS
Hypertension	13.2	5.6	0.0007
Thyroid	13.7	6.8	0.004
Asthma	4.9	3.9	NS
Intestinal disease	6.3	2.1	0.006
Diabetes	6.3	1.9	0.003
Backache	42.9	39.8	NS
Leg pains	42.6	30.7	0.003
Pre-menopause	65.4	84.9	0.0001
Medicine use	37.0	15.1	0.0001
Sleep Disorders		Mean ± SD	Mean ± SD
Difficulty falling asleep	3.17 ± 1.58	3.45 ± 1.61	0.04*
Early morning awakening	3.46 ± 1.74	3.13 ± 1.66	0.02
Sleeping pills	1.34 ± 0.94	1.29 ± 0.84	NS
Excessive daytime sleepiness	1.88 ± 1.25	2.11 ± 1.32	0.02
Morning sleepiness	2.85 ± 1.57	3.52 ± 1.59	0.0001
Snoring	2.79 ± 1.63	2.19 ± 1.56	0.0001*
Mid-sleep awakenings	3.71 ± 1.51	3.42 ± 1.49	0.02
Headaches on awakening	2.20 ± 1.34	2.49 ± 1.35	0.05
Fatigue	3.00 ± 1.60	3.22 ± 1.62	NS
Restless sleep	2.45 ± 1.58	2.44 ± 1.69	NS

* Significant after adjustment for age, BMI, and gender

and the differences in snoring remained higher for the daytime nurses ($p < 0.03$) (see Table 4).

The scope of non-adaptive nurses. The scope of non-adaptive shift nurses was the third aim (see Table 5). We defined a non-adaptive shift nurse as one who complained about difficulty falling asleep after any of the shifts “always” or “many times” and about multiple awakenings from sleep after a night shift “always” or “many times” (Lavie et al., 1989). Based on the responses to the sleep questionnaires, 27.7% (125 nurses) were defined as non-adaptive nurses and 72.3% (336 nurses) were defined as adaptive nurses. No significant differences were found between the females and males in either the adaptive or the non-adaptive groups ($\chi^2 = 2.236$, $p = 0.134$).

Medical history, health complaints: Adaptive versus non-adaptive nurses. Comparison of the medical history, health complaints, and sleep disorders between adaptive versus non-adaptive shift nurses was the fourth aim of the study. No significant differences were found in any reported medical histories or health complaints between the adaptive nurses and the non-adaptive nurses (see Table 6).

Sleep disorders: Adaptive vs. non-adaptive. In addition to the difficulties falling asleep and mid-sleep awakenings after a night sleep — the criteria for maladaptation to the shift system — non-adaptive shift nurses complained more about early morning awakening, use of sleeping pills, headaches in the morning, morning fatigue, and restless sleep. Adjustments for age and BMI did not change the results (see Table 6).

Errors and incidents at work. The fifth aim of this study was to compare clinical errors and adverse incidence report between adaptive and non-adaptive shift nurses. During the 1-year research period, 205 clinical errors and adverse incidences (e.g., medication errors, patient falls) were

Table 5.
Demographic Comparison Between Adaptive and Non-Adaptive Nurses

Type	Adaptive n = 336	Non-Adaptive n = 129	p
Age	36.3 ± 8.7	38.8 ± 9.4	0.01
BMI	25.0 ± 4.2	25.82 ± 5.7	NS
Family status			NS
% Single	16.7	16.7	
% Married	74.2	71.4	
% Divorced	6.7	8.7	
Children			NS
% None	20.2	23.2	
% 1-2	54.3	48.8	
% 3 or more	25.5	28.0	
Age of youngest			NS
% <4	38.8	30.5	
% 4-8	25.0	23.2	
% >8	36.2	46.3	
Years at hospital			0.006*
% 0-5	42.5	26.0	
% 6-10	26.6	31.5	
% >10	30.9	42.5	
Years in shift			NS
% 0-5	35.0	26.6	
% 6-10	29.7	28.1	
% >10	35.3	45.3	
Physical activity			0.009*
Never	58.5	44.1	
1-3 times a week	28.4	36.2	
>3 times a week	13.1	29.7	

* Significant after adjustment for age, BMI, and gender

reported by 201 night shift nurses. No significant differences were found between the group of 153 adaptive nurses (45%), and the group of 48 non-adaptive nurses (37%) ($p = 0.14$). Adjustments for age, gender, and BMI did not change the results.

Absentees at work. The last aim of this study was to compare rates of absenteeism between “adaptive” and “non-adaptive” shift nurses. The number of absentees was divided into three categories during the 1-year research period: none, one to three times a year, and more than four times a year. As demonstrated in Table 7, no significant differences were found

between the adaptive and non-adaptive nurses for all three categories ($\chi^2 = 0.49$, NS). Adjustments for age, gender, and BMI did not change the results. It is interesting to note that over 50% of the non-adaptive nurses did not miss work even once a year because of a health problem and only 8% missed work more than four times a year.

Discussion

It is well established that 20% of the workers in our society are shift workers (night shifts and rotating shifts) and that approximately half of them complain of difficulties with their sleep (Drake

Table 6.
Medical History, Health Complaints, and Sleep Disorders:
Comparison Between Adaptive and Non-Adaptive Nurses

Medical History and Complaints (%)	Adaptive n = 336	Non-Adaptive n = 129	p
Heart disease	0.9	1.6	NS
Hypertension	4.4	8.5	NS
Thyroid	7.7	4.7	NS
Asthma	3.6	4.7	NS
Intestinal disease	1.8	3.1	NS
Diabetes	2.1	1.6	NS
Backache	39.6	40.3	NS
Leg pains	28.7	35.9	NS
Pre-menopause	86.5	80.9	NS
Sleep Disorders	Mean ± SD	Mean ± SD	
Difficulty falling asleep**	3.11 ± 1.52	4.33 ± 1.52	0.0001*
Early morning awakening	2.79 ± 1.59	4.0 ± 1.52	0.0001*
Sleeping pills	1.19 ± 0.59	1.5 ± 1.2	0.003*
Excessive daytime sleepiness	2.09 ± 1.3	2.16 ± 1.39	NS
Morning sleepiness	3.45 ± 1.56	3.72 ± 1.65	NS
Snoring	2.15 ± 1.56	2.30 ± 1.57	NS
Mid-sleep awakenings**	3.1 ± 1.4	4.2 ± 1.4	0.0001*
Headaches on awakening	2.34 ± 1.28	2.9 ± 1.45	0.0001*
Morning fatigue	3.1 ± 1.6	3.6 ± 1.6	0.009*
Restless sleep	2.3 ± 1.6	2.8 ± 1.8	0.0009*

* Significant after adjustment for age, gender, and BMI

** Variables that define non-adaptive shift nurse

Table 7.
Absentees at Work During 1 Year

Number of Absentees	Adaptive n = 336	Non-adaptive n = 129	p
None (%)	45.5	52.1	NS
1-3 times (%)	43.7	39.6	NS
More than 4 times (%)	10.8	8.3	NS

* During 1 year

et al., 2004). There is also evidence in the scientific literature of the adverse physiological and psychological effects of shift work, including disruption to biological rhythm, sleep disorders, health problems, diminished performance at work, job dissatisfaction, and social isolation (Morshead, 2002; Muecke, 2005; Westfall-Lake, 1997).

Our study was aimed at examining the phenomenon of shift work among a group of female and

male workers in the same profession, namely nursing. We compared the results of health problems and sleep disorders between female and male nurses, between daytime and shift nurses, and between sleep-adjusted and non-sleep-adjusted shift nurses. Given the lack of research on the impact of shift work and sleep deprivation on nurses' performance and patient care (Brown, 2004), we also explored the relationship between adjustment to shift work and orga-

nizational outcomes (errors and incidents and absenteeism from work).

Shift work and gender. The main demographic gender-related differences in this study indicate that the female nurses are significantly older and have lower BMI than the male nurses. In addition, the female nurses complained more about health problems (thyroid problems, backache, and leg pain) and sleep disorders (mid-sleep awakenings, headaches on awakening, and morning fatigue) than the male nurses. One question that should be raised is whether these results reflect a general tendency of females to complain more than males about their health and sleep. Another question that needs examination is whether the females' subjective complaints about their health problems and sleep disorders can be supported by objective evidence. To answer these questions, we designed a second phase of this study that was aimed to test objective indicators of health condition and sleep patterns among the sample.

Shift work, health problems, and sleep disorders. Surprisingly, in contrast with the wealth of literature on the adverse effects of shift work on workers' health, our results indicate that daytime nurses complained significantly more than shift nurses about health problems and sleep disturbances. The main predictors of health symptoms and sleep disturbances were age and BMI.

The phenomenon of non-adaptive shift nurses. In our study, 27.7% of the nurses were non-adaptive to shift work, compared to the 5% to 10% reported for sleep disorders in the scientific sleep literature (Drake et al., 2004). The differences might stem from methodological, gender, or cultural differences. Methodologic problems can stem from different definitions of the terms "non-adaptive" and "sleep disorder" or from non-standardized criteria for shift workers (e.g., type, length, duration of shift).

The findings may indicate true differences between male and female shift workers or may suggest sociocultural differences. Lavie and colleagues (1989) reported about 15% non-adaptive shift workers among a group of male workers, which is less than that found among male and female non-adaptive nurses. Even though we used only two questions to define adaptiveness, there were many more differences between the two groups. Those differences may present organizational culture effects. Further research is needed to address these differences.

Shift work and organizational outcomes. In the present study, we investigated the impact of sleep disturbances on shift nurses and on two organizational outcomes: errors and incidents and absenteeism from work. Based on our literature review (Morshead, 2002; Muecke, 2005; Westfall-Lake, 1997), we expected that “non-adaptive shift nurses” would report on more involvement in errors and adverse incidents as compared to “adaptive shift nurses.” We also assumed that non-adaptive nurses, who by definition have more sleep-related complaints, would have higher absenteeism rates due to illness compared to their adaptive colleagues. Neither of our hypotheses was supported by the results of this study.

It is known that there is a tendency toward under-reporting on professional errors and incidents; however, there is no reason to believe that the non-adaptive nurses would avoid reporting more or less than the adaptive nurses. We found lower absenteeism rates among the shift work nurses (both adaptive and non-adaptive) than among the daytime nurses, which may be explained by differences in age.

There is a need to further explore the reasons that the “non-adaptive” nurses in the present study were not more involved in professional errors and incidents and did not have higher absent-

teeism rates from work than the “adaptive” nurses. We can only conclude that there is no relationship between reported sleep disorders and performance, as demonstrated by this study’s findings.

Conclusions

It appears that gender, age, and weight are more significant factors than shift work in determining the well-being of nurses. Moreover, nurses who were identified as being non-adaptive to shift work based on their complaints about sleep were found to work as effectively and safely as their adaptive colleagues in terms of absenteeism from work and involvement in professional errors and accidents.

It is important to emphasize that the decision to define a nurse as “adaptive” or “non-adaptive” was solely based on two subjective complaints about sleep disorders. The fact that we found higher rates of nurses who were not adjusted to shift work than reported in the literature thus far, might be attributed to differences in gender, age, BMI, and the definition of “adapting” versus “non-adapting” nurses employed in our study. It is well-established that the ability to cope with rotating night shifts is diminished with age and that BMI is rising with age (Learhart, 2000; Reid & Dawson, 2001; Reilly, Waterhouse, & Atkinson, 1997).

As for gender, most research on sleep disturbances associated with shift work has been conducted among male workers, and there is not enough evidence for comparison with females. It has yet to be investigated whether the differences in adjustment to shift work between male and female workers are supported objectively or whether they are attributable to the tendency of female workers to express more complaints. In this context, it would be interesting to investigate the impact of organizational culture and social culture on workers’ norms of complaining.

In conclusion, this research adds two additional findings to the

field of shift work studies. The first finding is that female shift workers complain significantly more about sleep disorders than male shift workers. The second finding is that although we found high rates of nurses whose sleep was not adapted to shift work, we did not find a more adverse impact on their health, absenteeism rates, or performance (reported errors and incidents), compared to their “adaptive” and “daytime” colleagues. In other words, shift work by itself was not a risk factor for nurses’ health and organizational outcomes in this study.

Policy Implications

Nurses are expected to deliver high-quality care and to assure patient safety 24 hours a day in health care facilities. Taking into account that nursing is a predominantly female profession with an increasingly aging workforce and a prolonged shortage of human resources, it is the responsibility of health care leaders to identify health risks and their effects on work patterns (absenteeism) among nursing personnel as well as risks to patient safety.

Policymakers should consider the impact of the aging nursing workforce. Daytime nursing personnel tend to be in managerial positions, as they are older and have more seniority and experience. However, with the increasing age of nurses, we already find growing numbers of older nurses who are required to work rotating shifts, including night shifts. This should be a point of concern for both the nurses and the patients.

The work scheduling policy for the nurses in the hospital where this study was conducted is to schedule 8-hour flexible rotating shifts according to employee preferences and organizational needs. There is some research evidence in the literature indicating that in general, nurses who work their preferred shifts and their preferred work weeks report more positive work outcomes and less interfer-

ence with their non-work activities (Havlovic, Lau, & Pinfield, 2002).

While there is not much that can be done about age and gender, other than to take these factors into account in shift planning, there is a need to address the increasing obesity among health care professionals, such as by encouraging a balanced diet and exercise regime.

Future studies should continue to explore the effects of shift work through objective indicators for measuring sleep disorders, adaptation to shift work, and biological markers of health problems. It is of importance to further explore gender differences among shift workers, as well as the effects of different organizational cultures and different occupations (industrial workers, helping professions) on adjustment to shift work and its impact on employees' health and organizational outcomes. \$

REFERENCES

- Akerstedt, T. (1988). Sleepiness as a consequence of shift work. *Sleep*, 11(1), 17-34.
- Basent, B. (2005). Shift-work sleep disorder – The glass is more than half empty. *New England Journal of Medicine*, 353(5), 519-521.
- Brown, P.S. (2004). *Relationships among life event stress, role and job strain, and sleep in middle-aged female shift workers*. Unpublished doctoral dissertation: Wayne State University, Detroit, MI.
- Costa, G., Lievore, F., Casaletti, G., Gaffuri, E., & Folkard, S. (1989). Circadian characteristics influencing inter-individual differences in tolerance and adjustment to shift work. *Ergonomics*, 32(4), 373-385.
- Cooper, E.E. (2003). Pieces of the shortage puzzle: Aging and shift work. *Nursing Economic*, 21(2), 75-79.
- Drake, C.L., Roehers, T., Richardson, G., Walsh, J.K., & Roth, T. (2004). Shift work sleep disorders: Prevalence and consequences beyond that of symptomatic day workers. *Sleep*, 27(8), 1453-1462.
- Gold, D.R., Rogacz, S.R., Bock, N., Tosteson, T.D., Baum, T.M., Speizer, F.E., et al. (1992). Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. *American Journal of Public Health*, 82, 1011-1014.
- Gordon, N.P., Cleary, P.D., Parker, C.E., & Czeisler, C.A. (1986). The prevalence and health impact of shift work. *American Journal of Public Health*, 76(10), 1225-1228.
- Havlovic, S.J., Lau, D.C., & Pinfield, L.T. (2002). Repercussions of work schedule congruence among full-time, part-time and contingent nurses. *Health Care Management Review*, 27(4), 30-41.
- Kogi, K. (2005). International research needs for improving sleep and health of workers. *Industrial Health*, 43(1), 71-79.
- Kawada, T., & Suzuki, S. (2002). Monitoring sleep hours using a sleep diary and errors in rotating shiftworkers. *Psychiatry and Clinical Neuroscience*, 56, 213-214.
- Lavie, P., Chillag, N., Epstein, R., Tzischinsky, O., Givon, R., Fuchs, S., et al. (1989). Sleep disturbances in shiftworkers: A marker for maladaptation syndrome. *Work and Stress*, 3(1), 33-40.
- Labyak, S. (2002). Sleep and circadian schedule disorders. *Nursing Clinics of North America*, 37, 599-610.
- Lee, K.A. (1992). Self reported sleep disturbances in employed women. *Sleep*, 15(6), 493-498.
- Learhart, S. (2000). Health effects of internal rotation of shifts. *Nursing Standard*, 14(47), 34-36.
- Morshead, D.M. (2002). Stress and shift work. *Occupational Health & Safety*, 71(4), 36-39.
- Muecke, S. (2005). Effects of rotating night shifts: Literature review. *Journal of Advanced Nursing*, 50(4), 433-439.
- Paley, M.J., & Tepas, D.I. (1994). Fatigue and the shiftworker: Firefighters working on a rotating shift schedule. *Human Factors*, 36(2), 269-284.
- Reid, K., & Dawson, D. (2001). Comparing performance on a simulated 12 hour shift rotation in young and older subjects. *Occupational and Environmental Medicine*, 58(1), 58-62.
- Reilly, T., Waterhouse, J., & Atkinson, G. (1997). Aging, rhythms of physical performance, and adjustment to changes in the sleep activity cycle. *Occupational and Environmental Medicine*, 54(11), 812-816.
- Rouch, I., Wild, P., Ansiau, D., & Marquie, J.C. (2005). Shiftwork experience, age, and cognitive performance. *Ergonomics*, 48(10), 1282-1293.
- Suzuki, K., Ohida, T., Kaneita, Y., Yokoyama, E., Miyake, T., Harano, S., et al. (2004). Mental health status, shift work, and occupational accidents among hospital nurses in Japan. *Journal of Occupational Health*, 46, 448-454.
- Suzuki, K., Ohida, T., Kaneita, Y., Yokoyama, E., & Uchiyama, M. (2005). Daytime sleepiness, sleep habits and occupational accidents among hospital nurses. *Journal of Advanced Nursing*, 52(4), 445-453.
- Thurston, N.E., Tanguay, S.M., & Fraser, K.L. (2000). Sleep and shiftwork. *The Canadian Nurse*, 96(9), 35-40.
- Westfall-Lake, P. (1997). Shift scheduling's impact on morale, and performance. *Occupational Health & Safety*, 66(10), 146-149.
- Zomer, J., Peled, R., Rubin, A., & Lavie, P. (1985). Mini-sleep questionnaire (MSQ) for screening large populations for EDS complaints. In W.P. Koella & P. Levin (Eds.), *Sleep* (pp. 467-470). Basel, Switzerland: Krager.

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