

Perspective: Ten Thousand Hours to Patient Safety, Sooner or Later

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Abstract

A call by the Institute of Medicine to advance the cause of patient safety catalyzed the current focus on duty hours limits during resident education. Unrelated benefits to resident education have accrued from those efforts, but, despite rigorous study of the issue, there is little evidence of a positive impact on patient safety resulting from trainee duty hours adjustments. Moreover, the discussion has become worryingly myopic in its singular preoccupation with the impact of postgraduate medical education duty hours on safe patient care.

The author argues that patient safety efforts should focus instead on the three essential elements of *capacity*, of which a discussion of duty hours and fatigue are an important part, *commitment*, and *competence*. *Commitment* requires altruism and professionalism, which are discouraged by a shift-work orientation. *Competence* is essential for safe patient care; as duty hours are constricted in the name of reducing fatigue-related medical error, it must be remembered that a certain amount of time is required to both acquire a knowledge base and attain proficiency in needed technical

skills. Until a competency-based educational system can be implemented, the profession and patients would be well served by a heightened awareness of the increased number of years required in a constrained work hours environment to achieve proficiency in the independent practice of medicine, especially when procedural competence is required. Such a realization will inevitably result in voluntary lengthening of some residency training programs, particularly in surgical disciplines and those medical specialties with a prominent procedural component.

The Institute of Medicine (IOM) initiated a compelling discussion on patient safety with the release of “To Err Is Human” in 1999¹ and catalyzed a program to eradicate avoidable medical error from patient care in the United States. In 2003, the Accreditation Council for Graduate Medical Education (ACGME) responded with the introduction and implementation of resident duty hours guidelines,^{2,3} which were painstakingly revised in 2010^{4,5} in response to continued criticism from the IOM.⁶ As a result, the task of eliminating sleep deprivation and fatigue-related errors from residency education has dominated the dialogue on patient safety. The leadership of the IOM and the ACGME are to be commended; they have arrived at thoughtful (albeit controversial) duty hours restrictions, the incorporation of rest periods into the workday, and an important acknowledgment of the need for graduated independence and declining

supervision in the final years of residency education. These changes are well intended, long overdue, and have been largely embraced by the community of medical educators. Our residency and fellowship programs are the better for them. Yet, the patient safety conversation has become myopic in its focus on resident fatigue, and some important, overlooked issues are deserving of equal time in the overarching discussion of patient safety.

I would propose that, for physicians, patient safety has three fundamental elements: capacity, commitment, and competence. As a profession, the practice of medicine is characterized by the privilege and responsibility of self-regulation—hence, the first element of *capacity*. The physician is expected to possess a self-awareness that supports safe patient care, and the resident duty hours issue and fatigue-related medical error are critical components of this discussion. The physician-in-training should be taught to recognize the signs of fatigue and sleep deprivation that may limit one’s overall capacity to deliver safe and effective patient care. Likewise, the practicing physician must be cognizant of when he or she is too tired to concentrate sufficiently to perform an operation or conduct an office evaluation required to make a complex diagnosis. Of course, such self-admissions of fatigue by either residents or their teaching faculty are rare

and unusual events in today’s medical environment. From this conversation emanates the thorny question of a surgeon’s obligation to disclose to a patient that he or she was on call the prior evening and without an adequate amount of sleep, in someone’s opinion, to perform a scheduled elective procedure the following day.^{7,8} Our obligation is not only to teach our trainees how to recognize and self-assess their own capacity to deliver safe patient care but also to incorporate those principles in our own practice as well. I can recall only once canceling an elective surgical list when stricken with a gastrointestinal flu, but in the past 27 years of practice there have been many days when my emotional or physical health was less than 100%, and none when I chose to cancel scheduled office hours or an operating room list. To fully realize optimal patient safety, eliminating fatigue-related medical error and increasing awareness of subpar capacity to perform should extend to faculty in our teaching programs as well as active practitioners. Duty hours regulation for residents must be only the beginning.

The second essential element of an environment that will inform best practice in patient safety is *commitment*. Without physicians’ altruistic dedication to patient care, the quality of care delivered is in jeopardy of erosion. Duty

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hours guidelines mandate that the physician trainee must, in all but exceptional circumstances, leave the patient's bedside at the end of a predetermined shift while the faculty counterpart typically continues on with uninterrupted responsibility to the patient. Some "old school" physicians (present company excluded, of course) may consider the apparent ease with which residents abrogate responsibility at shift change an unintended negative consequence of duty hours limits. Such observations have led to the widely held notion that the guidelines have resulted in a "shift-worker" mentality and deterioration of the palpable commitment of young physicians. To be more specific, I believe that the majority of today's resident physicians enter the study of medicine possessing no less altruism and commitment than did their teachers. However, logging several years governed by duty hours guidelines "conditions" our trainees into accepting a mindset of shift work that has been legislated into being socially acceptable. Continuity of care has long been a hallmark of the dedicated physician in tending to the sick, but this principle is devalued by a singular focus on duty hours regulation in the name of patient safety. We are challenged to reconcile the fact that we desire a physician who possesses a selfless commitment to our well-being, yet we dismiss residents from service (often against their wishes) in support of a "zero tolerance" stance on violation of ACGME duty hours guidelines. Nasca⁹ has emphasized nurturing "the effacement of self-interest" in resident physicians, yet we are increasingly in the hypocritical position of rejecting the precise behavior that we seek to instill in our young trainees. The current situation of "do as I say, not as I do" is inconsistent with our professional mores and practice and creates an ethical quandary for both the medical educator and resident that is neither desirable nor sustainable.

The final issue is *competence*. Despite the physician's *capacity* to provide care and strong altruistic *commitment* to the well-being of the patient, without *competence* in the practice of medicine there can never be truly safe patient care. Our present medical education system is primarily time defined, rather than competency based, in its milestones and metrics for advancement. Within the

traditional calendar year framework, the hours available to attain proficiency in the practice of medicine have been progressively reduced in the name of eliminating fatigue-related error. This has occurred without concurrent consideration of the minimum period necessary to acquire the needed body of knowledge and requisite skills. Moreover, the concurrent evolution of an increasingly complex and technically based practice of medicine further aggravates the problem; as the time available for technical learning has diminished, the number and nature of such tasks requiring mastery have only increased. One example is the advent of minimally invasive surgery. Although arguably more technically demanding than an open cholecystectomy, at minimum the laparoscopic removal of a gallbladder through a few tiny incisions represents an additional task for the surgical trainee to learn. Surely, it remains important for the newly minted surgeon to know how to remove the gallbladder through a midline abdominal incision for that case when things go awry and the laparoscopic exercise becomes futile! This conundrum is most troubling in both medical and surgical disciplines where a technical craft must be mastered concurrent with acquisition of a supporting knowledge base in order to effectively practice clinical medicine. The fundamental question emerges as to whether the current duty hours restrictions provide sufficient time within the traditional calendar of residency education to reach the level of proficiency necessary to support the safe, independent practice of medicine.

The community of cognitive psychologists has advanced the concept that the expertise required to perform a particular technical task is not derived of innate talent but, rather, is largely acquired as the result of deliberate practice and specific feedback.^{10,11} Moreover, the ability to perform similar tasks is not generalizable from expertise with a related task; it requires specific practice and directed feedback of its own.¹² Ericsson et al¹³ have used the example of playing the violin with 10,000 hours of deliberate practice as the threshold for achieving expertise. Although it is important to acknowledge that the immediate goal of residency training may only be to achieve competence rather than expertise, it is

reasonable to believe that there is a minimum amount of practice time required to achieve a given level of proficiency. It is equally logical to assume that the amount of directed practice required to attain proficiency has not diminished over the past century as the contemporary practice of surgery has become more technologically complex. The most important question is whether the available hours for surgical education and technical training under the current duty hours guidelines allow sufficient time for acquisition of the requisite level of proficiency needed for safe and independent practice.

In considering this question, I offer my own surgical training for comparison and context. I completed 5 years of surgical residency in 1984 en route to a career in academic orthopaedics. During my 2 years as a general surgical resident, we took every other night or every third night in-house call; this approximates 3 call nights per week. We will assume a 6-day workweek with 1 day off each week (which did not regularly occur) and 15-hour days when not on call. During my 3 years as an orthopaedic resident, the rotations required every third night call for the first 2 years and every fifth night in the final year; this averages 2 call nights per week. The work hour math (Table 1) provides for 3 × 24-hour days and 3 × 15-hour days each week (117 hours per week) for the first 2 years in general surgery. The 3 orthopaedic years included a more structured 10-hour "educational" day on Saturday along with 2 × 24-hour and 3 × 15-hour days each week (103 hours per week). I have assumed 4 weeks of vacation each year in this equation, resulting in a 48-week work year. The difference between the current 80-hour workweek and my 5 years of residency would be 37 hours per week during the first 2 surgical years (3,552 hours) and 23 hours per week during the 3 years of orthopaedics (3,312 hours). In total, my residency provided an additional 6,684 hours of "opportunity" for education and service compared with 5 years under the current 80-hour-per-week guidelines. This equates to 572 twelve-hour workdays or 95.3 working weeks of 6 days each. With a 48-week work year, this differential amounts to roughly 2 years of surgical education that are "lost" to the current duty hours restrictions.

Table 1

Comparative Hours of Orthopaedic Surgical Residency Training by Postgraduate Years (PGYs), 1984 to 2011*

Residency component	1984	2011	Duty hours differential
General surgery (PGYs 1 and 2)			
Schedule	3 on-call nights per week + 3 no-call workdays	N/A	N/A
Hours worked	$(3 \times 24 \text{ h} = 72 \text{ h}) + (3 \times 15 \text{ h} = 45 \text{ h}) = \mathbf{117 \text{ h/wk}}$	80 h/wk	$117 \text{ h} - 80 \text{ h} = 37 \text{ h/wk} \times 48 \text{ wk} = 1,776 \text{ h/y} \times 2 \text{ y} = \mathbf{3,552 \text{ h}}$
Orthopaedics (PGYs 3–5)			
Schedule	2 on-call nights per week + 3 no-call workdays + 1 “education” Saturday	N/A	N/A
Hours worked	$(2 \times 24 \text{ h} = 48 \text{ h}) + (3 \times 15 \text{ h} = 45 \text{ h}) + (10 \text{ h}) = \mathbf{103 \text{ h/wk}}$	80 h/wk	$103 \text{ h} - 80 \text{ h} = 23 \text{ h/wk} \times 48 \text{ wk} = 1,104 \text{ h/y} \times 3 \text{ y} = \mathbf{3,312 \text{ h}}$
PGYs 1–5	$(117 \text{ h/wk} \times 48 \text{ wk}) \times 2 \text{ y} + (103 \text{ h/wk} \times 48 \text{ wk}) \times 3 \text{ y} = (11,232 \text{ h} + 14,832 \text{ h}) = \mathbf{26,064 \text{ h}}$	$(80 \text{ h/wk}) \times (48 \text{ wk}) \times (5 \text{ y}) = \mathbf{19,200 \text{ h}}$	$6,864 \text{ h}$ $/12 \text{ h/d} = \mathbf{572 \text{ workdays}}$ $/6 \text{ d/wk} = \mathbf{95.3 \text{ workweeks}}$ $/48 \text{ wk/y} = \mathbf{1.99 \text{ work years}}$

* Bold type indicates total hours worked; h, hour(s); wk, week(s); y, year(s).

Although it is impossible to clearly define the threshold number of hours required for technical competency in surgical residency—and, certainly, not every hour spent on call or in the hospital “in the old days” was a rich learning experience—it is disturbing to note that today’s five-year surgical training program would need to be extended by two years, or 40%, to provide the same number of hours as in the era before ACGME duty hours guidelines. Likewise, it is unreasonable to expect current residents to acquire the same level of competency in roughly one-third less time than did their teachers before duty hours restrictions. The logical conclusion is that graduates of contemporary surgical residency programs are not as accomplished, or confident, as their predecessors were when they completed residency training a couple of decades ago. At a minimum, this realization should prompt the accelerated evolution of our system of graduate medical education to one based on competency milestones for advancement, rather than being arbitrarily defined by a predetermined (and perhaps outdated) period of years. In addition, while we methodically evolve to a competency-driven structure, one must consider the immediate need of our current residents to attain a level of proficiency that will support independent and safe practice, requiring both a knowledge base and competency in a technical craft. This year, at the University of Maryland, we opted to increase our orthopaedic residency

program from five to six years with the addition of a terminal-year junior faculty appointment to provide greater experience and independence in surgical decision making in a supportive environment with diminishing, but readily available, supervision. Indeed, there is accumulating evidence that effective supervision (and teaching) is more important than duty hours alone in optimizing the educational experience, as well as patient safety.^{14,15} The old reference to quality over quantity quickly comes to mind.

Concurrently, we introduced a list of 10 basic technical skills essential to orthopaedic surgical practice that will become the object of “deliberate practice” for each resident. As stated by Ericsson and colleagues^{13,16} and embellished by Colvin,¹⁷ deliberate practice is a very focused activity that is specifically designed to improve performance, is easily and frequently repeated, provides real-time feedback, is highly demanding both technically and cognitively, and, simply put, is not much fun because it intentionally and repeatedly places the learner in a zone of discomfort where proficiency has not yet been achieved. Decades ago, rightly or wrongly, deliberate practice occurred in the patient care setting and during “down time” in the hospital, which has been all but eliminated by duty hours regulation. Surgical residents constantly carried a needle driver or clamp in a lab coat pocket to practice blind manipulation of

the instrument, and knots tied with spare suture around call room doorknobs were a common sight, to mention just a couple of examples. Today, limited in-hospital time does not afford the opportunity to practice such skills, and society, in the name of reducing medical error, is likewise less accepting of residents “practicing” such basic tasks on real patients. In our current environment, only after demonstrated mastery of the designated list of surgical skills in a nonpatient setting will the resident earn the privilege of active participation in surgical procedures in the operating room. Certainly, it would prompt some debate to speculate how many surgeons achieve true mastery and demonstrate expertise during their residency at the level of a concert violinist after logging the symbolic 10,000 hours. Nevertheless, at a minimum, the inculcation of the habits of deliberate practice into the professional career of a surgical trainee, who must embrace the notion of lifelong learning, effectively implements the spirit of the six competencies of the ACGME. Interestingly, these changes in our residency program produced a matched class that filled as high on our list as any year in the prior decade, suggesting that there are at least some aspiring surgeon—students who share our concern about the direction that surgical residency education is taking under duty hours regulation in the absence of a supportive and complementary competency-based system.

Prioritizing patient safety is our obligation as medical practitioners and educators. This imperative requires thoughtful consideration of a constellation of contributing factors. To focus on one small piece of the puzzle, by regulating trainee duty hours in the hopes that eliminating fatigue-related medical error will alone improve patient safety, is short-sighted at best—a proverbial triumph of hope over reason. Nevertheless, duty hours guidelines represent an important first step in the quest for the holy grail of patient safety. They must now be quickly augmented by attention to other components of capacity, commitment, and competency that contribute to patient safety. Among other things, for at least the surgical community, this will require unabashed acknowledgment that safe, independent practice requires the demonstration of competence in technical surgical skills as well as the acquisition of a supporting fund of knowledge. We cannot suddenly expect these milestones to be attained in substantially fewer hours than previously accomplished. Therefore, we must anticipate that the current duty hours guidelines will result in the extension of some, if not many, surgical residency programs until such time as the fourth year of medical school can at least partially contribute to the goal of earlier specialty education. If 10,000 hours of deliberate practice are prerequisite to attaining expertise in performing technical tasks, the sooner we assist our residents in accumulating enough hours to reach expert proficiency, the better physicians and surgeons they will be—and the safer our patients, and we, will be.

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