

Assessing and managing the shift work disorder in healthcare workers

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SUMMARY

Background: *Shift work disorder (SWD) is a major concern for both healthcare workers (HCWs) employed in hospital wards and healthcare organizations. The consequences of SWD may lead to increased service costs and lower standards of care.* **Objectives:** *To identify and evaluate the latest developments in assessing and managing the occupational risk of SWD in shift-HCWs through a search of the literature published in the last five years.* **Methods:** *We performed a search of the literature starting from June 2012, using MEDLINE/Pubmed. The articles were reviewed and categorized into one or more of the following categories based on their subject matter: Risk assessment, Risk management, Occurrence rates.* **Results:** *A total of 25 publications matched the inclusion criteria. The topics discussed, in order of frequency (from the highest to the lowest), were: "Risk Assessment" (84%), "Occurrence Rates" (64%) and "Risk Management" (48%). Number of nights worked per year, long night-time working hours, frequent missing of nap opportunities during night-shift, quick returns and unhealthy workplace were found as organizational determinants of SWD that should be prioritized in the risk assessment of shift work in the healthcare sector.* **Conclusions:** *Organizational interventions targeted on both healthy shift-work scheduling and improvement of the workplace safety are proposed to moderate the occurrence of SWD and, consequently, to ensure HCWs' wellness and suitable standards of patient care. Further studies aimed to investigate the effectiveness of such interventions in minimizing SWD occurrence are needed.*

RIASSUNTO

«**Valutazione e gestione del disturbo da lavoro a turni tra gli operatori sanitari**». **Introduzione:** *Il disturbo da lavoro a turni (DLT) è globalmente un problema rilevante sia per la salute degli operatori sanitari ospedalieri che per le organizzazioni sanitarie. Le conseguenze del DLT possono comportare sia un incremento dei costi delle prestazioni sanitarie che un abbassamento della qualità delle cure.* **Obiettivi:** *Gli obiettivi della presente review sono stati l'analisi della letteratura e l'individuazione delle più recenti novità in tema di valutazione e gestione del rischio occupazionale di DLT tra gli operatori sanitari turnisti, negli ultimi 5 anni.* **Metodi:** *Abbiamo effettuato una revisione della letteratura a partire dal giugno 2012, utilizzando MEDLINE/Pubmed. Gli articoli sono stati rivisti*

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e categorizzati in una o più delle seguenti categorie in base all'argomento trattato: *Valutazione del rischio, Gestione del rischio, Frequenza del DLT*. **Risultati:** Sono state selezionate 25 pubblicazioni compatibili con i nostri criteri di ricerca. Gli argomenti più frequentemente discussi sono risultati: *Valutazione del rischio (84%), Frequenza del DLT (64%), e Gestione del rischio (48%)*. I fattori di rischio organizzativo correlati con il DLT, da analizzare prioritariamente nella valutazione del rischio da lavoro a turni sono risultati: *elevato numero di turni notturni in un anno, turni notturni lunghi, impossibilità di brevi riposi nel turno notturno, rientri precoci dopo un turno notturno, luogo di lavoro non sicuro*. **Conclusioni:** *La revisione della letteratura evidenzia la necessità di interventi organizzativi mirati sia alla corretta programmazione dei turni lavorativi che al miglioramento della sicurezza degli ambienti di lavoro, al fine di mitigare il rischio di DLT e, conseguentemente, di migliorare le condizioni di sicurezza di lavoratori e pazienti. Gli autori suggeriscono la necessità di ulteriori studi per misurare l'efficacia di tali interventi nel minimizzare l'occorrenza del DLT.*

INTRODUCTION

Shift-work represents a major concern for the safety and health of healthcare workers (HCWs) employed in twenty-four hours hospital wards. In fact, many shift-HCWs suffer from poor sleep and sleepiness, and a growing literature has been showing a relationship between shift-work, including night-shift, and the disruption of the circadian alerting system, resulting in sleep disorders (5, 7, 12, 14, 37, 38, 41, 45). According to DSM V (Diagnostic and Statistical Manual of Mental Disorders, fifth edition) the circadian rhythm sleep disorders are a specific diagnostic category because they share a common underlying chronophysiologic basis (2); the main trait of these disorders is a persistent or recurrent misalignment between the patient's sleep pattern and the pattern that is desired or regarded as the societal norm. Following the definition made by DSM V, shift work disorder (SWD) is a type of circadian rhythm sleep disorder and is characterized by complaints of insomnia or excessive sleepiness that occurs in relation to work hours being scheduled during the usual sleep period. As most shift-HCWs are unable to adjust their circadian rhythms to the atypical hours of sleep and wake, they appear susceptible to excessive sleepiness and/or insomnia consistent with a diagnosis of SWD (30). In a recent study Bjorvatn et al. (5) found that nurses working rotational shift work schedules had greater risk of confusional arousal and nightmares than nurses working daytime only, and hypothesized the rela-

tionship with the circadian rhythm misalignment and sleep deprivation caused by shifts schedules. Consistent with this finding, Gumenyuk V et al. (26) in the past showed that difficulties in attaining appropriate shifts in circadian phase, in response to night work, could lead to develop SWD. Moreover, Øyane N. et al. (46) found that shift nurses working night shifts had a greater incidence of insomnia and chronic fatigue than nurses with no night work shift, not completely reversed when employees stop working nights; a possible explanation of this association between night shift work and insomnia was found in the fact that nurses working night shifts often go to bed when the diurnal rhythm is inclined to wakefulness, and this leads to shortened sleep duration.

As SWD has been associated with decreased productivity, high prevalence of medication errors, increased absenteeism, impaired safety, diminished quality of life, and adverse effects on health of shift-HCWs, healthcare organisations face the challenge of preventing the occurrence of such disorder in shift-HCWs employed in twenty-four hours hospital wards, globally (8, 9, 19, 38). The purpose of this review was to evaluate the most recent developments in assessing and managing the occupational risk of SWD in shift-HCWs in the last five years, according to the definition of SWD made by DSM V. Shift work was defined as any work schedule in which at least 25% of the work days involve the majority of working hours outside the time period between 8 am and 5 pm (31).

METHODS

1) Search strategy

We performed a search of the literature starting from June 2012, using MEDLINE/Pubmed. Selected keywords were used to identify articles for the purposes of this non-structured review of literature: Shift Work, Healthcare Worker, Shift Work Disorder, Hospital Ward, Sleepiness, Insomnia, Assessment, Management, Occurrence. The keywords were systematically combined to conduct the literature search. For example, "Shift Work Disorder" AND "Healthcare Worker" AND "Sleepiness" was one combination. We aimed to identify original research articles (excluding reviews) with the above keywords and adopting the following inclusion criteria: (1) written in English; (2) published after June 2012; (3) human studies; and (4) full reports.

2) Data extraction

Articles were screened in two phases. In the first phase, articles were sorted by title and abstract. Three independent reviewers (G.d., M.M. and V.P.) read the abstracts and categorized them as relevant, not relevant and possibly relevant. In the second phase, the full-text articles were assessed for eligibility. The same three reviewers (G.d., M.M. and V.P.) independently applied inclusion and exclusion criteria to potentially eligible papers and then extracted data from the original articles. Any disagreement was independently checked by a fourth reviewer (M.G.) and consensus was eventually reached through discussion.

3) Categorization of selected articles

Every full-text article that met the inclusion criteria was reviewed and categorized into one or more of the three categories based on its subject matter: 1. Risk assessment (articles aimed at the identification of the occupational risk factors for SWD as well as the likelihood that they will occur); 2. Risk management (articles targeted on the organizational way to reducing the occupational risk factors for SWD to an acceptable level to protect workers); and 3. Occurrence rates (e.g. incidence or prevalence of SWD among HCWs).

RESULTS

Our search of the two literature databases resulted in a total of 375 publications that matched our inclusion criteria. 350 of these were removed because they were deemed irrelevant (i.e. non-research conference proceedings or not concerning shift-HCWs). Therefore, 25 papers remained in the study. These 25 papers were then categorized according to their subject matter. The topics, discussed in order of frequency from highest to lowest, were: "risk assessment", "occurrence rates" and "risk management". "Risk assessment" was addressed in 21 papers (84%); "Occurrence rates" in 16 (64%); and "Risk management" in 12 (48%). Fourteen papers discussed both "Risk assessment" and "Occurrence rates" and six paper targeted all three topics (table 1).

DISCUSSION

Risk Assessment of SWD

In the last five years, the main research topic of shift work disorder in healthcare workers was "Risk Assessment", with the aim to identify potential occupational hazards for SWD as well as the likelihood of their occurrence. Among the 21 studies on "Risk Assessment", 16 focused on the occupational determinants of SWD, 4 on the relationship between shift-HCWs' individual characteristics and SWD, and 1 analyzed the predictability of an assessment-scale for evaluating the SWD risk in shift-HCWs. Regarding the occupational determinants of SWD we found that: number of shifts separated by less than 11 hours (quick returns), number of nights worked the last year, long nighttime working hours, and frequent missing of nap opportunities during night work, were detected as occupational hazards for SWD. Waage et al. (44) demonstrated an increased risk of SWD for HCWs working frequent night shifts - in line with the study of Flo et al. (23) which found that HCWs working more than 50 night shifts per year had a 50% greater probability of suffering SWD compared to a worker with no night shift during the last year - and hypothesized a dose-response relationship which could indicate the need for an upper limit of night shifts worked per year. HCWs' diffi-

Table 1 - Summary of literature review findings about the shift work disorder in healthcare workers, with tally of articles based on topics addressed: Occurrence rates, Risk assessment and Risk management

Author and year	Occurrence rates	Risk assessment	Risk management
Waage S et al. 2014 (44)	X	X	
Flo E et al. 2014 (23)	X	X	X
Eldevik MF et al. 2013 (18)	X	X	
Øyane N et al. 2013 (46)	X	X	
Thun E et al. 2016 (40)	X	X	
Flo E et al. 2012 (22)	X	X	
Lajoie P et al. 2015 (29)		X	
Geiger B et al. 2014 (24)		X	
Yazdi Z et al. 2014 (28)	X	X	X
Asaoka S et al. 2013 (4)	X	X	
de Castilho P V et al. 2014 (16)	X	X	X
Chang YS et al. 2017 (13)		X	X
Chang YS et al. 2017 (14)		X	X
Chang YS et al. 2013 (11)		X	
Chang YS et al. 2013 (10)		X	
Anbazhagan S et al. 2016 (3)	X	X	X
Ferri P et al. 2016 (21)	X	X	
Vedaa Ø et al. 2017 (42)	X	X	X
Gómez-García T et al. 2016 (25)	X	X	X
Ferreira TS et al. 2017 (20)		X	
Li Huang B et al. 2013 (30)	X		X
Niu SF et al. 2013 (35)			X
Lin SH et al. 2014 (32)			X
Johnson AL et al. 2014 (27)	X		X
Mota MC et al. 2013 (33)	X	X	

culties in the re-adaptation to a day shift after one or more night shifts could explain the relationship between night work and SWD. Recently Chang et al. (13) showed that one day off after two night shifts was insufficient to adapt back to a daytime shift in shift-nurses; based on this evidence, the author concluded that a longer sequence of consecutive night shifts followed by two days off may be suitable to attain appropriate shifts in circadian phase. On the contrary, Øyane et al. (46) found no evidence for a cumulative relationship between the number of night shifts (worked in the last 12 months) and neither insomnia, nor sleepiness; but the author highlighted that his study could be affected by selection bias.

With regard to the role of quick returns in causing SWD, Eldvik et al. (18) found that the chance of suffering SWD was almost three times higher in the group of nurses who had worked more than 30 quick returns during the last year compared to the

group who never worked quick returns; this finding has been related to the impossibility for shift workers to synchronize their internal clock with the work schedule, as already revealed by the study of Gumenyuk et al. (26).

With regard to the HCWs' individual characteristics related to SWD, the recent literature showed that advancing age, female gender, eveningness-oriented chronotype, insomnia and anxiety, were positively associated to SWD. In particular Flo et al. (23) revealed increased risk among HCWs after 40 to 50 years of age; this evidence is consistent with the previous literature, which showed the relationship between advancing age and less restorative sleep during the morning, and, consequently, higher sensitivity to circadian phase misalignment (17).

One paper focused on the predictability of a modified version of the Karolinska Sleepiness Scale (KSS) as an end-of-shift recall measurement, asking

for «average» sleepiness over the shift and «highest» level of sleepiness during the shift (24); based on multiple tests of predictive validity, the study found a partial support for adopting such format of KSS to assess the sleepiness during the shift.

Risk management of SWD

Among the 12 papers focused on this topic, 10 discussed the management interventions aimed to improve shift schedules; 1 paper investigated the effectiveness of bright light exposure in shift working nurses; 1 paper focused on the organisational level interventions effective in supporting shift-HCWs and, consequently, in improving the workers' perception of safety climate at work. With regard to the three-shift work schedules, Chang et al. (14) suggested the need of two days off after two night shifts; in fact the author found that in shift-nurses, 24 h off between night and day shifts was insufficient for re-adapting to a daytime shift after two night shifts; this finding is in line with the study of Niu et al (35), which demonstrated difficulties in re-adapting circadian rhythms in nurses shifting from night shift to other shifts with only one day-off after night-shift. Regarding the environmental interventions at the workplace, Huang et al. (30) observed that the shift-work nurses who received bright light of 7,000-10,000 lux for 30 minutes at about 8 pm (evening shift) or at about 11:30 pm (night shift), significantly improved sleep; in particular, 80% of the nurses did not have insomnia following treatment, whereas all nurses in the control group still met the criteria for insomnia. Regarding organizational factors impacting the sleep of shift-HCWs, Gómez-García et al. (25) found a relationship between SWD and nurses' perception of low job performances; in fact shift-nurses perceived both a worse quality of their work and an unhealthy environment because sleep deprivation affected nurses' abilities to provide the high standard of care they want to give to their patients and they found their work more stressful, dangerous and challenging; furthermore, shift-nurses had worse perceptions of nurse manager ability, leadership and support, suggesting that shift-nurses feel that supervisory staff does not support their practice. Consequently, the

authors suggest that effective supervisors could play a critical role by providing interpersonal and instrumental support, which results in a more supportive and positive team environment, useful to improve the wellness of shift nurses.

Occurrence of SWD

All the 16 checked studies revealed that between 28% and 52% of shift-HCWs was affected by SWD. The studies were affected by differences in assessment of SWD; in fact, Flo et al (23) found three different prevalences of SWD symptoms (44,3%, 42,9%, 38,8%) in three-shift nurses, using, respectively, the three followed assessment procedures: 1) diagnosis of SWD based on three symptom questions, according to the study of Waage et al. (44); 2) diagnosis of SWD based on the above cited three symptom questions, additionally excluding subjects answering "always" on symptoms of restless legs, sleep apnoea, periodic limb movements or parasomnia; diagnosis of SWD based on the above cited three symptom questions, additionally using clinical cut-offs on Bergen Insomnia Scale (36) as diagnostic criteria.

The findings of the present review highlighted the SWD as a major concern for both shift-HCWs working in twenty-four hours hospital wards and healthcare organizations; based on these findings, the main organizational determinants of SWD that should be prioritized in the risk assessment appear to be: quick returns, number of nights worked per year, long night-time working hours, frequent missing of nap opportunities during night-shift, unhealthy workplace. Consequently, a management approach aimed at reducing the occurrence of SWD in shift-HCWs should consider both a healthy shift-work scheduling (ensuring more than 11 h between two shifts, almost two whole rest days after two night shifts, clockwise rotating shifts) and the improvement of the workplace safety. According to the literature, such management interventions appear effective in bringing benefits not only to shift-HCWs but also to healthcare organizations. Garcia-Gómez et al. (25) revealed that the prevention of sleep deprivation in shift-nurses was essential to guarantee nurses' abilities to provide the high standard of care they want to give to their patients and, consequently,

to avoid a significant number of adverse effects. This finding is consistent with the recent literature which showed the link between shift-work and fatigue-related incidents, loss of productivity and increase in sickness absence (9, 34). The reviewed studies suggested many management strategies at the organizational level or at the individual worker level (e.g. approaches to promote sleep, wakefulness, and adaptation of the circadian clock to the imposed work schedule), there still is a lack of evidence as to the effectiveness of such interventions in minimizing the occurrence of SWD in shift-HCWs. Further pre-post intervention studies among HCWs exposed to shift work are required to indicate the evidence-based management interventions that should be prioritized to prevent SWD in shift-HCWs.

This study has limitations. The examined period is short to draw firm conclusions. The studies considered suffer from differences in the definition of SWD in shift-HCWs. Some studies analyzed the SWD according to the definition by the second or third edition of International Classification of Sleep Disorders (ICSD-2 and 3) (1), other studies analyzed the symptoms related to circadian disruption in shift-HCWs (insomnia or excessive sleepiness) according to SWD definition made by DSM V. Notwithstanding these limitations, some suggestions about the possible implementation of interventions aimed at managing the shift work disorder in healthcare workers emerged; further studies are required to analyze the effectiveness of such interventions.

NO POTENTIAL CONFLICT OF INTEREST RELEVANT TO THIS ARTICLE WAS REPORTED BY THE AUTHORS

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