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Chronotypes, night shifts and intensive care

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One of the underlying challenges of intensive care is the need to provide ongoing quality care 24 h per day, 7 days per week. In fact the time of highest physiological instability of patients who have undergone major surgical interventions during the day may be late at night.

Inevitably that means that nearly all intensive care unit (ICU) staff will be called upon to work outside of normal working hours, and during hours when it is normal to be asleep. Added to the challenge is the requirement for continuous vigilance (while trying to maintain some normal diurnal variation for patients); ongoing accuracy of work (particularly in the calculations and adjustments required for individualized therapy with high potency

medication); and the capacity to respond to emergencies in a focussed and effective manner.

Clearly sleep disruption is associated with deterioration in many aspects of function in the medical setting [1], and the effects of sleep disruption may also be aggravated by factors such as age [2]. Fatigue is distinct from sleep deprivation and sleep debt, but the three are often considered together, and they clearly interact, contributing to cognitive failure. Sleep deprivation probably constitutes the biggest threat to patient safety. The average cognitive decrement toward the end of a typical night shift is estimated at about 25 % [3]. A major impact is the loss of cognitive executive function, located mostly in the pre-frontal cortex [4]. As with cognitive overload, this leads to diminished performance, degraded analytic reasoning, and impaired monitoring and debiasing.

Individuals have different sleep–wake cycles and that has been described as chronotype. Recent studies have highlighted the influence of chronotype on a wide range of human behaviour including morality [5], sexual behaviour [6], mood [7] and athletic function [8]. The impact of shift work on the individual may differ depending on their chronotype [9] and by sex [10]. Discrepancy between individual chronotypes and sleep patterns enforced by shift work has been labelled “social jetlag” [11], with significant impact on individual performance and well-being. Social jetlag may also be associated with changes in emotional status and possibly with depressive illness [7, 12].

In a recent article in *Intensive Care Medicine*, Reinke et al. [13] report on the chronotypes of nursing staff in their ICU and reassuringly provide evidence that there was no significant impairment in accuracy of function (as measured in the study) or vigilance, but a drop in productivity (measured in time to complete tasks) in nursing staff while working a night shift. Their nurses were working 8-h shifts with the night-time shift being between 23:00 and 08:00 hours (with some variability of start and

Fig. 1 An approach to shift staffing in the ICU

end times). The study confirmed that night shifts were indeed disruptive to sleep patterns, and that there was a range of adaptive patterns displayed by the nurses.

This study did not provide information on issues such as the shift rotation [14], and the pattern of after-hours shiftwork that the nurses in this study were exposed to. There is evidence that the pattern of rotation of shifts may have significant metabolic effects [14] and there is a need to investigate these issues in more detail. They also did not provide information on medical staff, which probably had yet another pattern of work distribution and night work. It is intriguing that the responses of the nurses were affected by their families, and there is clearly a need to review the impact of young children on the chronobiology of their parents.

The current study did not investigate the effect of night shift on physical tasks and procedures in detail, and they did not perform very in-depth cognitive function tests. Some surgical skills do not necessarily decline with a limited amount of sleep loss under average conditions in the hospital [15, 16]. Procedures not a part of routine work, like emergency procedures, may well be performed better during sleep deprivation than more ordinary repetitive tasks. This particular area is far from sufficiently

studied, in particular regarding intensive care procedures and performance by physicians as well as by ICU nurses.

Other recent studies have highlighted the range of adaptations that nurses make to shift work [17], and increasingly employers are going to need to consider providing information to personnel about how best to adapt to shifts. Restorative napping, defined as a purposeful, brief sleep period, has long been considered effective in reducing fatigue and improving performance and vigilance in non-healthcare work environments [18]. Work facilities (e.g. space for naps during working hours) and schedules may also need to be developed that optimize adaptation to shift work for ICU and other staff (Fig. 1).

This study has highlighted once again the impact of intensive care shift work on nursing staff, and should encourage intensive care personnel to focus on understanding the implications of shift work and in turn on the potential for improving staff well-being and patient safety by addressing this issue effectively.

Conflicts of interest The authors have stated that they have no conflict of interest with regard to this publication.

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