PERSPECTIVE

Duty Hour Reform in a Shifting Medical Landscape

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The circumstances that led to the death of Libby Zion in 1984 prompted national discussions about the impact of resident fatigue on patient outcomes. Nearly 30 years later, national duty hour reforms largely motivated by patient safety concerns have demonstrated a negligible impact of duty hour reductions on patient mortality. We suggest that the lack of an impact of duty hour reforms on patient mortality is due to a different medical landscape today than existed in 1984. Improvements in quality of care made possible by computerized order entry, automated medication checks, inpatient pharmacists, and increased resident supervision have, among other systemic changes, diminished the adverse impact that resident fatigue is able to have on patient outcomes. Given this new medical landscape, advocacy towards current and future duty hour reforms may be best justified by evidence of the impact of duty hour reform on resident wellbeing, education, and burnout.

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The circumstances that led to the death of Libby Zion in 1984 brought to the national forefront discussions about the impact of resident fatigue on patient outcomes. Nearly 20 years later, resident duty hour reforms largely motivated by these concerns were implemented nationally. Somewhat surprisingly, these reforms demonstrated a negligible impact of duty hour reductions on inpatient mortality,^{1,2} raising the question of whether duty hour reforms had served their purpose. In this perspective, we argue that, although important, the impact of long duty hours on patient outcomes may be less relevant today for graduate medical education policy than the impact of long hours on resident well-being, education, and burnout. The primary reason for this shifting justification is that the medical landscape which characterized Libby Zion's death is substantially different today.

Many of the circumstances that contributed to Libby Zion's tragic death in 1984 would be averted by systemic changes in medicine and the nature of hospital care over the

last three decades. Computerized order entry systems^{3,4} and 24-hour inpatient pharmacists^{5,6} available today may have caught the putative drug interaction that caused the serotonin syndrome leading to Ms. Zion's death. Increased attending supervision of residents^{7,8} may have prevented the errors of diagnosis and prescribing. Physician awareness of life threatening medication interactions associated with MAO inhibitors is also greater today than it was then. Finally, the complex risk profile of this class of medications, and emergence of safer alternatives, has virtually eliminated their use by psychiatrists.

If duty hour restrictions were implemented in 1984, they might well have reduced resident fatigue and averted Libby Zion's death, but enhanced physician knowledge and safeguards in existence today may equally have averted the tragedy, even without work hour restrictions. More generally, a limited (if any) impact of duty hour restrictions and reduced resident fatigue on patient outcomes should be expected with today's medical landscape. In fact, the difficulty of recent studies to statistically control for systemic improvements in medical care may explain the absence of a patient mortality benefit associated with the 2003 duty hour reforms.^{1,2} It remains unknown whether these studies would have found a different impact of duty hour restrictions if they occurred in 1984.

A helpful analogy for understanding the shifting role of duty hour limits in impacting patient outcomes is the evolution of data for early administration of beta-blockers in acute myocardial infarction (AMI). Data from the 1980s demonstrated a clear benefit to early administration of beta blockers in AMI in an era prior to routine revascularization.^{9,10} However, in 2005, the largest randomized trial on the question showed no net benefit of early beta blockers,¹¹ perhaps due to the diminished effectiveness of these medications once adequate coronary revascularization had occurred. An improvement in one area of medical care—early percutaneous coronary intervention—raised the possibility that an established treatment may no longer be as beneficial as expected. Returning to the shifting impact of duty hour restrictions, changes in the 'safety net' of inpatient medicine may eliminate the adverse effect of resident fatigue on patient outcomes.

Outside of health care, the importance of shifting landscapes is apparent in the evolution of speed limits in

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the U.S. The rapid rise of automobile fatalities in the 1950s and 1960s led to debates regarding the potential benefits of reduced speed limits on U.S. roads. In response to the 1973 oil crisis, Congress limited all U.S. motorway speeds to 55 miles per hour, in an effort to improve fuel efficiency. During the years the limit existed, countless concurrent safety innovations were advanced, primarily those for cars themselves. Economic analyses of the impact of federal legislation on safety reached discordant conclusions, some showing little to no independent benefit of lower speeds,¹² while others suggested a small benefit.¹³ When it comes to strict speed limits, both conclusions may be true—they may have saved lives in 1950, but make less sense with today's transportation infrastructure.

As suggested by both of these examples, the impact of duty hour restrictions and resident fatigue on patient outcomes cannot be considered in isolation of the medical landscape in which those changes are implemented. Countless interactions between systems designed to deliver high quality patient care make the role of the resident physician but one piece in a larger machinery that determines any given patient's outcome, and the machinery is evolving over time. Patients cared for in hospitals without electronic medical records, computerized order entry systems, or significant physician supervision may be differentially impacted by physician fatigue compared to patients cared for in hospitals with a more substantial safety net. Duty hour restrictions that may be needed in some hospitals or some specialties to optimize patient outcomes may not be needed in others.

The limited role of duty hour restrictions in improving patient outcomes in today's medical landscape raises the question of whether future graduate medical education policy should instead rely more heavily on the impact of duty hour reforms on resident well-being, education, and burnout. Interestingly, resident surveys support the claim that duty hour limitations in 2003 have improved resident well-being, but show discordant views regarding impressions of resident education and patient safety.^{14,15} Self-reported rates of resident physician burnout and fatigue may also not have improved after implementation of work hour changes.¹⁶ Such findings seem discordant among themselves, and against those of other health care providers; for instance, among nurses there is a strong, consistent relationship between length of shift, fatigue and burnout.¹⁷ Some adjudicate the uncertainty regarding the emotional benefits to physicians by noting that lengthier shifts are associated with greater needle stick injuries and car accidents among physicians;¹⁸ as such, these writers consider duty hour limits a moral concern.¹⁹ Perhaps not surprisingly, duty hour reforms implemented in 2011 and those forthcoming specifically emphasize the need to restructure duty hours to improve well-being and educa-

tional opportunities of residents.²⁰ Some have called for flexibility^{21,22} in duty hour limits to permit research exploring how best to promote work hour changes. Such exceptions are almost certainly needed to provide more clarity as to what duty hour arrangements optimize resident quality of life, education, and professional competence. Nevertheless, despite such exceptions, work hour limits are largely here to stay.²¹

There will never be an easy answer to the question of whether duty hours should be restricted. The harm to patients of long resident work hours is likely mitigated by secular improvements in health systems, suggesting that future decisions about duty hour reform should rely more heavily on emerging data about physician well-being rather than data on adverse patient outcomes which are unlikely to materialize.²³ An impact on mortality is definitive for so many medical interventions, but for duty hours, patient outcomes may be inadequate as our sole guiding motivation for reform. We should instead evaluate duty hour policies by their ability to optimize resident well-being while ensuring adequate education and training for a career of independent practice.

Conflict of Interest: The authors declare that they do not have any conflicts of interest.

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