



Review

The difference in the timings of healthcare professionals' shifts and sleep disturbances

Mahmoud Dibas^{ab}, Mohammad Rashidul Hashan^{bc}

^aSulaiman Al Rajhi Colleges, College of Medicine, Saudi Arabia;

^bOnline research Club (<http://www.onlineresearchclub.org>);

^cMedical Officer, Infectious Disease Division, Respiratory and enteric infections department. International Center for Diarrheal Disease and Research, Dhaka, Bangladesh.

Received March 14, 2018; Accepted June 23, 2018; Published online July 07, 2018

Abstract: Healthcare professionals (HCPs) bear a huge responsibility of taking care of patients 24 hours a day and for the whole week. Although HCPs help patients get over their sufferings, these workers endanger their lives and cause themselves health problems including sleep disturbances. Since most of these disturbances are related to the timing or the schedules of these workers, the aim of this mini-review is to shed the light on how these shift schedules are different and how they can affect the sleepiness and/or wakefulness of the workers in the health sector.

Keywords: Healthcare professionals, Shift work, Shift time, sleep disturbances.

1. SHIFT WORK AND HEALTHCARE PROFESSIONALS

Shift work is an indispensable and essential strategy to ensure continuous health care services in hospitals and residential sites. Globally, one-fifth of the workforce is involved in shift work with almost 20% of people engaged from the European workplace [1]. Patients can come unexpectedly to hospitals or clinics; hence it is impossible for healthcare professionals (HCPs) to work in the health sector without getting involved in shift schedules. These workers dedicate themselves to help people. Looking from another point of view, many research articles pointed out an association between their work time and health problems and disorders [2-4]. This includes sleep disorders, gastrointestinal diseases, cardiovascular diseases, diabetes, metabolic disturbances, cancer, etc. Although the mechanism of how these diseases are caused by shift work is still not well elaborated, it was shown by most of the studies that factors disturbing the circadian rhythm of the workers play a major role [2-4]. Most notably changes in the pattern of sleep, which may be reflected as changes in sleep quality and quantity or as sleep disorders that may differ from shift timing to another. The Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (DSM-5) has included these sleep alterations related to shift work among Circadian

Rhythm Sleep-Wake Disorders, irregular type, estimating a high prevalence of this disorder among night shift workforce (5%-10% of total work population) in healthcare settings [5]. Studies reported to have detrimental effects of shift work on health from several dimension but the pathological mechanisms in relation with shift work yet to be deciphered. Many HCP suffering from sleep, distress or fatigue disorders are still undermined even though these diseases are frequent [6]. So, in this study, we aim to explore the different shift work impact on sleep among HCPs and its associated underlying mechanisms of how that might contribute.

2. HOW DIFFERENCES IN SHIFT SCHEDULES IN HCPS AFFECT SLEEP

Even though they are working outside the traditional time and their sleep is disturbed more than day workers [7], there are some variations in the schedules of these professionals, leading to varied effects. So, they can be classified into:

2.1. Permanent shift workers

These workers have fixed timings and they can be subdivided into three main categories:

2.1.1. Early-morning shifts

As many studies elucidate the adverse effects of night

*Address correspondence to Mahmoud Dibas, Sulaiman Al Rajhi Colleges, College of Medicine, Saudi Arabia. EMail: m-ahmod@live.com.
 DOI: 10.32895/UMP.MPR.2.2.32

work, only a few were about early-morning work. According to a review published by Åkerstedt *et al* [8], shift workers including HCPs have worse sleep patterns than night workers. Authors reported these workers to experience reduced sleep quantity due to less stage & rapid eye movement (REM) sleep [6, 9]. Problems in this type of schedules result mainly from the fact that they need to give up their sleep very early in the morning, resulting in a reduction of sleep that accounts to sleepiness in their morning shifts. Moreover, difficulties in working. This is due to the action of the circadian rhythm, more specifically the hormone cortisol that is so low at that time to prevent premature sleep termination. Consequently, their early arousal in the morning gives rise to anticipation stress that causes a decrement in slow wave sleep, sleep disturbance and fatigue [10].

2.1.2. Afternoon and evening shifts

This type of timing is not well studied as compared with the other types. It may appear to be less harmful than the other categories of shift workers, but not as safe as the standard working time (8 am - 4 pm) [3]. Yazdi *et al* concluded that nurses who are with eveningness orientation have lower sleep quality than those who go to bed and wake up early. However, a meta-analysis drew attention to having an increased sleep duration in evening workers in contrast to night workers [11]. As mentioned before, this category is very poorly studied and there must be more studies focusing on it in the future to further examine its impact.

2.1.3. Night shifts

Although these health providers have fixed working times and they may adjust to their schedules, the majority of studies concluded that this category is in danger of sleep disturbances most importantly decreased quality and quantity of sleep more than day-workers or non-rotating individuals working in the same field [12, 13]. This is attributed to having most of the physiological and psychological variables i.e. melatonin, metabolism, concentration, and performance in their lowest amount or nadir the time he/she starts the shift [8]. As a result, these problems will start the time the HCP starts working and will persist until finishing the shift and sleep. Consequences will be that they will fall asleep after one hour of night shift [14] and they will have a reduction of one to four hours in sleep duration which further results in premature awakening and not getting sufficient sleep, according to EEG (electroencephalogram) studies [15-17]. Due to the sleep deprivation, they are significantly facing drowsiness, fatigue, and difficulties in concentration throughout the day [18-19]. Moreover, they are highly exposed to the irregular type of circadian rhythm sleep-wake disorders (5%–10%) and shift work disorder [5, 20]. These patterns of sleep habitat make night shift HCPs more vulnerable to irritability, somatization, obsessive-compulsive disorder, anxiety, alteration in mood, paranoia, interpersonal sensitivity and consequently impairment on psychological health and social life [21, 22].

2.2. Rotating shift workers

These workers do not have fixed schedules and that mainly results in an inability to adjust their circadian clock to work times. Also, other factors including having family can

negatively affect it [23]. All of these collectively contribute to having HCPs experiencing more sleep disturbances including decreased sleep duration and drowsiness at work than permanent day/night workers [3]. Additionally, another study on nurses concluded that their rotating schedules caused them to have decreased sleep quality with aggravated mental health [24]. It also indicated that these problems can be reversed if nurses can have two days off or more after their rotating night shifts. As a consequence, this type of schedules should be avoided as it increases the occurrence of accidents or errors at work [25].

2.3. Extended workdays (EW)

This category refers to HCPs that work more than the original duration of eight hours. However, they also work for fewer days in a week which may help them to recover. Studies on nurses [26, 27], clinicians [28] and residents [29] found that this type of working schedules results in decreased vigilance in work and causes accidents. Moreover, prospective trial on interns indicated that those who had extended shifts performed worse than those who had overnight shifts [30]. Many other studies investigated the hazard of this type of schedule and how EW workers may endanger their lives and other people's lives [31]. On the contrary, a study conducted by Richardson *et al* on nurses postulates that 12-hour shifts on critical care staff result in an increase in the quality of care and an improvement in dealing with patients or relatives [32]. Another narrative review suggested that sleep problems are not necessarily caused by extending the shift interval from eight to twelve hours [33]. This category is still under controversy and more research is needed in the future.

3. CONCLUSION

HCPs are at an increased risk of developing sleep disturbances due to their shift work. The difference in the shift timings may appear to be an important predictor of the shift hazard. Permanent shift workers were shown to have better results than rotating workers. However, most of the studies were conducted on nurses, which is one of the limitations of the literature. We highly suggest future studies to study that in further. Based on World Health Organization (WHO) definition of shift work, as it increases the risk of many health problems, it is highly suggested to implement ergonomic criteria to attenuate such adverse effects for holistic workplace environment in healthcare settings and promote the well-being of professionals.

Declarations

The authors declare that they have no competing interests. Moreover, this study did not receive any funding.

REFERENCES

1. Eurofound. Sixth European Working Conditions Survey—Overview Report. Publications Office of the European Union Luxembourg. 2016.
2. Jorgensen JT, Karlsen S, Stayner L, Andersen J, Andersen ZJ. Shift work and overall and cause-specific mortality in the Danish nurse cohort. *Scandinavian journal of work, environment & health*. 2017;43(2):117-26.
3. Kecklund G, Axelsson J. Health consequences of shift work and insufficient sleep. *BMJ*. 2016;355.
4. Knutsson A. Health disorders of shift workers. *Occupational medicine*.

- 2003;53(2):103-8.
5. Edition F. Diagnostic and statistical manual of mental disorders: Am Psychiatric Assoc. 2013.
 6. Costa G, Accattoli MP, Garbarino S, Magnavita N, Roscelli F. Sleep disorders and work: guidelines for health surveillance, risk management and prevention. *La Medicina del lavoro*. 2013;104(4):251-66.
 7. Alshahrani SM, Baqays AA, Alenazi AA, AlAngari AM, AlHadi AN. Impact of shift work on sleep and daytime performance among health care professionals. *Saudi medical journal*. 2017;38(8):846-51.
 8. Åkerstedt T. Shift work and disturbed sleep/wakefulness. *Occupational medicine*. 2003;53(2):89-94.
 9. Tilley AJ, Wilkinson R, Warren P, Watson B, Drud M. The sleep and performance of shift workers. *Human Factors*. 1982;24(6):629-41.
 10. Åkerstedt T, Kecklund G, Selén J. Early morning work—prevalence and relation to sleep/wake problems: a national representative survey. *Chronobiology international*. 2010;27(5):975-86.
 11. Pilcher JJ, Lambert BJ, Huffcutt AI. Differential effects of permanent and rotating shifts on self-report sleep length: a meta-analytic review. *Sleep: Journal of Sleep Research & Sleep Medicine*. 2000.
 12. Garde AH, Hansen ÅM, Hansen J. Sleep length and quality, sleepiness and urinary melatonin among healthy Danish nurses with shift work during work and leisure time. *International archives of occupational and environmental health*. 2009;82(10):1219-28.
 13. Waage S, Pallesen S, Moen BE, Magerøy N, Flo E, Di Milia L, et al. Predictors of shift work disorder among nurses: a longitudinal study. *Sleep medicine*. 2014;15(12):1449-55.
 14. Knauth P, Rutenfranz J. Duration of sleep related to the type of shift work. *Advances in the Biosciences*. 1981;30:161-8.
 15. ÅKERSTEDT T. Work hours, sleepiness and the underlying mechanisms. *Journal of sleep research*. 1995;4(s2):15-22.
 16. Matsumoto K. Sleep patterns in hospital nurses due to shift work: An EEG study. *Waking & Sleeping*. 1978.
 17. Torsvall L, Akerstedt T, Gillander K, Knutsson A. Sleep on the night shift: 24-hour EEG monitoring of spontaneous sleep/wake behavior. *Psychophysiology*. 1989;26(3):352-8.
 18. Boivin D, Boudreau P. Impacts of shift work on sleep and circadian rhythms. *Pathologie Biologie*. 2014;62(5):292-301.
 19. Winwood PC, Winefield AH, Lushington K. Work-related fatigue and recovery: the contribution of age, domestic responsibilities and shiftwork. *Journal of Advanced Nursing*. 2006;56(4):438-49.
 20. Åkerstedt T, Wright KP. Sleep Loss and Fatigue in Shift Work and Shift Work Disorder. *Sleep medicine clinics*. 2009;4(2):257-71.
 21. Akerstedt T, Kecklund G, Knutsson A. Spectral analysis of sleep electroencephalography in rotating three-shift work. *Scandinavian journal of work, environment & health*. 1991;17(5):330-6.
 22. Shields M. Shift work and health. *Health Reports*. 2002;13(4):11.
 23. Korompeli A, Chara T, Chrysoula L, Sourtzi P, editors. Sleep disturbance in nursing personnel working shifts. *Nursing forum*. Wiley Online Library. 2013.
 24. Lin P-C, Chen C-H, Pan S-M, Pan C-H, Chen C-J, Chen Y-M, et al. Atypical work schedules are associated with poor sleep quality and mental health in Taiwan female nurses. *International archives of occupational and environmental health*. 2012;85(8):877-84.
 25. Gold DR, Rogacz S, Bock N, Tosteson TD, Baum TM, Speizer FE, et al. Rotating shift work, sleep, and accidents related to sleepiness in hospital nurses. *American journal of public health*. 1992;82(7):1011-4.
 26. Geiger-Brown J, Rogers VE, Trinkoff AM, Kane RL, Bausell RB, Scharf SM. Sleep, sleepiness, fatigue, and performance of 12-hour-shift nurses. *Chronobiology international*. 2012;29(2):211-9.
 27. Scott LD, Rogers AE, Hwang W-T, Zhang Y. Effects of critical care nurses' work hours on vigilance and patients' safety. *American Journal of Critical Care*. 2006;15(1):30-7.
 28. Gaba DM, Howard SK. Fatigue among clinicians and the safety of patients. *New England Journal of Medicine*. 2002;347(16):1249-55.
 29. Baldwin Jr DC, Daugherty SR. Sleep deprivation and fatigue in residency training: results of a national survey of first-and second-year residents. *Sleep*. 2004;27(2):217-23.
 30. Gordon JA, Alexander EK, Lockley SW, Flynn-Evans E, Venkatan SK, Landrigan CP, et al. Does simulator-based clinical performance correlate with actual hospital behavior? The effect of extended work hours on patient care provided by medical interns. *Academic medicine : journal of the Association of American Medical Colleges*. 2010;85(10):1583-8.
 31. Caruso CC. Negative impacts of shiftwork and long work hours. *Rehabilitation nursing : the official journal of the Association of Rehabilitation Nurses*. 2014;39(1):16-25.
 32. Richardson A, Turnock C, Harris L, Finley A, Carson S. A study examining the impact of 12-hour shifts on critical care staff. *Journal of Nursing Management*. 2007;15(8):838-46.
 33. Sallinen M, Kecklund G. Shift work, sleep, and sleepiness - differences between shift schedules and systems. *Scandinavian journal of work, environment & health*. 2010;36(2):121-33.