

Medical staff working the night shift: can naps help?

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Napping at night may benefit both health professionals and their patients

Delivering medical care is a 24-hour business that inevitably involves working the night shift. However, night shift requires the health professional to work when the body's clock (circadian system) demands sleep. Added to this is the problem of "sleep debt", arising from both prolonged prior wakefulness on the first night shift and cumulative sleep debt after several nights' work and repeated unsatisfactory daytime sleeps. A further aggravation, particularly for trainee medical staff in teaching hospitals, has been the demand for excessive work hours across the working week. As has been dramatically shown in recent well controlled studies, the net result of this assault on the sleep of health professionals can be impaired patient safety,¹ and the health and safety of health professionals themselves.²

The good news is that health organisations and regulators are beginning to treat the matter seriously. In Australia, the United States and Europe, work hours of medical staff have recently been shortened by government regulation, and bodies such as the Australian Medical Association and professional colleges are advising their members on strategies to improve their sleep health and thus work safety. A recent publication prepared by the Royal College of Physicians (London) (RCP), *Working the night shift: preparation, survival and recovery. A guide for junior doctors*, is an excellent example.³ One proposed countermeasure for excessive sleepiness is the use of strategically placed naps both before and during the night shift. But does napping either before or during the night shift reduce sleepiness and improve performance, and, if so, how practical is it?

There are two important, independent mechanisms of sleep and sleepiness that hold the key to these questions.⁴ Probably the more potent mechanism impairing night-shift alertness is the circadian system. For most individuals, even those working permanent night shift, the circadian system is in sleep mode during the night. This causes slowed reactions, increased feelings of fatigue, impaired concentration, and increased sleep propensity. The second important mechanism affecting night-time alertness is homeostatic sleep drive. This increases in intensity the longer we are awake and, like appetite which is sated by eating, homeostatic sleep drive is reduced by sleeping. If the first night shift starts at midnight following a normal wake time at about 8 am, about 16 hours of wake sleep debt has already been accrued and the rest of the night shift will be performed under intense homeostatic, in addition to circadian, sleep drive. Performance decrements during this night period can be similar to those measured in the daytime with a blood alcohol concentration of 0.05%–0.10%.⁵ Day sleep in the home environment is likely to be shorter and less effective than night sleep so, even though second and subsequent night shifts may follow fewer wakeful hours (8–10 hours), homeostatic sleep drive is likely to remain elevated during night shifts because of incomplete repayment of the previous sleep debt.

To a limited extent, it is possible to "bank" sleep (or pay off residual sleep debt) before the first night shift, potentially reducing subsequent night-time homeostatic sleep drive and improving alertness and work safety. A long (1–2 hours) nap in the afternoon,

as recommended in the RCP report, is best. Afternoon sleep is more efficient than early evening sleep as it uses the natural afternoon “dip” in circadian physiology⁶ and avoids the risk of post-sleep grogginess or sleep inertia impinging on the start of night duty. Between subsequent night shifts, the aim should be to maximise daytime sleep length (at least 7 hours) and efficiency by including the afternoon sleepy period (1–4 pm).

What about napping during a night shift to improve alertness and reduce errors and accidents? Brief afternoon naps of 10–30 minutes (so-called power naps) improve alertness and performance. We compared afternoon naps of 5, 10, 20, and 30 minutes of total sleep.⁷ The 10 minute sleep (about a 15 minute nap opportunity) produced improvements over the 3 hour post-nap period in all eight alertness and performance measures, without any of the post-nap impairment of sleep inertia that followed the 20 and 30 minute naps. Whether these results would be replicated at, say, 3 am in a night-shift environment, with considerably greater homeostatic and circadian sleep drive, is now being tested.

Only a few studies have measured the effects of night-shift napping. Long naps of about 2 hours appear as effective at about 3 am as at 3 pm.⁸ However, 1–2 hour naps were followed by sleep inertia, during which alertness was impaired for up to an hour.⁹ Longer naps, although beneficial once sleep inertia has been dissipated, may be used reluctantly by medical staff wishing to maintain continuity of patient care.¹⁰ Briefer naps (18–26 minutes) have also improved performance in night-shift environments.¹¹ Therefore, the picture emerging from night-shift napping studies is similar to that from the afternoon studies. Very brief naps (10–15 minutes of sleep) may improve alertness immediately without the negative effects of sleep inertia. How long this improvement lasts and what is the optimal nap length on the night shift remains to be determined.

In the meantime, as recommended in the recent RCP guide, health professionals who work night shift should, for the sake of their own health and safety and that of their patients, consider

the benefits of night-shift napping. Optimal benefit and a higher take-up rate are likely for sleep lengths of 10–15 minutes.

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References

- 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.
- Barger LK, Cade BE, Ayas NT, et al. Extended work shifts and the risk of motor vehicle crashes among interns. *N Engl J Med* 2005; 352: 125-134.
- Horrocks N, Pounder R. Working the night shift: preparation, survival and recovery. A guide for junior doctors. London: Royal College of Physicians of London, 2006. <http://www.rcplondon.ac.uk/pubs/books/nightshift/index.asp> (accessed Aug 2006).
- Borbely AA. A two-process model of sleep regulation. *Hum Neurobiol* 1982; 1: 195-204.
- Dawson D, Reid K. Fatigue, alcohol and performance impairment. *Nature* 1997; 388: 235.
- Lack LC, Lushington K. The rhythms of human sleep propensity and core body temperature. *J Sleep Res* 1996; 5: 1-11.
- Brooks A, Lack L. A brief afternoon nap following nocturnal sleep restriction: which nap duration is most recuperative? *Sleep* 2006; 29: 831-840.
- Dinges DF, Orne MT, Whitehouse WG, Orne EC. Temporal placement of a nap for alertness: contributions of circadian phase and prior wakefulness. *Sleep* 1987; 10: 313-329.
- Takahashi M, Arito H, Fukuda H. Nurses' workload associated with 16-h night shifts. II: Effects of a nap taken during the shifts. *Psychiatry Clin Neurosci* 1999; 53: 223-225.
- Arora V, Dunphy C, Chang VY, et al. The effects of on-duty napping on intern sleep time and fatigue. *Ann Intern Med* 2006; 144: 792-798.
- Purnell MT, Feyer AM, Herbison GP. The impact of a nap opportunity during the night shift on the performance and alertness of 12-h shift workers. *J Sleep Res* 2002; 11: 219-227. □