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Journal club critique

Reducing interns' work hours led to fewer attentional failures and serious medical errors in intensive care units

Babak Sarani[1] and Louis H. Alarcon[2]

[1] Clinical Fellow, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA
[2] Assistant Professor, Department of Critical Care Medicine, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania, USA

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Expanded Abstract

Citations

Lockley SW, Cronin JW, Evans EE, Cade BE, Lee CJ, Landrigan CP, Rothschild JM, Katz JT, Lilly CM, Stone PH, Aeschbach D, Czeisler CA; Harvard Work Hours, Health and Safety Group: Effect of Reducing Interns' Weekly Work Hours on Sleep and Attentional Failures. *NEJM* 2004, 351:1829-37.[1]

Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, Lilly CM, Stone PH, Lockley SW, Bates DW, Czeisler CA: Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units. *NEJM* 2004, 351:1838-48.[2]

Hypotheses

Eliminating interns' extended work shifts will increase their duration of sleep, reduce attentional failures, and decrease rates of medical errors as compared with traditional work schedules.

Methods

Design: Single center, randomized, unblinded, crossover study.

Setting: Closed, medical intensive care unit and coronary care unit at an academic medical center hospital.

Subjects: The first 20 medical interns to volunteer and consent to participate were enrolled. They were observed during two 3-week rotations in either the medical intensive care unit or coronary care unit.

Intervention: Both studies used a crossover design. Interns were randomly assigned to either a traditional or intervention call schedule. The traditional call schedule involved in-house call every 3rd night with a limit of 30 hours of consecutive work. The intervention schedule involved call every 4th night with a limit of 16 hours of consecutive work. Interns recorded their sleep and work hours and were followed by physician observers to detect medical errors. In addition, nurse chart reviewers assessed medical records for medical errors and a computer error detection program was utilized. The interns also underwent continuous ambulatory polysomnography at least 3 times per week to assess for periods of sleep and inattentiveness. All data were reviewed by investigators blinded to the interns' schedules.

Outcomes

The primary endpoints were the number of hours each intern slept, number of attentional lapses each intern suffered, and number of serious medical errors made by interns. A secondary endpoint was the number of errors made by all house-officers in the intensive care units. The study had 90% power to detect a 16% difference between groups for rates of serious medical errors.

Results

Interns slept 5.8 hours more per week, had half the rate of attentional lapses during on-call nights, and made fewer serious medical errors during the intervention schedule than during the traditional schedule. Additionally, the total rate of serious errors made by all house-officers (not just interns) was significantly lower during the intervention schedule. Patient length of stay and mortality did not differ significantly between the two schedules.

Conclusion

Eliminating interns' extended work schedules can increase sleep and decrease rates of attentional lapses and serious medical errors in the intensive care unit setting.

Commentary

Post-graduate medical training in the United States has involved extensive work schedules since the early 1900's. Beginning July 2003, the Accreditation Council for Graduate Medical Education (ACGME) restricted resident work hours to no more than 30 continuous hours and no more 80 hours per week when averaged over a four-week period.[3] While studies suggest that sleep deprivation causes reduced physician cognitive performance in simulated situations, there is a lack of studies conducted in real world clinical environments.

The two studies by the Harvard Work Hours, Health and Safety Group are a step forward in understanding the impact of sleep deprivation in the clinical environment. The authors found that interns working in an intensive care unit (ICU) under traditional extended work schedules slept less, had more attentional lapses, and made more serious medical errors than those working a schedule with less frequent call and shifts that were limited to no more than 16 hours. These studies have a number of strengths. First, they were conducted in a clinical setting as opposed to a simulated environment. Second, they were randomized and used a crossover design, which allowed each intern to serve as his or her own control. Third, each study used multiple methods to validate the collected data – such as the use of daily sleep logs and ambulatory polysomnography to measure sleep and observers, chart reviewers, and computer data to assess medical errors.

Several limitations deserve consideration. There were more patients admitted to the ICU and more ICU patient-days in the traditional arm than in the intervention arm. Although these differences were not statistically significant, it does raise the possibility that interns in the traditional arm had more *opportunities* to make serious errors. Although the authors attempted to validate medical error determinations through review by blinded investigators, the data collection itself was not blinded. Observers may have had inherent biases and may have been more apt to cite errors made by interns in one arm as opposed to the other. As noted by the authors, only one intern could be observed for errors at any given time. As such, it is possible that other errors went undetected, though this possibility was mitigated somewhat by the use of the chart reviewers and computerized error detection.

Recommendation

Based on the results of these studies, it seems that the ACGME resident work hour restrictions are warranted, at least for interns, and that efforts to reduce the number of hours worked by interns may improve patient care. It is not known, however, if these findings extend to upper-level residents or to those in more technically oriented fields, such as surgery. Furthermore, a "safe" number of hours that can be worked in a given time period has yet to be defined.

As we move to more restricted resident, and, perhaps, attending work hours, it will be crucial that we instill a sense of professionalism in our trainees, such that commitment to individual patients does not wane as work hours are curtailed and that a "shift-work" mentality does not compromise care. Similarly, as number of patient hand-offs increases, we will need to find ways to improve the transfer of patient information from one caregiver to another to prevent the potential lapses that can occur during these vulnerable transitions of care. Finally, we must also be sure that as our trainees spend less time in the hospital caring for patients and attending lectures, their education does not suffer.

Competing interests

The authors declare that they have no competing interests.

References

1. Lockley SW, Cronin JW, Evans EE, Cade BE, Lee CJ, Landrigan CP, Rothschild JM, Katz JT, Lilly CM, Stone PH, Aeschbach D, Czeisler CA; Harvard Work Hours, Health and Safety Group: Effect of Reducing Interns' Weekly Work Hours on Sleep and Attentional Failures. *NEJM* 2004, 351:1829-37.
2. Landrigan CP, Rothschild JM, Cronin JW, Kaushal R, Burdick E, Katz JT, Lilly CM, Stone PH, Lockley SW, Bates DW, Czeisler CA: Effect of Reducing Interns' Work Hours on Serious Medical Errors in Intensive Care Units. *NEJM* 2004, 351:1838-48.
3. ACGME duty hours requirements. http://www.acgme.org/acWebsite/dutyHours/dh_Lang703.pdf. Accreditation Council for Graduate Medical Education. Accessed: Jan 5, 2005.