

Great Expectations: Should We Anticipate That Changes in Work Hour Standards Will Impact Health Care Outcomes?

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Since 2003, the Accreditation Council for Graduate Medical Education (ACGME) has defined the standards for maximum permissible work hours for residents in its Common Program Requirements. Although these standards are only one component of the section that pertains to the learning and working environment, they are among the most controversial, and often the subject of intense debate in the educational community and public sector. These requirements underwent significant revisions in 2011 and again in 2017.^{1,2} The revisions, guided by consensus of medical education experts, public opinion, and research, were undertaken despite uncertainty regarding their effects. Thus, research that informs us of the impact of these requirements, particularly as it relates to patient safety or the educational experience of our residents, is important to help guide future iterations of these standards.

In this issue of the *Journal of Graduate Medical Education*, Eid and colleagues³ report trends in in-hospital mortality and cost in a 4-year period centered on the 2011 revision of the learning and working environment requirements. In this retrospective cohort study, the authors utilized the Agency for Healthcare Research and Quality Healthcare Cost and Utilization Project–National Inpatient Sample (HCUP-NIS) database to track trends in their primary outcome measures in the 2 years before and after the 2011 revisions; data from nonteaching hospitals served as a control group for teaching hospital data. The authors report no differences in hospital mortality or length of stay between groups, and a very small change toward lower cost in teaching hospitals after the revisions. In addition to the use of a nonteaching hospital control group, a strength of this study is its large sample size and potential power to detect small changes in these measures.

The authors acknowledge several important limitations to this study, such as the complexity of defining a “teaching hospital,” the inherent differences in teaching versus nonteaching hospitals as they

relate to the appropriateness of using nonteaching hospitals as a control, and potential variables that were not assessed and would be expected to have a significant impact on the measured outcomes. Additional limitations of this study include the inability to assess compliance with the ACGME requirements, the lack of data on medical errors, and the potential effect of changes to the HCUP-NIS sample design in 2012.

In order to assess the relevance of this and other similar studies, it is important to understand first what changed in the 2011 revisions. With regard to the duty hour standards, there were no changes to the 80-hour weekly limit, every third night call limit, and 1 day off in 7 rule. There were modest changes to the “shift” rules for postgraduate year 2 (PGY-2) and above: “24 + 6” became “24 + 4,” and rules around time off between shifts became more nuanced (from 10 hours to 8 to 14 hours, depending on the preceding shift). The most significant change, in terms of its effects on teaching service structure and controversy in the medical and public domains, was the new limit of 16-hour maximum shifts for PGY-1 residents.

Importantly, the 2011 revisions to Section VI of the ACGME Common Program Requirements included not only duty hour standards but also a large number of new requirements pertaining to patient safety, supervision, transitions of care, professionalism, and recognition of fatigue. Arguably, these non-duty hour requirements have great potential to improve patient safety and the learning environment, but these effects are inherently difficult to measure; thus, studies often focus on the duty hour requirements alone. Potential outcomes related to the changes have not been studied. This includes whether the changes affected resident learning, well-being, and the learning environment. The critical issue of whether these non-duty hour changes prepare residents to deliver higher-quality care after graduation also has not yet been addressed.

It is probable that meaningful implementation of these requirements may take several years of trial and error as programs move toward improvement. During

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the time period examined in this study, changes required by the 2011 modifications were just being implemented and socialized. The culture of medicine changes slowly, and it is likely that many programs were not fully compliant during this study period. It may take more time before the effects of changes in the ACGME Common Program Requirements can be fully realized. Thus, changes to variables such as mortality may not be a reasonable expectation in the initial stages of implementation.

Therefore, it is important to consider what other outcomes, like quality of care or care process measures, may be important in assessing the impact of these program requirements. The failure of this study, despite the large sample size, and other studies to find differences in mortality following the program requirement changes contrasts dramatically with experimental studies of medical errors that occur during sleep deprivation.⁴⁻⁶ These studies have generally found significant degradation in the ability of residents to perform under sleep-deprived and repeated extended shift conditions. This lack of alignment in study findings may result from several factors. First, the experimental and directly observational studies examine the performance of individuals, whereas this study and others like it are examining the performance of a system of care. This system includes a coordinated team comprised of residents, nursing staff, pharmacists, and others who have a responsibility to prevent errors, arising at any level of care, from reaching the patient. Furthermore, resident inpatient practice is conducted in a setting in which patient safety is safeguarded by supervision of their care by senior residents and attending physicians. It is certainly plausible that deleterious effects on individuals will not translate to adverse outcomes at a system level. Secondly, medical errors do not usually result in mortality, the measure used in this study, or even in significant morbidity. Additionally, comparing mortality between hospitals and over time is fraught with complications. Thus, assessing medical errors, and other adverse outcomes less severe than mortality, may be more helpful than mortality to assess the impact of these requirements. It has been reported, for example, that the increased number of handoffs required by duty hour restrictions may have increased the likelihood of errors. It is possible that a reduction in errors from reduced shift length and an increase in errors from increased handoffs might offset each other. This would be important information to further our understanding of the effect of these requirements.

An interesting related aspect is the discussion regarding whether rigorous work schedules are necessary to prepare residents for the circumstances they will encounter in practice. Some practice settings

inevitably require physicians to perform when they are fatigued and sleep deprived, such as in situations of limited physician personnel, prolonged surgeries, and unpredictable emergencies. There is no evidence, as yet, that cognitive resilience to sleep deprivation and/or fatigue develops during residency. However, it has been established that subsets of the population are, respectively, very vulnerable or very resilient to sleep deprivation.⁷ Whether resilient individuals self-select for certain specialties is unknown, but it is now possible to identify resilient and vulnerable individuals.⁷ This raises the question of whether determination of resiliency and vulnerability to sleep deprivation should be used to guide students toward certain specialties, which would raise interesting ethical and practical questions for medical schools, residency programs, and health systems. As long as society accepts the fact that practicing physicians are not subject to work hour limits, questions will remain regarding whether more limited work hour standards should be implemented in the graduate medical education environment.

In summary, although the study by Eid and colleagues³ did not demonstrate that duty hour revisions have a significant impact on mortality or length of stay, the results are not unexpected and are aligned with existing literature that has shown no clear impact on patient safety from these regulations.

Where should the profession, responsible for its own self-regulation, go from here? Perhaps prospective studies of more radical interventions are warranted before considering further changes to the work hour standards, to ensure that any potentially disruptive changes are made based on sound evidence. These may include significantly reduced weekly work hour limits, well-defined strategies to control workload, or novel paradigms to enhance supervision in training programs. Exploration of alternative training paradigms that permit a much better work-life balance, or that truly change the culture of medicine to restore the humanism and “joy of curiosity, problem solving, intellectual rigor, and discovery,”⁸ may be worthy of study as well. Strategies that focus on identifying fatigue and poor performance, perhaps using objective technology-based methods and linking to a focus on professionalism, may also be effective. Conducting these or similar investigations, even on a small scale, will cost money, will be logistically challenging, and will require mechanisms to safeguard clinical care and resident education. Perhaps the time has come to stop trying to determine whether small changes to work hour standards lead to big results and, rather, to try something bold so that we can be more certain about the direction of future requirements.

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