COLLABORATION
This series is part of a collaboration between
NIOSH
Medscape Public Health & Prevention

Running on Empty: Fatigue and Healthcare Professionals

Claire C. Caruso, PhD, RN | Aug 02, 2012

Sleep Deprivation in Healthcare

A growing number of healthcare workers suffer from sleep deprivation and fatigue. From 1985 to 2007, the percentage of healthcare workers reporting 6 or fewer hours of sleep per day (a level considered by sleep experts to be too short) rose from 28% to 32%.[1]

This trend toward shorter sleep has several likely explanations. Healthcare workers typically work off-shifts and long hours to provide vital services to society around the clock. These demanding schedules can lead to difficulties with sleep because of the need to sleep at irregular times and at times that are out of phase with normal circadian rhythms. This misalignment of sleep with circadian rhythms leads to trouble with falling asleep, more arousals during sleep, and early awakenings leading to poorer sleep quality and shorter sleep duration. Furthermore, sleep duration may be shortened by insufficient time between work shifts and the competing demands of work and personal life. Economic pressures could force healthcare workers to seek second jobs, extra shifts, or longer hours, leaving even less time for them to sleep.

Healthcare workers often lack knowledge about the importance of sleep because the topic is rarely covered in their education programs.[2] Without this knowledge, healthcare workers may mistakenly curtail their sleep to fit other activities into their schedules. Short sleep duration is reported by 52% of night shift healthcare and social assistance workers.[3]

According to a 2011 American Nurses Association Health & Safety Survey, the top concerns of 74% of registered nurses were stress and overwork.[4] An alarming 10% of respondents had experienced a vehicle crash that was believed to be a consequence of shift work and fatigue.[4]

The Consequences of Inadequate Sleep

Considerable evidence suggests that shift work and long hours lead to shorter time asleep and poorer sleep quality.[5,6] Sleep deprivation can impair job performance and increase risk for worker errors and injuries. Errors made by fatigued healthcare workers also can endanger patients.[7,8] Moreover, sleep deprivation endangers both workers and others on the road during commutes to and from work. An estimated 20% of vehicle crashes are attributed to drowsy driving.[9,10]

Laboratory studies have compared performance in healthy participants after being kept awake for long hours or after consuming alcohol.[11-13] In terms of performance, being awake for 17 hours was similar to having a blood alcohol level of 0.05%, and being awake for 24 hours was similar to a blood alcohol level of 0.10%. The blood alcohol level that defines drunk driving in the United States is 0.08%, but several other countries use a cut-off of 0.05% because of the decrements in performance seen at that level.[14]

Shift type and length also influence performance. Compared with the day shift, incidents increased by 15% on the evening shift and 28% on the night shift. Compared with 8-hour shifts, incidents increased by 13% for 10-hour shifts and 28% for 12-hours shifts.[15]

Shift work and long work hours are associated with a growing number of health risks: obesity; smoking; metabolic disturbances; cardiovascular, gastrointestinal, and musculoskeletal disorders; mental disturbances, and adverse reproductive outcomes.[16-24] In 2007, the International Agency for Research on Cancer of the World Health Organization identified shift work with circadian disruption as a probable carcinogen.[25] The night shift is associated with a 40% increased risk for breast cancer, the most frequently studied cancer.[26,27]

Shift work also can exacerbate symptoms and progression of chronic diseases, such as sleep disorders, gastrointestinal disorders, heart disease, hypertension, epilepsy, psychiatric conditions, alcohol and other drug abuse, insulin-dependent diabetes, asthma, and health conditions that require medications with circadian changes in effectiveness.[28] Shift work and long work hours also strain personal relationships, including marriage and family life.[29]

Shift work, long work hours, and fatigue cost employers an estimated $116 billion or $2000 per employee per year owing to a variety of factors: reduced productivity; increased errors; absenteeism; increased healthcare and worker compensation costs; and worker attrition due to disability, death, and moving to jobs with less demanding work schedules.[30-31] Nurses said demanding work hours were a leading factor that drove them out of their jobs.[32]

Strategies to Promote Adequate Sleep

Employers, managers, and healthcare workers share the responsibility for reducing the costly and sometimes fatal consequences of fatigue. Key strategies include making sleep a priority in the healthcare worker's personal life and designing schedules and organizing the work to reduce fatigue. The following are just a few of the suggestions offered by experts to help healthcare employers and managers reduce fatigue and associated risks.[33-40]

1. Establish at least 10 consecutive hours per day of protected time off-duty to allow workers to obtain no fewer than 7-8 hours of sleep. A panel of experts authored an Institute of Medicine report that recommended that work hours for nurses be limited to 12 hours a day and 60 hours per week.[41]

2. Permit frequent brief rest breaks (eg, every 1-2 hours) during demanding work, which are more effective against fatigue than a few longer breaks. Allow longer breaks for meals.

3. Schedule five 8-hour shifts or four 10-hour shifts per week, which are usually acceptable. Depending on the workload, 12-hour day shifts may be tolerated when interspersed with days off. During the evening and night, shorter shifts (eg, 8 hours) are better tolerated than longer shifts.

4. Examine work demands with respect to shift length. Twelve-hour shifts are more acceptable for "lighter" tasks (eg, desk work).

5. Plan 1-2 full days of rest following 5 consecutive 8-hour shifts or 4 consecutive 10-hour shifts. Consider 2 rest days after 3 consecutive 12-hour shifts.

6. Provide training to inform workers of the challenges linked to shift work and long work hours and what resources are available to them to help with any difficulties they are having with their work schedule.

7. Examine close calls and incidents to determine the role, if any, of fatigue as a root cause or contributing cause to the incident.

The following are a few of the suggestions experts offer to help healthcare workers[33-40]:

1. Learn about sleep to adopt better practices and routines to improve sleep. The National Heart, Lung, and Blood Institute's Your Guide to Healthy Sleep provides sleeping tips, information on sleep disorders, and how to seek help from sleep professionals.[41]

2. Allow enough time for sleep. Most people need 7-9 hours of sleep each day,[42-43] and it is best to get this amount on a daily basis to avoid a build-up of sleep debt and associated risks.

3. Prepare for sleep by avoiding heavy meals and alcohol before sleep and reducing intake of caffeine and other stimulants several hours before bedtime. These substances can make it difficult to get quality sleep.

4. Arrange a sleep environment that is very dark, comfortable, quiet, and cool to facilitate falling asleep quickly and staying asleep.

5. Follow an exercise routine (but not 3 hours before bedtime); daily physical activity improves sleep, helps with stress management, and promotes general health.

6. Address other sources of sleepiness. For example, some medications cause drowsiness so it is best to find a non-sedating alternative.

7. Seek assistance from healthcare providers for continuing difficulties with sleep. An estimated 50-70 million Americans have a sleep disorder, which is often undiagnosed and untreated.[2]

National Efforts to Improve Sleep Health

In recognition of the widespread negative effects of poor sleep on the individual, the workplace, and the community, a growing number of US government organizations in the US Department of Health and Human Services are targeting sleep health. These include Healthy People 2020 (the 10-year health objectives for the United States); several institutes of the National Institutes of Health, including the National Center on Sleep Disorders Research; the Centers for Disease Control and Prevention; and the National Institute for Occupational Safety and Health (NIOSH). A goal of NIOSH's National Occupational Research Agenda for Healthcare and Social Assistance is for healthcare organizations to adopt best practices for scheduling and staffing that minimize excessive workload and other factors associated with fatigue.[44]

Healthy People 2020 recognizes that strong scientific evidence links better sleep health to reduced rates of disease, injury, disability, and premature death. In 2010, Healthy People 2020 launched a new chapter on sleep health that includes 3 objectives for adults:

- Increase the proportion who get 7 or more hours of sleep per day;
- Increase the proportion with sleep apnea who seek medical evaluation; and
- Reduce the rate of vehicular crashes attributed to drowsy driving.[45]

Recently, the Joint Commission issued a sentinel event alert about healthcare worker fatigue and patient safety.[46] The Joint Commission gave several suggestions for healthcare organizations to reduce risks from fatigue:

- Examine and improve work schedules, staffing, and hand-off processes;
- Consider fatigue as a factor in all adverse events;
- Involve staff in the design of their schedules;
- Create and implement a fatigue management plan;

- Educate staff about sleep and fatigue;
- Support staff who work long shifts; and
- Lastly, encourage organizations that allow naps during the work shift to provide good sleep environments and adequate release from work responsibilities.

For more information on this topic, including additional strategies for healthcare employers, managers, and workers, see the NIOSH resource Work Schedules: Shift Work and Long Work Hours. NIOSH is also developing new training programs to relay coping strategies for shift work and long work hours. They can be accessed via this Website when they become available.

The opinions and conclusions in this article are those of the author and do not necessarily represent the views of NIOSH.

References

1. Luckhaupt SE, Tak S, Calvert GM. The prevalence of short sleep duration by industry and occupation in the National Health Interview Survey. Sleep. 2010;33:149-159. Abstract
2. Colten HR, Altevogt BM. Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem. Washington, DC: National Academies; 2006.
3. Centers for Disease Control and Prevention (CDC). Short sleep duration among workers -- United States, 2010. MMWR Morb Mortal Wkly Rep. 2012;61:281-285. Abstract
4. American Nurses Association. ANA 2011 Health and safety survey. 2011. www.nursingworld.org/MainMenuCategories/WorkplaceSafety/Work-Environment/2011-HealthSafetySurvey.html Accessed June 1, 2012.
5. Caruso CC, Hitchcock EM, Dick RB, Russo JM, Schmit JM. Overtime and Extended Work Shifts: Recent Findings on Illnesses, Injuries, and Health Behaviors. DHHS (NIOSH) publication no. 2004-143. Cincinnati: Department of Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; 2004. http://www.cdc.gov/niosh/docs/2004-143/pdfs/2004-143.pdf Accessed July 3, 2012.
6. Pilcher JJ, Lambert BJ, Huffcutt AI. Differential effects of permanent and rotating shifts on self-report sleep length: a meta-analytic review. Sleep. 2000;23:155-163. Abstract
7. Landrigan CP, Rothschild JM, Cronin JW, et al. Effect of reducing interns' work hours on serious medical errors in intensive care units. N Engl J Med. 2004;351:1838-1848. Abstract
8. Rogers AE, Hwang W, Scott LD, Aiken LH, Dinges DF. The working hours of hospital staff nurses and patient safety. Health Aff (Millwood). 2004;23:202-212. Abstract
9. Horne JA, Reyner LA. Sleep related vehicle accidents. BMJ. 1995;310:565-567. Abstract
10. Connor J, Norton R, Ameratunga S, et al. Driver sleepiness and risk of serious injury to car occupants: population based case control study. BMJ. 2002;324:1125.
11. Arnedt JT, Owens J, Crouch M, Stahl J, Carskadon MA. Neurobehavioral performance of residents after heavy night call vs after alcohol ingestion. JAMA. 2005;294:1025-1033. Abstract

12. Dawson D, Reid K. Fatigue, alcohol and performance impairment. Nature. 1997;388:235.

13. Williamson AM, Feyer AM. Moderate sleep deprivation produces impairments in cognitive and motor performance equivalent to legally prescribed levels of alcohol intoxication. Occup Environ Med. 2000;57:649-655. Abstract

14. National Highway Traffic Safety Administration, US Department of Transportation. DWI Laws in Other Countries. Washington DC; National Highway Traffic Safety Administration; 2000.

15. Folkard S, Lombardi DA. Modeling the impact of the components of long work hours on injuries and "accidents." Am J Ind Med. 2006;49:953-963. Abstract

16. Bushnell PT, Colombi A, Caruso CC, Tak S. Work schedules and health behavior outcomes at a large manufacturer. Ind Health. 2010;48:395-405. Abstract

17. Caruso CC, Lusk SL, Gillespie BW. Relationship of work schedules to gastrointestinal diagnoses, symptoms, and medication use in auto factory workers. Am J Ind Med. 2004;46:586-598. Abstract

18. Caruso CC, Waters TR. A review of work schedule issues and musculoskeletal disorders with an emphasis on the healthcare sector. Ind Health. 2008;46:523-534. Abstract

19. Dembe AE, Erickson JB, Delbos RG, Banks SM. The impact of overtime and long work hours on occupational injuries and illnesses: new evidence from the United States. Occup Environ Med. 2005;62:588-597. Abstract

20. Frazier LM, Grainger DA. Shift work and adverse reproductive outcomes among men and women. Clin Occup Environ Med. 2003;3:279-292.

21. Knutsson A, Bøggild H. Gastrointestinal disorders among shift workers. Scand J Work Environ Health. 2010;36:85-95. Abstract

22. Mozurkewich EL, Luke B, Avni M, Wolf FM. Working conditions and adverse pregnancy outcome: a meta-analysis. Obstet Gynecol. 2000;95:623-635. Abstract

23. Puttonen S, Harma M, Hublin C. Shift work and cardiovascular disease -- pathways from circadian stress to morbidity. Scand J Work Environ Health. 2010;36:96-108. Abstract

24. Rohr SM, Von Essen SG, Farr LA. Overview of the medical consequences of shift work. Clin Occup Environ Med. 2003;3:351-361.

25. Straif K, Baan R, Grosse Y, et al. Carcinogenicity of shift-work, painting, and fire-fighting. Lancet Oncol. 2007;8:1065-1066. Abstract

26. Megdal SP, Kroenke CH, Laden F, Pukkala E, Schernhammer ES. Night work and breast cancer risk: a systematic review and meta-analysis. Eur J Cancer. 2005;41:2023-2032. Abstract

27. Hansen J, Lassen CF. Nested case-control study of night shift work and breast cancer risk among women in the Danish military. Occup Environ Med. 2012 May 29. [Epub ahead of print]

28. Sood A. Medical screening and surveillance of shift workers for health problems. Clin Occup Environ Med. 2003;3:339-349.

29. Albertsen K, Rafnsdóttir GL, Grimsmo A, Tómasson K, Kauppinen K. Workhours and worklife balance. Scand J Work Environ Health. 2008;Suppl 5:14-21.

30. Sirois WG. The secret cost of fatigue. 2006. http://www.taproot.com/archives/445 Accessed July 23, 2012.

31. Rosekind MR, Gregory KB, Mallis MM, Brandt SL, Seal B, Lerner D. The cost of poor sleep: workplace productivity loss and associated costs. J Occup Environ Med. 2010;52:91-98. Abstract

32. Peter D. Hart Research Associates. The nurse shortage: perspectives from current direct care nurses and former direct care nurses. Hart Research Associates. April 2001. http://www.aft.org/pdfs/healthcare/staffing/Hart_Report.pdf Accessed June 1, 2012.

33. Caruso CC, Rosa RR. 2012. NIOSH science blog: sleep and work. http://blogs.cdc.gov/niosh-science-blog/2012/03/sleep-and-work Accessed July 5, 2012.

34. Pallesen S, Bjorvatn B, Magerøy N, Saksvik IB, Waage S, Moen BE. Measures to counteract the negative effects of night work. Scand J Work Environ Health. 2010;36:109-120. Abstract

35. Lowden A, Moreno C, Holmbäck U, Lennernäs M, Tucker P. Eating and shift work -- effects on habits, metabolism and performance. Scand J Work Environ Health. 2010;36:150-162. Abstract

36. Caruso CC, Hitchcock EM. Strategies for nurses to prevent sleep-related injuries and errors. Rehabil Nurs. 2010;35:192-197. Abstract

37. Caldwell JA, Mallis MM, Caldwell JL, Paul MA, Miller JC, Neri DF; Aerospace Medical Association Fatigue Countermeasures Subcommittee of the Aerospace Human Factors Committee. Fatigue countermeasures in aviation. Aviat Space Environ Med. 2009;80:29-59. Abstract

38. Sack RL, Auckley D, Auger RR, et al; American Academy of Sleep Medicine. Circadian rhythm sleep disorders: part I, basic principles, shift work and jet lag disorders. An American Academy of Sleep Medicine review. Sleep. 2007;30:1460-1483. Abstract

39. Morgenthaler TI, Lee-Chiong T, Alessi C, et al; Standards of Practice Committee of the American Academy of Sleep Medicine. Practice parameters for the clinical evaluation and treatment of circadian rhythm sleep disorders. An American Academy of Sleep Medicine report. Sleep. 2007;30:1445-1459. Abstract

40. Lerman SE, Eskin E, Flower DJ, et al; American College of Occupational and Environmental Medicine Presidential Task Force on Fatigue Risk Management. Fatigue risk management in the workplace. J Occup Environ Med. 2012;54:231-258. Abstract

41. Keeping Patients Safe: Transforming the Work Environment of Nurses. Committee on the Work Environment for Nurses and Patient Safety, Board on Health Care Services. Institute of Medicine of the National Academies. Washington, DC: The National Academies Press; 2004. http://www.nap.edu/openbook.php?isbn=0309090679 Accessed July 27, 2012.

42. National Heart, Lung, and Blood Institute. Your guide to healthy sleep. 2011. NIH 11-5271. http://www.nhlbi.nih.gov/health/public/sleep/healthy_sleep.pdf Accessed June 1, 2012.

43. National Sleep Foundation. How much sleep do we really need? http://www.sleepfoundation.org/how-much-sleep-do-we-really-need Accessed June 1, 2012.

44. National Occupational Research Agenda. National healthcare and social assistance agenda. December 21, 2009.

http://www.cdc.gov/niosh/nora/comment/agendas/hlthcaresocassist/pdfs/HlthcareSocAssistDec2009.pdf Accessed June 1, 2012.

45. Healthy People 2020. Sleep health. May 1, 2012. http://healthypeople.gov/2020/topicsobjectives2020/overview.aspx?topicid=38 Accessed June 1, 2012.

46. The Joint Commission. Health care worker fatigue and patient safety. The Joint Commission Sentinel Event Alert. 2011;48:1-4. http://www.jointcommission.org/assets/1/18/sea_48.pdf Accessed June 1, 2012.

Public Information from NIOSH and Medscape

Cite this article: Running on Empty: Fatigue and Healthcare Professionals. *Medscape*. Aug 02, 2012.