

## Editorial

### Resident work hours

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In the past 10 years a number of activists have called for dramatic reductions in the hours worked by resident physicians. They have attempted to link resident fatigue with medical errors. The result of this was the Institute of Medicine's report that recommended, among other things, a 16-hour maximum in the number of consecutive hours worked by all residents regardless of specialty. Two papers in this issue of the *Journal of Neurosurgery* provide information relevant to this discussion in our specialty.

Ganju et al.<sup>2</sup> report in this issue on studies they conducted on the effect of fatigue in neurosurgical residents. They found that neurosurgical residents tested in the post-call state did not have a statistically significant decrease in aspects of simulated technical performance or increase in cognitive errors. The authors noted that a similar study performed in general surgical residents did demonstrate a statistically significant decrease in performance.<sup>5</sup>

There are some potential limitations with this study. It was performed in a single institution in a relatively small cohort of residents. As the authors note, it is not clear that the tasks tested are relevant to conditions encountered in clinical practice and that other tasks might not better reflect the challenges that confront practicing neurosurgeons. Nonetheless, these results suggest that neurosurgery residents may be among those who are relatively resistant to the effects of sleep deprivation.

The science of sleep deprivation has long depended for much of its data foundation on experiments conducted in "residential" sleep laboratories where volunteers would be subjected to varying paradigms of sleep deprivation over extended periods of time. Little attention has been directed to the question of whether people who, as a result of their career or socioeconomic conditions, are available to participate in such studies represent the general population, let alone a population of high-achieving, self-selected professionals. In fact, there are significant data supporting the notion that there exists a population that is relatively resistant to the effects of sleep deprivation.<sup>3</sup>

Of the 16,000 medical students graduating from US medical schools each year, approximately 270 apply to enter the neurosurgery residency match and 170 are accepted to neurosurgical training positions. This is a high-

ly competitive process, which involves self-selection for attributes that will portend success in a career in neurosurgery—probably including the ability to work intensely over sustained periods to care for critically ill patients. It is likely that many neurosurgical residents come into their residency training better prepared than most for the rigors of a demanding surgical specialty. It is also clear to most neurosurgical educators that as a result of their rigorous training most residents develop, over time, the emotional and psychomotor stamina that allows them to be effective when they must respond to the needs of their patients—often at inconvenient times of the day or night and for sustained periods.

Of even more concern is the report by Dumont and colleagues<sup>1</sup> in this issue of the *Journal*. These authors report an increase in potentially avoidable morbidity as determined in their monthly quality improvement activities since the advent of the Accreditation Council for Graduate Medical Education (ACGME) duty-hours restrictions in 2003. Neurosurgical educators have been concerned that the increased number of handovers of patient care responsibilities could lead to errors, especially in neurosurgical patients where subtle changes in findings on neurological examination might be the only indicator of impending intracranial or intraspinal complications. The findings in the Dumont report now indicate that this concern is justified and is in concert with the overall observation that medical errors have not been reduced by the adoption of the 2003 ACGME duty-hours restrictions. As the authors note, there is the potential for bias in the interpretation of these results because inferences had to be based on comparisons between cohorts treated during different epochs. This type of bias is unfortunately unavoidable in studies of the effect of duty-hours restrictions on care, because any effect must necessarily begin after the new restrictions go into effect. This study indicates that neurosurgeons should redouble their efforts to improve procedures for transitions in care. It also suggests that there is value in limiting as much as possible the number of transitions of care between neurosurgeons. Calls for across-the-board limits on physician work hours—especially resident work hours—increase the risks that important differences between specialties will not be incorporated into workable, practical rules that recognize the diversity of what various specialists do and the differences in the patient populations they serve. If neurosurgeons are hamstrung in the future by restrictive rules in their ability to care for their patients continuously during the course of complicated and protracted neurosurgical illnesses, patient care and safety will suffer.

Regulation of residency training must take into account the diverse nature of specialty practice and the special needs of residents training in different specialties. Neurosurgical residency training has a number of relatively unique characteristics.<sup>4</sup>

Experience from the military has shown that demanding training paradigms including stress inoculation and periods of sleep deprivation have an important role in preparing selected individuals for special roles that require unusual skill sets. The appropriate role of such special training in medicine is not defined at this time. More data such as those presented by these authors are needed to provide this definition. Clearly there are limits in the hours that physicians can work under safe and healthy conditions. A uniform set of rules, however, will only serve to set a standard of mediocrity in specialties that depend on a large experiential base of technical training. Careful research based on studies involving neurosurgery residents will provide us with the information needed to determine the appropriate conditions for resident training in neurosurgery.

#### Disclosure

The author reports no conflict of interest.

#### References

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## Response

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As Dr. Dacey points out, there are a number of limitations with our study. It was performed in a single institution with a limited cohort of residents; a multi-institutional study would address this concern. Another concern is the applicability of simulators to real surgical practice. Although earlier work has validated the use of

the surgical simulator as an assessment tool for cognitive and psychomotor skills,<sup>2</sup> it is unclear if such simulators accurately mimic the cognitive and procedural tasks of neurosurgical practice.

Despite the limitations of the study, it remains that in a similar study, a cohort of general surgery residents demonstrated a significant increase of 27.3% in technical and cognitive errors in the sleep-deprived state. In contrast, our neurosurgical resident cohort demonstrated a nonsignificant performance decline of 13.1% in the sleep-deprived state.

Many would argue that the methodology herein applied does not truly approximate the adrenaline-charged response that occurs when one encounters a patient with a dilated pupil in the emergency room. Most of us can probably recall various times during a physically and emotionally difficult chief resident year when we were invigorated by being confronted with a patient in need of neurosurgical intervention. It could be argued that the surgical simulator greatly underestimates the impact of physiological changes that occur when neurosurgeons are faced with actual patients. In the practice of neurosurgery, the stakes are high and time is of the essence; the correct intervention, delivered in a timely fashion, has implications for both the quality and quantity of life for our patients. This study's methodology may actually understate changes in neurosurgeons' psychomotor and cognitive capabilities when faced with a real patient.

The beauty of medicine lies in its breadth and depth; during the 3rd and 4th years of medical school, students have the opportunity to identify their strengths, weaknesses, and passion as they decide upon a career path. Neurological surgery has long been recognized as an arduous career path, during training as well as after.<sup>1</sup> Most medical practitioners would agree that all medical specialties are not created equal; as Dr. Tom Nasca, head of the ACGME, pointed out in his keynote address at the 2011 Society of Neurological Surgeons meeting, "One size does not fit all." (Keynote speech, May 22, 2011, Portland, Oregon.) The demands of each medical specialty are unique and noncomparable; therefore, applying the same work-hour restrictions to all specialties has little merit. Neurosurgical emergencies do not occur on an 8:00–5:00 schedule; nor do surgical complications obey the standard work-day schedule. It is integral to the job description that a neurosurgeon is able to respond, regardless of the hour or the number of hours worked, to the neurosurgical issues at hand. As a group, we should be unapologetic in regard to the demands of our specialty.

Our study is a preliminary step in addressing the challenges in producing a competent neurosurgeon in the era of work-hour restrictions. As we critically look at neurosurgical training in the 21st century, we should design rigorous studies that answer the questions, "Are our current training paradigms doing harm?" and "Are other options more meritorious?"

It is up to the thought and academic leaders of our specialty to define neurosurgical training and competency in order to develop future generations of neurosurgeons who will not only preserve the traditions of the specialty but also continue to provide excellent care to the public.

## Editorial

We should devise better methods to measure fatigue and its effects in the real-life neurosurgical workplaces of the emergency room, intensive care unit, and operating room.

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2. Kahol K, Leyba MJ, Deka M, Deka V, Mayes S, Smith M, et al: Effect of fatigue on psychomotor and cognitive skills. **Am J Surg** **195**:195–204, 2008

## Response

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We would like to thank Dr. Dacey for his ongoing ad-

vocacy on the present topic. We would also like to thank him for echoing one of our key points—duty-hours regulations have led to an increased number of handoffs and transitions in care, and we feel that increased handoffs may contribute to as many errors, or more errors, than sleep deprivation in the care of neurosurgical patients. The burden of establishing this has fallen on our specialty. Unfortunately, this sort of analysis is handicapped by obvious methodological flaws. Furthermore, such an analysis will never be able to demonstrate the more subtle effects of duty hours on patient care, including the patients' experience of decreased continuity of care; on the training of surgeons and their exposure to adequate surgical case volumes; and on fundamental change in the work ethic of trainees. Despite the limitations of this work, we hope that continued efforts on this topic lead to optimized resident training and patient care.

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