

Can sleep quality and burnout affect the job performance of shift-work nurses? A hospital cross-sectional study

Fabio Giorgi | Antonella Mattei | Ippolito Notarnicola | Cristina Petrucci | Loreto Lancia 

Department of Health, Life and Environmental Sciences, University of L'Aquila, Italy

Correspondence

Loreto Lancia, Department of Health, Life and Environmental Sciences, University of L'Aquila, Italy.

Email: loreto.lancia@cc.univaq.it

Funding information

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors

Abstract

Aim: The aim of this study was to investigate any possible relationship between sleep disorders, burnout and job performance in a shift-work population of nurses.

Background: Sleep disorders and burnout can affect the job performance of nurses in terms of efficiency, productivity, task execution speed and supervision, which can be compromised when work shifts are organized on a 24-hour schedule and when the shift itself is irregular.

Design: A cross-sectional observational study was conducted from August 2014 - January 2015 on a sample of 315 shift-work nurses across 39 wards in seven central Italian hospitals.

Methods: The Pittsburgh Sleep Quality Index was used to detect the presence of sleep disorders, the Copenhagen Burnout Inventory was used to detect the presence of any possible type of burnout and the Job Performance Scale was used to measure job performance. Data analysis was mainly based on a multivariate logistic regression to identify variables significantly associated with investigated outcomes.

Results: On shift-work nurses' sleep quality and burnout correlated positively. The female gender and personal burnout were significantly associated with impaired sleep quality, while working in the psychiatric setting, working a long cycle shift pattern and experiencing daytime dysfunction were significantly associated with burnout. A significant negative association between patient-related burnout and job performance was observed.

Conclusion: Specific characteristics of shift-work nurses can directly affect sleep quality and burnout and indirectly job performance. This evidence offers healthcare administrators opportunities to intervene with measures to promote nurse's health, well-being and safety.

KEYWORDS

burnout, job performance, nurse, shift work, sleep quality

1 | INTRODUCTION

Shift work, including the night shift, is common for hospital nurses because patients need to be cared for twenty-four hours a day. As shown in many studies, this shift work can lead to the misalignment

of circadian rhythms and, subsequently, to sleep disorders that have many possible consequences for nurses, including performance impairment (Johnson et al. 2010), daytime sleepiness, health impairment (Admi, Tzischinsky, Epstein, Herer, & Lavie, 2008; Huth, Eliades, Handwork, Englehart, & Messenger, 2013), physical and

psychological distress (Lin, Liao, Chen, & Fan, 2014; Saksvik-Lehouillier et al., 2013; Soric, Golubic, Milosevic, Juras, & Mustajbegovic, 2013), decreases in alertness and vigilance (Karhula et al., 2013) and reductions in the safety of both nurses and patients (Garrett, 2008; Keller, 2009; Peate, 2007).

1.1 | Background

Sleep disorders are represented by dyssomnias (i.e. hypersomnolence or insomnia) and are associated with the disruption of the normal 24-hour sleep-wake cycle that occurs secondary to shift work or other causes, such as travelling (e.g. jet-lag syndrome), environmental conditions or various pathologic conditions. In addition to cognitive impairment, increased drowsiness, anxiety and fatigue, sleep disorders are often associated with psychiatric, cardiovascular, metabolic or hormonal diseases, can affect professional efficiency and, consequently, can increase the risk of accidents (Garbarino, Lanteri, Durando, Magnavita, & Sannita, 2016).

Sleep disorders can be contingent on long shifts or shift rotation patterns (Chung, Liu, Lee, & Hsu, 2013; Lin et al., 2012) and can promote the onset of burnout (Sundin, Hochwalder, & Lisspers, 2011), which is the pathological outcome of a stress-related process characterized by emotional exhaustion and depersonalization as well as a lack of personal accomplishment (Maslach, Jackson, & Leiter, 1996; Pisanti, Lombardo, Lucidi, Violani, & Lazzari, 2013). Some authors highlighted that burnout can also be associated with shift work carried out for many years and that sleeping a few hours during the day coupled with spending less than eight hours away from work can produce negative effects, especially in emotional domains (Chin, Guo, Hung, Yang, & Shiao, 2015; Wisetborisut, Angkurawaranon, Jiraporncharoen, Uaphanthasath, & Wiwatana-date, 2014).

Nurses are more susceptible to burnout than some other health-care professionals due to their close interpersonal relationship with patients (Trbojević-Stanković et al., 2015). Shift work places nurses under stress and can cause their health, well-being and lifestyle to deteriorate. Nurses who feel strained are more likely to experience depression, somatic disturbances, sleep disorders and burnout (Demir Zencirci & Arslan, 2011).

Based on possible causes, burnout is classified into three types: (1) personal burnout, which is associated with subjective and/or personal problems, such as sleep disorders; (2) work-related burnout, which is associated with factors of a poor work climate; and (3) patient-related burnout, which is associated with emotional involvement in a patient's problems (Avanzi, Balducci, & Fraccaroli, 2013; Borritz et al., 2006; Kristensen, Borritz, Villadsen, & Christensen, 2005).

Compared with nurses who managed to sleep for seven hours or more, nurses who slept for less than six hours on work days had higher risks of personal burnout (OR = 3.0, CI = 1.7–5.2), work-related burnout (OR = 3.4, CI = 2.0–6.0) and patient-related burnout (OR = 2.0, CI = 1.2–3.6) and the sleep duration on work days was inversely associated with the onset of burnout (Chin et al., 2015).

Why is this research needed?

- Although sleep disorders and burnout have been thoroughly investigated in recent years, little is known about the relationship between them or their effect on job performance.

What are the key findings?

On shift-work nurses:

- sleep quality and burnout are positively correlated each other;
- gender and personal burnout can affect sleep quality;
- shift pattern, work setting and daytime dysfunction can affect burnout;
- burnout is negatively associated with high job performance.

How should these findings be used to influence policy, practice, research/education?

- Considering the transposition of the European directive that imposes the regulation of work hours and rest periods that most closely imitate normal circadian rhythms, the results of this study can help to monitor burnout and sleep disorders among nurses who work rotating 24-hour shifts from the perspective of improving the quality of life of the nurses and the safety of patients.

Sleep disorders and burnout can affect the job performance of nurses in terms of efficiency, productivity, task execution speed and supervision, which can be compromised when work shifts are organized on a twenty-four-hour schedule and when the shift itself is irregular (Coffey, Skipper, & Jung, 1988).

Given that job performance is crucial for the quality of care provided by nurses because it can significantly affect patient outcomes during and after their hospitalization (Greenslade & Jimmieson, 2007; Tzeng, 2004), the evaluation of job performance has been conceptualized as a quality indicator for nursing care (Tzeng, 2004). The best job performance was found in nurses who worked only in the morning shift or only the night shift compared with nurses who rotated shifts (Coffey et al., 1988; Figueiro, Sahin, Wood, & Plitnick, 2015; Fitzpatrick, While, & Roberts, 1999).

Because of chronic sleep loss, sleep deprivation and drowsiness, shift workers can often make mistakes due to fatigue, especially in the context of a persistent staffing shortage, with consequent work dissatisfaction and burnout, even in the presence of programmes designed to increase personal motivation and improve professionalism (Sabanciogullari & Dogan, 2015).

Many studies have shown that the interference of personal life issues in the work environment, or vice versa, can often cause sleep disorders and burnout especially in women because they are

generally more involved in family management (Abiodun, Osibanjo, Adeniji, & Iyere-Okojie, 2014; Gandi, Wai, Karick, & Dagona, 2011). Conversely, a sound work environment, good leadership and supportive co-workers can mitigate the above-described negative effects and improve job satisfaction and care performance in the daily activities performed by nurses (AbuAlRub, 2004; Top, 2013).

2 | THE STUDY

2.1 | Aims

This study aimed to investigate any possible relationship between sleep disorders, burnout and job performance in a shift-work population of nurses.

2.2 | Research hypothesis

Specific characteristics linked to shift-work nurses can affect directly sleep quality and burnout and indirectly job performance.

2.3 | Design

A cross-sectional approach was used according to the STROBE guidelines for observational studies.

2.4 | Sample

This study was conducted on a convenience sample of 315 nurses who work rotating 24-hour shifts in 39 wards of seven central Italian hospitals that were equipped with several beds ranging from 50-120. All the investigated hospitals were acute and chronic care general hospitals, where "team nursing" was the model of nursing care mainly used. Only nurses who worked at least six nights per month were included.

2.5 | Data collection

After written informed consent was obtained from each participant, questionnaires were administered between August 2014 and January 2015.

Particular attention was paid to the creation of a positive environment during the administration of the questionnaire. To avoid the feeling of forced participation in the study by nurses, questionnaires were anonymized and were collected in a sealed envelope.

2.6 | Instruments

Validated questionnaires were used to investigate sleep quality, burnout and job performance.

In particular, the Italian version of the Pittsburgh Sleep Quality Index (Curcio et al., 2013) was used to detect the presence of sleep disorders, the Italian version of the Copenhagen Burnout Inventory

(Avanzi et al., 2013) was used to detect the presence of any possible type of burnout and finally, the Italian version of the Job Performance Scale: Task Performance and Contextual Performance (Green-slade & Jimmieson, 2007) was used to detect the job performance of nurses who participated in the study.

2.6.1 | Pittsburgh sleep quality index (PSQI)

The PSQI is a self-assessment scale that was developed to provide information on the subjective quality of sleep (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). This scale is a validated, standardized and reliable tool that assesses the following seven areas: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disorders, hypnotic drug usage and the quality of everyday life. The final score ranges from 0 (better sleep) - 21 (worst sleep) and a value >5 indicates the presence of a sleep disorder.

2.6.2 | Copenhagen burnout inventory (CBI)

The CBI (Kristensen et al., 2005) includes 19 items that evaluate three subcategories of burnout: personal burnout, work-related burnout and patient-related burnout. The first subscale (personal burnout) includes six items pertaining to the physical and psychological fatigue and overall exhaustion experienced by an individual, the second subscale (work-related burnout) is composed of seven items pertaining to the physical and psychological fatigue that results from the work environment and the third subscale (patient-related burnout) is composed of six items that evaluate the physical and psychological fatigue experienced by people who work with clients, which are represented by patients in this study. In this study, the items were rated on a 5-point Likert scale and mean values ≥ 3 indicated the presence of burnout.

2.6.3 | Job performance scale: Task performance and contextual performance

This scale consists of two sections (task performance and contextual performance) with four factors that are fundamental to each section: 'provide information, coordination of care, social support and technical care' in the Task Performance section and 'interpersonal support, job-task support, compliance and volunteering for additional duties' in the Contextual Performance section.

The Italian validation process reduced the four factors in the Contextual Performance section to three on the basis of an exploratory factor analysis that combined 'compliance and volunteering for additional duties into a single factor that was named membership to the organization'.

Overall job performance was measured using the mean score on a 7-point scale that ranged from 1 to 7, where 6-7 indicated a high level that exceeded the standards for job performance, where a score of 3-5 indicated a moderate level that met the standards for job performance and where a score of 1-2 was a low level that fell below the standards for job performance.

2.7 | Ethical considerations

Research ethics approval was obtained from the board of directors of the hospitals where the study was conducted and additional approval was obtained from the nursing school board at the University of L'Aquila. The Ethics Committee was consulted and the committee noted that their ethical approval was not required for this type of study because this study did not interfere with patient care or care facilities and only concerned the nurses who voluntarily responded to an anonymous and self-administered questionnaire.

2.8 | Data analysis

Descriptive analyses were performed on all data. For this purpose, frequencies and percentages were calculated for both discrete and nominal variables and compared using the chi-squared test. Continuous variables are reported as means and standard deviations. First, all potential determinants of impaired sleep quality, burnout and high job performance were entered separately into a univariate logistic regression model.

Second, independent variables with a *p*-value below .05 in the model were included in the multiple logistic regression model. Backward stepwise selection with the Akaike information criterion (AIC) was used to determine the factors that best predicted outcome variables. The Spearman coefficient was calculated to examine the degree of correlation between the ordinal variables that were investigated in the study.

All the data were recorded electronically and statistical analyses were carried out using the Stata Statistical Software: Release 12. College Station, TX: Stata Corp LP. All the tests were two-tailed and *p*-values $\leq .05$ were considered statistically significant.

2.9 | Validity and reliability

All the questionnaires used in this study have been validated in previous research.

The PSQI showed an overall reliability coefficient (Cronbach's alpha) of 0.835, indicating a high internal consistency (Curcio et al., 2013). For the CBI, the Cronbach's alpha values for each subcategory were as follows: personal burnout = 0.89, work-related burnout = 0.86 and patient-related burnout = 0.84 (Avanzi et al., 2013). Both the Job Performance subscales (task performance and contextual performance) were internally consistent with coefficients > 0.90 (Greenslade & Jimmieson, 2007).

3 | RESULTS

The overall characteristics of the analysed sample are summarized in Table 1. Overall, 315 nurses, 214 (67.9%) of whom were females, were included in the study. The median age of the investigated subjects was 46 years old (IQR = 10) and basic education (bachelor of nursing) was the most common professional qualification.

All the participants worked in clinical areas (medical, surgical, critical care and psychiatric) and 60.3% of nurses followed a shift pattern based on a long cycle (two morning shifts, two afternoon shifts and two night shifts, followed by 3-day rest periods), while the rest of sample (39.7%) followed a short cycle shift pattern (1 morning shift, 1 afternoon shift and 1 night shift, followed by 2-day rest periods). The average number of hours worked per week by a nurse was 36. In total, 52.1% of sample showed impaired sleep quality and 31.4% showed a presence of burnout, while high values of task and contextual performance resulted in 64.4% and 38.4% of sample, respectively.

Table 2 shows the frequencies of the overall sleep quality disturbances and the presence of burnout in the investigated subgroups. The data analysis highlighted that there was a higher percentage of nurses with impaired sleep quality in the female group (58.4% vs 38.6%; $\chi^2 = 10.776$; $p = .001$) compared with the male group and that a larger presence of burnout was observed in the group of nurses who worked a long-shift pattern compared with the group that worked a short-shift pattern (35.8% vs 24.8%; $\chi^2 = 4.225$; $p = .040$). A higher presence of burnout ($\chi^2 = 7.836$; $p = .050$) was also found in the psychiatric work area (50.0%) compared with the surgical work area (37.4%), the critical care work area (29.8%) or the medical work area (24.1%).

TABLE 1 Sample characteristics

Variables	N	%
Gender		
Male	101	32.1
Female	214	67.9
Age groups		
≤ 40	78	24.8
41–50	153	48.6
> 50	84	26.7
Education		
Basic	271	86
Basic+Post-basic	44	14
Work setting		
Medical area	108	34.3
Surgical area	91	28.9
Critical care area	94	29.8
Psychiatric area	22	7.0
Years in practice		
≤ 15	98	31.1
16–25	122	38.7
> 25	95	30.2
Shift pattern		
Long cycle ^a	190	60.3
Short cycle ^b	125	39.7

^a2 morning shifts, 2 afternoon shifts, and 2 night shifts, followed by 3-day rest periods.

^b1 morning shift, 1 afternoon shift, and 1 night shift, followed by 2-day rest periods.

Data collected on 315 shift-work nurses were included in the univariate logistic regression analysis.

As shown in Table 3, mainly female nurses and CBI components were univariately associated with impaired sleep quality, while work setting, shift pattern and PSQI components were univariately associated with total burnout. Furthermore, total burnout, work-related burnout and patient-related burnout showed a significant negative association with high task performance, while only patient-related burnout showed a significant negative association with high contextual performance. The multivariate model (Table 4) was built with variables that showed significant associations with sleep quality, burnout and job performance in the univariate analysis.

Looking at the final model, the female gender and personal burnout were significantly associated with impaired sleep quality, while working in the psychiatric setting, working a long cycle shift pattern and experiencing daytime dysfunction were significantly associated

with burnout. In addition, a significant negative association between patient-related burnout and both high task performance and contextual performance was observed.

The correlation analysis (Table 5) showed a general and significant linear association between the quality of sleep and burnout ($\rho = 0.367$; $p < .001$). In particular, sleep disturbance, daytime dysfunction and subjective sleep quality showed a significant positive correlation with the mean values of the total burnout scores and its relative dimensions, while being predominantly correlated to personal burnout. Instead, job performance showed a significant negative correlation with burnout, particularly between task performance and patient-related burnout ($\rho = -0.262$; $p < .001$), but not with the quality of sleep or its relative dimensions.

4 | DISCUSSION

To our knowledge, this is the first study that has investigated the relationship among different dimensions of sleep quality, burnout and job performance on a large sample of shift-work nurses on a rotating 24-hour schedule who worked in the clinical areas of several general hospitals in Italy.

Some of the research on nurses who work rotating 24-hour shifts has already highlighted the presence of impaired sleep quality (Camerino et al., 2010; Gandi et al., 2011), burnout (Estryn-Béhar & Van der Heijden, 2012; Weishan, Yue, Yu-Ju, Chiu-Yueh, & Judith, 2015), absence due to sickness described as "mental health days" (Lamont et al., 2017), or more generally, worse general and mental health (Perry, Gallagher, & Duffield, 2015; Perry, Lamont, Brunero, Gallagher, & Duffield, 2015) that can influence the intention to leave (Perry et al., 2016).

In this study, 52.1% of the sample suffered from poor sleep quality and 31.4% showed the presence of burnout. High values of task performance and contextual performance were found in 64.4% and 38.4% of sample, respectively. Data analysis, mainly based on a multiple logistic regression model, allowed us a more comprehensive understanding of the relationships underlying the variables examined in this study.

The conceptual framework derived from the results of this study (Figure 1) clearly shows that there is a circular relationship between burnout and sleep quality, mediated by the effects of personal burnout on impaired sleep quality and of daytime dysfunction on the presence of total burnout.

In this model, both sleep quality and burnout show to be affected by factors outside this circular relationship: sleep quality is affected by gender and burnout is affected by work setting and shift pattern. Burnout seems to be negatively associated with job performance through patient-related burnout.

Compared with males, females seemed to experience more disturbance in the total sleep quality. In accordance with other studies, it could be argued that women have greater difficulties reconciling work and family commitments, perceiving work as an obstacle to motherhood (Messing et al., 2011). Camerino et al. noted that shift

TABLE 2 Frequency distributions for impaired sleep quality and presence of burnout

	Impaired sleep quality (N = 315)			Presence of burnout (N = 315)		
	N	%	p-value ^a	N	%	p-value ^a
Total	164	52.1	N/A	99	31.4	N/A
Gender						
Male	39	38.6	.001	32	31.7	.947
Female	125	58.4		67	31.3	
Age groups						
≤40	40	51.3	.987	28	35.9	.584
41–50	80	52.3		47	30.7	
>50	44	52.4		24	28.6	
Education						
Basic	142	52.4	.447	143	52.8	.323
Basic+post-basic	22	50.0		21	47.7	
Work setting						
Medical area	63	58.3	.342	26	24.1	.050
Surgical area	46	50.5		34	37.4	
Critical care area	43	45.7		28	29.8	
Psychiatric area	12	54.5		11	50.0	
Years in practice						
≤15	52	53.1	.539	30	30.6	.952
16–25	59	48.4		38	31.1	
>25	53	55.8		31	32.6	
Shift pattern						
Long cycle ^b	105	55.3	.161	68	35.8	.040
Short cycle ^c	59	47.2		31	24.8	

^aChi-squared test.

^b2 morning shifts, 2 afternoon shifts, and 2 night shifts, followed by 3-day rest periods.

^c1 morning shift, 1 afternoon shift, and 1 night shift, followed by 2-day rest periods.

N/A, not applicable.

TABLE 3 Univariate logistic regression analysis

	Impaired sleep quality			Burnout			High task performance			High contextual Performance		
	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value	OR	95% CI	p-value
Gender												
Male ^a	1			1			1			1		
Female	2.23	1.38–3.62	.001	0.98	0.59–1.64	.947	1.46	0.90–2.39	.126	0.87	0.54–1.42	.585
Work setting												
Medical area ^a	1			1			1			1		
Surgical area	0.73	0.42–1.28	.272	1.88	1.02–3.47	.043	0.77	0.43–1.139	.384	0.70	0.40–1.25	.231
Critical care area	0.60	0.34–1.05	.075	1.34	0.72–2.50	.361	0.81	0.45–1.45	.482	0.74	0.42–1.30	.288
Psychiatric area	0.86	0.34–2.16	.743	3.15	1.23–8.11	.017	0.55	0.22–1.40	.211	0.74	0.29–1.91	.537
Shift pattern												
Short cycle ^{a,b}	1			1			1			1		
Long cycle ^c	1.38	0.88–2.17	.162	1.69	1.02–2.79	.041	0.92	0.57–1.48	.728	1.01	0.63–1.59	.997
PSQI												
Total sleep quality	N/A	N/A	N/A	1.26	1.16–1.36	<.001	0.98	0.91–1.05	.564	1.03	0.96–1.11	.412
Subjective sleep quality	N/A	N/A	N/A	2.30	1.58–3.33	<.001	1.07	0.77–1.50	.686	1.24	0.89–1.73	.198
Sleep latency	N/A	N/A	N/A	1.51	1.17–1.93	.001	1.08	0.85–1.37	.527	1.08	0.85–1.36	.529
Sleep duration	N/A	N/A	N/A	1.26	0.95–1.68	.110	1.01	0.76–1.33	.975	1.23	0.93–1.62	.140
Sleep disturbances	N/A	N/A	N/A	2.23	1.45–3.43	<.001	0.85	0.57–1.27	.425	1.23	0.83–1.82	.310
Habitual sleep efficiency	N/A	N/A	N/A	1.25	0.98–1.60	.075	0.91	0.72–1.16	.452	0.96	0.75–1.22	.730
Sleep medication usage	N/A	N/A	N/A	2.00	1.31–3.03	.001	0.71	0.48–1.05	.085	0.85	0.56–1.28	.441
Daytime dysfunction	N/A	N/A	N/A	3.12	2.12–4.60	<.001	0.89	0.65–1.22	.453	1.02	0.74–1.39	.922
CBI^d												
Total burnout	3.59	2.14–6.03	<.001	N/A	N/A	N/A	0.51	0.31–0.83	.007	0.64	0.39–1.06	.081
Personal burnout	4.47	2.78–7.19	<.001	N/A	N/A	N/A	0.83	0.52–1.32	.426	0.69	0.44–1.09	.112
Work-related burnout	3.08	1.90–4.98	<.001	N/A	N/A	N/A	0.57	0.35–0.91	.019	0.64	0.40–1.03	.066
Patient-related burnout	2.00	1.15–3.48	.014	N/A	N/A	N/A	0.30	0.17–0.52	<.001	0.49	0.27–0.89	.019

^aReference category.

^b1 morning shift, 1 afternoon shift, and 1 night shift, followed by 2 days rest periods.

^c2 morning shift, 2 afternoon shift, and 2 night shift, followed by 3 days rest periods.

^dReference subcategories for OR=1 (absence of disturb).

Significant *p*-values are highlighted in bold font.

N/A, not applicable.

work, particularly night shifts, have a strong impact on the family-labour conflict among women. This conflict, if it is associated with excessive workloads, may facilitate the onset of burnout and sleep disorders (Camerino et al., 2010). In addition, Estryn-Béhar and Van der Heijden, in a study conducted in Europe in 2012, highlighted that women are more susceptible to illness and discomfort that was dependent on shift work: among 25,924 nurses, a substantial percentage of women reported a relationship between work-family conflicts, dissatisfaction with shift-length that heavily affected their private lives and psycho-physical discomfort due to the excessive shift-length. These authors highlighted the effects of shifts of twelve hours or more and showed that even burnout was more significant among women, in addition to a reduced functional capacity to work (Estryn-Béhar & Van der Heijden, 2012).

Hence, it is of great importance for healthcare administrators and managers to consider the female gender when organizing shift

work, both in the light of the results of this study and on the basis of other research, which has shown an increased risk of health issues for female nurses doing shift work (Nicholls et al., 2017; Perry, Gallagher, et al., 2015; Perry, Lamont, et al., 2015).

In this study, shift pattern and work setting were found significantly associated with burnout. Nurses who worked a long-shift pattern showed higher levels of burnout than those nurses who followed a short-shift pattern. No corroborating evidence was found in the literature for this phenomenon, even if the studies often considered the length of a single shift rather than the length of the work cycle before a rest period. Most likely, longer shifts (six consecutive work days or more) produce negative effects because of the longer exposure to patients and to the hospital environment.

In terms of work setting, significant differences were observed with the higher levels of burnout found on nurses who worked in psychiatric areas. This contrasts with previous research, which found

TABLE 4 Multivariate logistic regression analysis

	Impaired sleep quality			Burnout			High task performance			High Contextual Performance		
	OR ^b	95% CI	<i>p</i> -value	OR ^b	95% CI	<i>p</i> -value	OR ^b	95% CI	<i>p</i> -value	OR ^b	95% CI	<i>p</i> -value
Gender												
Male ^a	1											
Female	1.84	1.07–3.16	.027									
Work setting												
Medical area ^a				1								
Surgical area				1.85	0.92–3.70	.082						
Critical care area				1.60	0.79–3.21	.190						
Psychiatric area				6.85	2.16–21.70	.001						
Shift pattern												
Short cycle ^{a,c}				1								
Long cycle ^d				2.22	1.18–4.19	.013						
PSQI												
Total sleep quality												
Subjective sleep quality				1.53	0.98–2.38	.061						
Sleep latency				1.30	0.96–1.75	.094						
Sleep duration												
Sleep disturbances				1.24	0.71–2.16	.447						
Habitual sleep efficiency												
Sleep medication usage				1.42	0.88–2.30	.147						
Daytime dysfunction				2.60	1.70–3.96	<.001						
CBI ^e												
Total burnout	1.90	0.69–5.22	.216				1.23	0.49–3.09	.658			
Personal burnout	2.67	1.50–4.75	.001									
Work-related burnout	1.35	0.63–2.88	.446				0.83	0.39–1.78	.635			
Patient-related burnout	0.85	0.37–1.95	.704				0.29	0.14–0.60	.001	0.49	0.27–0.89	.019

^aReference category.

^bAdjusted odds ratio for the other variables in the model.

^c1 morning shift, 1 afternoon shift, and 1 night shift, followed by 2 day rest periods.

^d2 morning shift, 2 afternoon shift, and 2 night shift, followed by 3 day rest periods.

^eReference subcategories for OR=1 (absence of disturb).

Significant *p*-values are highlighted in bold font.

that the levels of burnout were transversely distributed among different clinical areas (Colff & Rothmann, 2014; Henderson, 2015; Zhou et al., 2015). The correlation analysis between sleep quality and burnout showed a statistically significant agreement both in the overall score and in the subcategories.

This finding agrees with the results of previous research in that nurses who habitually slept less than six hours a day were found more to be vulnerable to burnout than those nurses who habitually slept for more 6 hr a day (OR = 3.0; *p* < .001, 95% CI = 1.7–5.2) (Weishan et al., 2015). In addition, nurses who worked shifts that lasted for 10–12 hr more often suffered from sleep disorders and were more inclined to ask for shorter or longer periods of sick leave (Estryn-Béhar & Van der Heijden, 2012).

There was a stronger correlation of sleep disorders with patient-related burnout than with work-related burnout, which suggests that even when the work environment is favourable, the very nature of

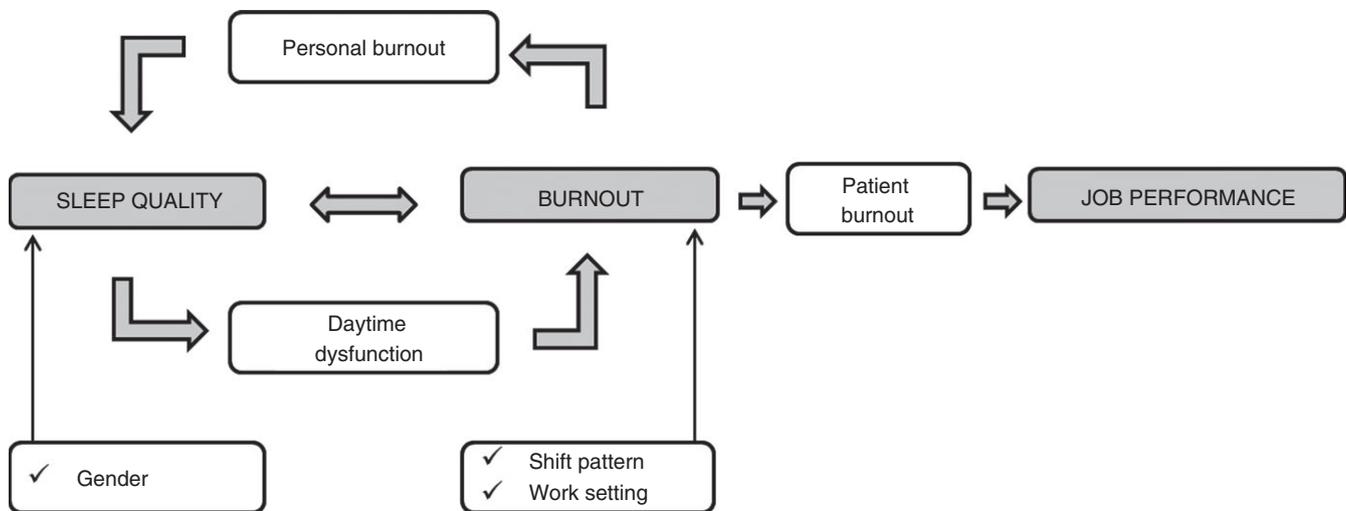
nursing activities can produce stressful conditions. Patient-related burnout was the component of burnout more strongly associated with task and contextual performance, confirmed by the multivariate logistic regression model.

This finding agrees with the results of many previous studies that have highlighted that nurses belong to a category of workers who are more susceptible to burnout because they are in continuous contact with emotions related to patients and their diseases (Borritz et al., 2006; Chakraborty, Chatterjee, & Chaudhury, 2012; Koch, Stranzinger, Nienhaus, & Kozak, 2015). In other studies, statistically significant associations were observed between emotional exhaustion, depersonalization and job performance and emotional exhaustion was emphasized as the dominant factor that was associated with greater decreases in job performance (Bartram, Casimir, Djurkovic, Leggat, & Stanton, 2012), which can ultimately affect patient safety (Fallis, McMillan, & Edwards, 2011; Moret et al., 2012; Spoor, de Jonge, & Hamers, 2010).

TABLE 5 Correlation coefficients (Spearman's Rho) between the PSQI, CBI, and Job performance values^a

	Total burnout	Personal burnout	Work-related burnout	Patient-related burnout	Task performance	Contextual performance
Total sleep quality	0.367	0.434	0.332	0.224	-0.064	-0.003
Sleep disturbance	0.269	0.333	0.232	0.171	-0.019	0.006
Daytime dysfunction	0.461	0.501	0.446	0.283	-0.055	-0.058
Subjective sleep quality	0.302	0.309	0.290	0.191	0.009	0.045
Sleep duration	0.097	0.169	0.046	0.061	-0.029	0.084
Sleep latency	0.183	0.214	0.181	0.100	0.010	0.039
Habitual sleep efficiency	0.114	0.121	0.097	0.076	-0.045	-0.032
Sleep medication usage	0.170	0.175	0.126	0.170	-0.116	-0.066
Total burnout					-0.194	-0.202
Personal burnout					-0.050	-0.076
Work-related burnout					-0.185	-0.210
Patient-related burnout					-0.262	-0.222

^aThe correlation coefficients showing the strongest relationships are highlighted in bold font.

**FIGURE 1** Conceptual framework

Reversing the 1993 European directive, recent 2015 legislation imposes a regulation on work hours and rest periods that most closely imitate normal circadian rhythms. The results of this study can help to better understand the dimension of burnout and sleep disorders among nurses who work rotating 24-hour shifts from the perspective of improving the quality of life of the nurses and the safety of patients while allowing for data comparisons between work environments and different countries.

4.1 | Limitation of this study

The main limitation of this research is that the sample, although representative of the population from which it was extracted, may not allow these results to be generalized, despite the consistency of the results with previously published studies pertaining to these issues.

5 | CONCLUSION

Specific characteristics of shift-work nurses can directly affect sleep quality and burnout and indirectly job performance.

In examined population, sleep disorders and burnout appear to be related, but only the latter seems to have adverse effects on the job performance of nurses. Sleep quality appears to be worse in women than in men, while working in the psychiatric setting, working a long cycle shift pattern and experiencing daytime dysfunction showed to be significantly associated with burnout. This evidence offers healthcare administrators opportunities to intervene with measures to promote nurse's health, well-being and safety.

In Italy, the imposed 2015 legislation on work hours and rest periods that most closely imitate normal circadian rhythms has only been in effect for a short amount of time and this research was conducted prior to the application of the new laws. Conduction of

similar surveys in the mid-term that ascertain whether the new regulations can determine changes concerning the health, well-being, satisfaction and professional performance of nurses would be both appropriate and interesting.

CONFLICT OF INTEREST

No conflict of interest has been declared by the authors.

AUTHOR CONTRIBUTIONS

All authors have agreed on the final version and meet at least one of the following criteria (recommended by the ICMJE [<http://www.icmje.org/recommendations/>]):

1. substantial contributions to conception and design, acquisition of data, or analysis and interpretation of data;
2. drafting the article or revising it critically for important intellectual content.

ORCID

Loreto Lancia  <http://orcid.org/0000-0002-2345-1731>

REFERENCES

- Abiodun, A. J.z, Osibanjo, O. A., Adeniji, A. A., & Iyere-Okojie, E. (2014). Modelling the relationship between job demands, work attitudes and performance among nurses in a transition economy. *International Journal of Healthcare Management*, 7, 257–264. <https://doi.org/10.1179/2047971914Y.0000000073>
- AbuAlRub, R. F. (2004). Job stress, job performance and social support among hospital nurses. *Journal of Nursing Scholarship*, 36, 73–78. <https://doi.org/10.1111/j.1547-5069.2004.04016.x>
- Admi, H., Tzischinsky, O., Epstein, R., Herer, P., & Lavie, P. (2008). Shift work in nursing: Is it really a risk factor for nurses' health and patients' safety? *Nursing Economic*, 26, 250–257.
- Avanzi, L., Balducci, C., & Fraccaroli, F. (2013). Contributo alla validazione italiana del Copenhagen Burnout Inventory (CBI). *Psicologia della Salute*, 2, 120–135. <https://doi.org/10.3280/PDS2013-002008>
- Bartram, T., Casimir, G., Djurkovic, N., Leggat, S. G., & Stanton, P. (2012). Do perceived high performance work systems influence the relationship between emotional labour, burnout and intention to leave? A study of Australian nurses. *Journal of Advanced Nursing*, 68, 1567–1578. <https://doi.org/10.1111/j.1365-2648.2012.05968.x>
- Borritz, M., Rugulies, R., Bjorner, J. B., Villadsen, E., Mikkelsen, O. A., & Kristensen, T. S. (2006). Burnout among employees in human service work: Design and baseline findings of the PUMA study. *Scandinavian Journal of Public Health*, 34, 49–58. <https://doi.org/10.1080/14034940510032275>
- Buyse, D. J., Reynolds, C. F.III, Monk, T. H., Berman, S. R., & Kupfer, D. J. (1989). The pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28, 193–213. [https://doi.org/10.1016/0165-1781\(89\)90047-4](https://doi.org/10.1016/0165-1781(89)90047-4)
- Camerino, D., Sandri, M., Sartori, S., Conway, P. M., Campanini, P., & Costa, G. (2010). Shiftwork, work-family conflict among italian nurses and prevention efficacy. *Chronobiology International: The Journal of Biological & Medical Rhythm Research*, 27, 1105–1123. <https://doi.org/10.3109/07420528.2010.490072>
- Chakraborty, R., Chatterjee, A., & Chaudhury, S. (2012). Internal predictors of burnout in psychiatric nurses: An Indian study. *Industrial Psychiatry Journal*, 21, 119–124. <https://doi.org/10.4103/0972-6748.119604>
- Chin, W., Guo, Y. L., Hung, Y.-J., Yang, C.-Y., & Shiao, J. S.-C. (2015). Short sleep duration is dose-dependently related to job strain and burnout in nurses: A cross sectional survey. *International Journal of Nursing Studies*, 52, 297–306. <https://doi.org/10.1016/j.ijnurstu.2014.09.003>
- Chung, M. H., Liu, W. I., Lee, H. L., & Hsu, N. (2013). Selected neurophysiological, psychological and behavioral influences on subjective sleep quality in nurses: A structure equation model. *PLoS ONE*, 8, e79529. <https://doi.org/10.1371/journal.pone.0079529>
- Coffey, L. C., Skipper, J. K. Jr, & Jung, F. D. (1988). Nurses and shift work: Effects on job performance and job-related stress. *Journal of Advanced Nursing*, 13, 245–254. <https://doi.org/10.1111/j.1365-2648.1988.tb01414.x>
- Colff, J. J., & Rothmann, S. (2014). Burnout of registered nurses in South Africa. *Journal of Nursing Management*, 22, 630–642. <https://doi.org/10.1111/j.1365-2834.2012.01467.x>
- Curcio, G., Tempesta, D., Scarlata, S., Marzano, C., Moroni, F., Rossini, P. M., & De Gennaro, L. (2013). Validity of the Italian version of the Pittsburgh Sleep Quality Index (PSQI). *Neurological Sciences*, 34, 511–519. <https://doi.org/10.1007/s10072-012-1085-y>
- Demir Zencirci, A., & Arslan, S. (2011). Morning-evening type and burnout level as factors influencing sleep quality of shift nurses: A questionnaire study. *Croatian Medical Journal*, 52, 527–537. <https://doi.org/10.3325/cmj.2011.52.527>
- Estryn-Béhar, M., & Van der Heijden, B. I. J. M. (2012). Effects of extended work shifts on employee fatigue, health, satisfaction, work/family balance and patient safety. *Work*, 41(Suppl 1), 4283–4290. <https://doi.org/10.3233/wor-2012-0724-4283>
- Fallis, W. M., McMillan, D. E., & Edwards, M. P. (2011). Napping during night shift: Practices, preferences and perceptions of critical care and emergency department nurses. *Critical Care Nurse*, 31, e1–e11. <https://doi.org/10.4037/ccn2011710>
- Figueiro, M. G., Sahin, L., Wood, B., & Plitnick, B. (2015). Light at night and measures of alertness and performance: Implications for shift workers. *Biological Research for Nursing*, 18, 90–100. <https://doi.org/10.1177/1099800415572873>
- Fitzpatrick, J. M., While, A. E., & Roberts, J. D. (1999). Shift work and its impact on nurse performance: Current knowledge and research issues. *Journal of Advanced Nursing*, 29, 18–27. <https://doi.org/10.1046/j.1365-2648.1999.00861.x>
- Gandi, J. C., Wai, P. S., Karick, H., & Dagona, Z. K. (2011). The role of stress and level of burnout in job performance among nurses. *Mental Health in Family Medicine*, 8, 181–194.
- Garbarino, S., Lanteri, P., Durando, P., Magnavita, N., & Sannita, W. G. (2016). Co-morbidity, mortality, quality of life and the healthcare/welfare/social costs of disordered sleep: A Rapid Review. *International Journal of Environmental Research and Public Health*, 13, 831. <https://doi.org/10.3390/ijerph13080831>
- Garrett, C. (2008). The effect of nurse staffing patterns on medical errors and nurse burnout. *Association of periOperative Registered Nurses Journal*, 87, 1191–1204. <https://doi.org/10.1016/j.aorn.2008.01.022>
- Greenslade, J. H., & Jimmieson, N. L. (2007). Distinguishing between task and contextual performance for nurses: Development of a job performance scale. *Journal of Advanced Nursing*, 58, 602–611. <https://doi.org/10.1111/j.1365-2648.2007.04256.x>
- Henderson, J. (2015). The effect of hardiness education on hardiness and burnout on registered nurses. *Nursing Economic*, 33, 204–209.
- Huth, J. J., Eliades, A., Handwork, C., Englehart, J. L., & Messenger, J. (2013). Shift worked, quality of sleep and elevated body mass index in pediatric nurses. *Journal of Pediatric Nursing*, 28, e64–e73. <https://doi.org/10.1016/j.pedn.2013.02.032>

- Johnson, A. L., Brown, K., & Weaver, M. T. (2010). Sleep deprivation and psychomotor performance among night-shift nurses. *AAOHN journal: official journal of the American Association of Occupational Health Nurses*, 58, 147–154. <https://doi.org/10.3928/08910162-20100329-05>
- Karhula, K., Härmä, M., Sallinen, M., Hublin, C., Virkkala, J., Kivimäki, M., & Puttonen, S. (2013). Job strain, sleep and alertness in shift working health care professionals - A field study. *Industrial Health*, 51, 406–416. <https://doi.org/10.2486/indhealth.2013-0015>
- Keller, S. M. (2009). Effects of extended work shifts and shift work on patient safety, productivity and employee health. *American Association of Occupational Health Nurses Journal*, 57, 497–502. <https://doi.org/10.3928/08910162-20091116-01>
- Koch, P., Stranzinger, J., Nienhaus, A., & Kozak, A. (2015). Musculoskeletal symptoms and risk of burnout in child care workers - A cross-sectional study. *PLoS ONE*, 10, 1–14. <https://doi.org/10.1371/journal.pone.0140980>
- Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, 19, 192–207. <https://doi.org/10.1080/02678370500297720>
- Lamont, S., Brunero, S., Perry, L., Duffield, C., Sibbritt, D., Gallagher, R., & Nicholls, R. (2017). 'Mental health day' sickness absence amongst nurses and midwives: Workplace, workforce, psychosocial and health characteristics. *Journal of Advanced Nursing*, 73, 1172–1181. <https://doi.org/10.1111/jan.13212>
- Lin, P. C., Chen, C. H., Pan, S. M., Pan, C. H., Chen, C. J., Chen, Y. M., & Wu, M. T. (2012). Atypical work schedules are associated with poor sleep quality and mental health in Taiwan female nurses. *International Archives of Occupational and Environmental Health*, 85, 877–884. <https://doi.org/10.1007/s00420-011-0730-8>
- Lin, S. H., Liao, W. C., Chen, M. Y., & Fan, J. Y. (2014). The impact of shift work on nurses' job stress, sleep quality and self-perceived health status. *Journal of Nursing Management*, 22, 604–612. <https://doi.org/10.1111/jonm.12020>
- Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *Maslach Burnout Inventory Manual*, 3rd ed.. Palo Alto, CA: Consulting Psychologists Press.
- Messing, K., Caroly, S., Estryng-Behar, M., Fry, C., Guetarni, K., Aune, I., & Prudhomme, C. (2011). Work week duration, work-family balance and difficulties encountered by female and male physicians: Results from the French SESMAT study. *Work*, 40(Suppl 1), 83–100. <https://doi.org/10.3233/WOR-2011-1270>
- Moret, L., Anthoine, E., Paille, C., Tricaud-Vialle, S., Gerbaud, L., Giraud-Roufast, A., & Lombrail, P. (2012). Relationship between inpatient satisfaction and nurse absenteeism: An exploratory study using WHO-PATH performance indicators in France. *BMC Research Notes*, 5, 83. <https://doi.org/10.1186/1756-0500-5-83>
- Nicholls, R., Perry, L., Gallagher, R., Duffield, C., Sibbritt, D., & Xu, X. (2017). The personal cancer screening behaviours of nurses and midwives. *Journal of Advanced Nursing*, 73, 1403–1420. <https://doi.org/10.1111/jan.13221>
- Peate, I. (2007). Strategies for coping with shift work. *Nursing Standard*, 22, 42–45. <https://doi.org/10.7748/ns2007.10.22.4.42.c4620>
- Perry, L., Gallagher, R., & Duffield, C. (2015). The health and health behaviours of Australian metropolitan nurses: An exploratory study. *BMC Nursing*, 3, 45. <https://doi.org/10.1186/s12912-015-0091-9>
- Perry, L., Gallagher, R., Duffield, C., Sibbritt, D., Bichel-Findlay, J., & Nicholls, R. (2016). Does nurses' health affect their intention to remain in their current position? *Journal of Nursing Management*, 24, 1088–1097. <https://doi.org/10.1111/jonm.12412>
- Perry, L., Lamont, S., Brunero, S., Gallagher, R., & Duffield, C. (2015). The mental health of nurses in acute teaching hospital settings: A cross-sectional survey. *BMC Nursing*, 27, 15. <https://doi.org/10.1186/s12912-015-0068-8>
- Pisanti, R., Lombardo, C., Lucidi, F., Violani, C., & Lazzari, D. (2013). Psychometric properties of the Maslach Burnout Inventory for human services among Italian nurses: A test of alternative models. *Journal of Advanced Nursing*, 69, 697–707. <https://doi.org/10.1111/j.1365-2648.2012.06114.x>
- Sabanciogullari, S., & Dogan, S. (2015). Effects of the professional identity development programme on the professional identity, job satisfaction and burnout levels of nurses: A pilot study. *International Journal of Nursing Practice*, 21, 847–857. <https://doi.org/10.1111/ijn.12330>
- Saksvik-Lehouillier, I., Bjorvatn, B., Hetland, H., Sandal, G. M., Moen, B. E., Magerøy, N., & Pallesen, S. (2013). Individual, situational and lifestyle factors related to shift work tolerance among nurses who are new to and experienced in night work. *Journal of Advanced Nursing*, 69, 1136–1146. <https://doi.org/10.1111/j.1365-2648.2012.06105.x>
- Soric, M., Golubic, R., Milosevic, M., Juras, K., & Mustajbegovic, J. (2013). Shift work, quality of life and work ability among Croatian hospital nurses. *Collegium Antropologicum*, 37, 379–384.
- Spoor, E., de Jonge, J., & Hamers, J. P. (2010). Design of the DIRECT-project: Interventions to increase job resources and recovery opportunities to improve job-related health, well-being and performance outcomes in nursing homes. *BMC Public Health*, 10, 293. <https://doi.org/10.1186/1471-2458-10-293>
- Sundin, L., Hochwälder, J., & Lisspers, J. (2011). A longitudinal examination of generic and occupational specific job demands and work-related social support associated with burnout among nurses in Sweden. *Work*, 38, 389–400. <https://doi.org/10.3233/WOR-2011-1142>
- Top, M. (2013). Organizational variables on nurses' job performance in Turkey: Nursing assessments. *Iranian Journal of Public Health*, 42, 261–271.
- Trbojević-Stanković, J., Stojimirović, B., Soldatović, I., Petrović, D., Nešić, D., & Simić, S. (2015). Continuing nursing education. work-related factors as predictors of burnout in serbian nurses working in hemodialysis. *Nephrology Nursing Journal*, 42, 553–562.
- Tzeng, H. M. (2004). Nurses' self-assessment of their nursing competencies, job demands and job performance in the Taiwan hospital system. *International Journal of Nursing Studies*, 41, 487–496. <https://doi.org/10.1016/j.ijnurstu.2003.12.002>
- Weishan, C., Yue, Leon G., Yu-Ju, H., Chiu-Yueh, Y., & Judith, Shu-Chu S. (2015). Short sleep duration is dose-dependently related to job strain and burnout in nurses: A cross sectional survey. *International Journal of Nursing Studies*, 52, 297–306. <https://doi.org/10.1016/j.ijnurstu.2014.09.003>
- Wisetborisut, A., Angkurawaranon, C., Jiraporncharoen, W., Uaphanthasath, R., & Wiwatanadate, P. (2014). Shift work and burnout among health care workers. *Occupational Medicine*, 64, 279–286. <https://doi.org/10.1093/occmed/kqu009>
- Zhou, W., He, G., Wang, H., He, Y., Yuan, Q., & Liu, D. (2015). Job dissatisfaction and burnout of nurses in Hunan, China: A cross-sectional survey. *Nursing & Health Sciences*, 17, 444–450. <https://doi.org/10.1111/nhs.12213>

How to cite this article: Giorgi F, Mattei A, Notarnicola I, Petrucci C, Lancia L. Can sleep quality and burnout affect the job performance of shift-work nurses? A hospital cross-sectional study. *J Adv Nurs*. 2018;74:698–708. <https://doi.org/10.1111/jan.13484>

The *Journal of Advanced Nursing (JAN)* is an international, peer-reviewed, scientific journal. *JAN* contributes to the advancement of evidence-based nursing, midwifery and health care by disseminating high quality research and scholarship of contemporary relevance and with potential to advance knowledge for practice, education, management or policy. *JAN* publishes research reviews, original research reports and methodological and theoretical papers.

For further information, please visit *JAN* on the Wiley Online Library website: www.wileyonlinelibrary.com/journal/jan

Reasons to publish your work in JAN:

- **High-impact forum:** the world's most cited nursing journal, with an Impact Factor of 1.998 – ranked 12/114 in the 2016 ISI Journal Citation Reports © (Nursing (Social Science)).
- **Most read nursing journal in the world:** over 3 million articles downloaded online per year and accessible in over 10,000 libraries worldwide (including over 3,500 in developing countries with free or low cost access).
- **Fast and easy online submission:** online submission at <http://mc.manuscriptcentral.com/jan>.
- **Positive publishing experience:** rapid double-blind peer review with constructive feedback.
- **Rapid online publication in five weeks:** average time from final manuscript arriving in production to online publication.
- **Online Open:** the option to pay to make your article freely and openly accessible to non-subscribers upon publication on Wiley Online Library, as well as the option to deposit the article in your own or your funding agency's preferred archive (e.g. PubMed).