LETTER TO THE EDITOR

Physician, Heal Thyself: Sleep, Fatigue, and Medical Education

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IN 1989, THE BELL COMMISSION REPORT CITED SLEEP DEPRIVATION IN MEDICAL HOUSE OFFICERS AS A MAJOR CONTRIBUTOR TO THE DEATH OF A YOUNG WOMAN IN NEW YORK, LIBBY ZION.1 In response, the New York State Legislature enacted New York State Code 405, reducing total work hours for house staff from 100 or more per week, to 80 hours maximum (although allocated sleep time for residents was not specifically addressed). Over the subsequent decade, medical error rates in the state of New York did not appreciably decline, while teaching hospitals increasingly struggled to support house staff costs. Consequently, there is now an initiative in New York and elsewhere to reverse resident work hour restrictions, based on the claim that sleep deprivation has not been definitively shown to cause impairment in house staff performance, and that professionalism may suffer if residents do not learn to work long hours.2 In this editorial, we briefly summarize key points from the research data concerning sleep loss and house staff performance, review current work schedule regulations for residents, and discuss some important implications for the sleep medicine community.

Evidence that Sleep Loss Impairs Physician Performance

To date, there are at least 30 studies in the English literature examining specific effects of sleep loss and fatigue in medical interns and residents (see selected key references: 3-14). These studies have varied widely in the methodology and study designs employed. Although these studies begin to address this important issue, the studies involve, in general, small sample sizes, lacking adequate power to test effect. In addition, there are no studies with control groups of documented “rested” residents. Therefore, comparisons are made between groups of chronically sleep-restricted residents and house officers with short-term total sleep loss superimposed upon chronic sleep restriction. Recent studies suggest significant and lasting effects of chronic sleep restriction, thereby weakening conclusions in most, if not all, studies to date. Finally, the parameters most clinically relevant, concerning medical error and patient care are in most cases not examined. Despite the limitations in study design, some important conclusions may still be drawn, as follows.

First, medical interns and residents can be characterized as frequently functioning in a state of chronic, partial sleep deprivation. For example, one recent study of 26 internal medicine residents in a major teaching hospital found that interns spent an average of less than five hours per call night in bed, and obtained an average of 3.7 hours of sleep, as measured by ambulatory EEG recording,7 and most other studies corroborate a similar level of ongoing sleep loss.

Secondly, when tasks dependent upon high levels of vigilance or newly learned procedural skills are examined, the effects of short-term sleep loss are much more apparent. Thus, studies that have employed simulated triage or intubation procedures, for example, have shown marked sleep-related decrements in performance.15 Similarly, operative technique in surgical residents has been found to be significantly poorer following on-call nights.10 It should be noted that the effects of sleep loss, in general, have not been examined as extensively or rigorously in residents or medical practitioners compared to other populations studied by sleep researchers. In particular, few studies have used sufficiently sensitive or specific outcome measures.

Third, few studies to date have systematically evaluated the effects of counter-measures or alternative work hour schedules. Although there are a few studies which have examined the impact of so-called “night float” schedules, in which house staff have protected night-time hours while on call, residents seldom take advantage of this time to catch up on lost sleep. For instance, one study found similar total sleep times in residents on call, with or without night float coverage.7 In other studies, however, use of a night shift on-call system resulted anecdotally in improved morale and resident learning in one obstetrics and gynecology residency program, for example,16 and systematic implementation of a sleep hygiene and counter-measures program with shift rotation adaptations resulted in increased sleep time and self-ratings of alertness among emergency room physicians.17

Work Hour Regulations for House Staff

Since the Bell Commission’s initial concern about the potentially deleterious effects of sleep loss on residents’ performance and patient care, the primary change in resident work hours has been a reduction from 100 to 80 hours per week. However, in many training programs, interns and residents may still work up to 36 hours continuously. Furthermore, evidence suggests that there are widespread violations of the New York State regulations governing the 80-hour work week. In a 1999 review of residency training standards, the ACGME cited 17 of 86 teaching hospitals reviewed (nearly one in five) and about one third of U.S. residency programs in internal medicine and general surgery for violations of the organization’s arguably minimal restrictions on work-hours. It is troubling that while other professions involving high stakes for human error, such as aeronautics and transportation, have actively addressed the role of sleep and fatigue on

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workers’ performance, this issue has been relatively neglected by the medical profession generally, and the sleep community in particular.

Recent developments suggest the time may be ripe for re-examining the issue. Of particular concern in this era of increased accountability in health care is the potential impact of sleep loss and fatigue in physicians on the quality of patient care, and specifically on the commission of errors in the hospital setting. The scope and significance of this problem was underscored by a recent (1999) report of the Institute of Medicine (IOM), “To Err is Human,” which attributes approximately 44,000 deaths per year directly or indirectly to medical errors. According to the IOM report, one of the key components involved in the genesis of medical errors, and thus clearly deserving of further study, is that of human factors, such as reduced vigilance and fatigue. A number of studies in the anesthesia literature, in particular, have examined this issue of human factors as a preventable cause of medical mishaps in more detail. The IOM report recommends establishment of a federally funded center for patient safety and the creation of a “culture of safety” in designing work-place conditions for medical personnel. In response, the Agency for Healthcare Research and Quality (AHRQ) has announced new federal initiatives to identify and address threats to patient safety, including the impact of fatigue and stress on medical providers.

Several factors may contribute to the relative stalemate in developing research and policy in this area. First, the difficulty in conducting well-controlled studies and inconsistency in research findings to date is often cited as a major obstacle. Despite the accumulation of data from studies of sleep loss on human performance in the laboratory and in various occupational settings, the specific evidence linking sleep loss and fatigue with performance deficits during medical training is inconclusive. Concerns about the fiscal and administrative aspects of the issue have been another major stumbling block. The parties responsible for the containment of health care costs and for funding of medical education, including third-party payers, hospitals, and federal insurance programs, usually assume that system reform necessarily involves additional professional and ancillary support staffing and consequently, higher costs. Indeed, it was estimated in 1988 that the cost of implementing the modified New York State regulations would be upwards of $226 million initially, and $15.7 billion over the subsequent 15 years. However, projections of this type are typically made without awareness of the potential use of cost-effective counter-measures, such as prophylactic napping and timed rest periods, and without data on the effectiveness or applicability of these measures in the hospital setting. Finally, there is a tradition of resistance to change on the part of the medical profession itself. Some of the usual justifications given for continuing the current system include continuity of patient care and the conditioning of future physicians to be mentally alert at night, or following long periods on call. There remains considerable commitment in the medical profession to a tradition of self-sacrifice and dedication that requires physicians, in the supposed interests of patient care, to survive and function on little or no sleep.

A Leadership Role for the Sleep Medicine Community

Why has the sleep medicine community not been more actively involved in this issue? The sleep medicine community has played a highly effective and influential role in related policy areas; for example, research on the effects of sleep deprivation on job performance and occupational safety has been translated into national policy over the past several years, including enactment of regulations governing work hours by federal agencies such as the National Highway and Transportation Safety Agency (NHTSA) the National Aeronautics and Space Administration (NASA), and in occupational groups such as airline pilots, truck drivers, and railroad engineers. Further, active participation of sleep experts in policy decisions for both of these industries, was essential for fair interpretation of the data and the translations of research findings into sound policy. The ongoing debate regarding optimal scheduling of school hours for high school students is another example of attempts to link sleep science with public policy, and is the direct result of evidence-based observations regarding the impact of sleep deprivation on learning and academic performance. Of particular note, sleep researchers have advanced understanding of the consequences of partial chronic sleep deprivation under conditions which closely simulate “real world” experiences, as well as the efficacy of various countermeasures in reversing and/or mitigating these effects. Empirical support for these approaches is critical in providing a scientific basis both for regulating work hours and schedules during residency training, and for the development of recommendations regarding fatigue management and effective counter-measures.

Despite the lack of definitive research, regarding sleep loss and fatigue in medical training, it is clear that some action from the sleep medicine community is called for in addressing the issues and in assuming a leadership role in this area. Given the controversy that frequently surrounds the issue, our reluctance in the past to take a public stand has perhaps been understandable. However, it is no longer justifiable in the current climate of health care reform. If public policy is to be based upon sound science, as is increasingly our mandate, then who better to embrace a leadership role in advancing this issue than sleep scientists and educators? Moreover, to maintain our credibility as advocates for the importance of sleep in health and disease generally, it is imperative for us to take a hard look at our own practices and standards in this area, and to seriously consider the implications of failing to take the lead in reforming training practices and education for future physicians. As a first step in this direction, we propose the following action items:

- To develop a scientifically sound and comprehensive body of evidence regarding the effects of sleep loss and fatigue on medical education and house staff performance. To achieve this aim, a clear definition is needed of the problems to be addressed and optimal research strategies to be employed. New research methodologies and data collection techniques will likely be needed for this purpose. Lack of funding has clearly hampered efforts to develop coordinated or large-scale research in this area, and additional funding will need to be allocated to achieve these goals. Ultimately, all changes in policy and procedures should be evidence-based and linked to results of specific studies.

- To begin the process, we recommend that a national workshop be convened to address the impact of sleep loss and fatigue on medical education, and related consequences for patient safety and quality of medical care.
In summary, the topic of sleep loss and fatigue in medical training has significant implications for patient safety and the overall quality of health care. Despite growing concern and attention to this issue in other industries (e.g., aeronautics, transportation), physician education and training has lagged behind. We invite the sleep medicine community to lend their considerable talents and resources to making this a priority for research, education, and policy development in the coming decade. Ultimately, this will lead to benefits in improved patient care, medical professionalism, and reinforcement in young physicians of the importance of sleep medicine. Not only will this effort have a lasting impact on the quality of health care in the United States and abroad, but there is perhaps no more important legacy that we can leave to the next generation of physicians.

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