

Kevin G. Volpp, MD, PhD

*LDI Senior Fellow,
Assistant Professor of Medicine and
Health Care Systems
The University of Pennsylvania*

Jeffrey H. Silber, MD, PhD

*LDI Senior Fellow,
Professor of Pediatrics, Anesthesiology and
Critical Care, and Health Care Systems
The University of Pennsylvania
Director, Center for Outcomes Research
The Children's Hospital of Philadelphia*

A Wake-Up Call: Quality of Care After Resident Duty Hour Reform

Editor's note: On first glance, it seems self-evident: sleep-deprived physicians-in-training (residents) are more likely to make mistakes that could harm patients. Like pilots and truck drivers, these new physicians might need restrictions on how much they work. Such restrictions were created in 2003, but the impact of these new rules is unclear. Are patients any safer? Is hospital care more fragmented? Who's doing the work that residents performed prior to duty hour reform? This Issue Brief summarizes several studies that offer evidence about the impact of these regulations on patient mortality, as well as on residents' perceptions of the effects on quality of care, medical education, and residents' quality of life.

Since 2003, physicians-in-training may work no more than 80 hours per week

In response to concerns about the numbers of hospitalized patients dying from medical errors, the Accreditation Council for Graduate Medical Education (ACGME) instituted restrictions on the hours physicians-in-training can work, effective July 2003. These regulations represent arguably the largest national effort ever undertaken to reduce medical errors in teaching hospitals.

- The ACGME rules require that, when averaged over four weeks, residents must work no more than 80 hours per week and must have one day in seven free. Residents may not work more than 24 continuous hours, though they are allowed an additional six hours for education and transfer of care. They must have in-house call no more frequently than every third night and have at least 10 hours off between duty periods.
- Controversy remains over whether the duty hour rules benefit patient care, adversely affect patient care and physician training, or do not go far enough in limiting work hours. A necessary byproduct of the reform has been an increase in the number of handoffs between residents, which has led to concerns about discontinuity of patient care. If reduced work shifts do reduce sleep deprivation and improve the quality of care, it is not clear whether further reductions in work hours would further improve quality, as there is no firm scientific basis for the duty hour standards as currently designed.

New studies investigate the effect of duty hour reform on patient mortality

To shed light on the impact of the ACGME duty hour reforms, Volpp, Silber, and colleagues conducted complementary studies in two patient populations: Medicare beneficiaries in acute care, non-federal hospitals, and patients in Veterans Affairs (VA) hospitals. The VA system is the single largest provider of residency education in the U.S.

- In both studies, investigators used data from July 2000 to July 2005 to compare risk-adjusted mortality rates pre- and post-duty hour reform. They measured mortality within 30 days of hospital admission in patients with a principal diagnosis of heart attack, heart failure, gastrointestinal bleeding, stroke, or a diagnosis related to general, orthopedic, or vascular surgery.
- They compared changes over time between more intensive teaching hospitals and less intensive teaching or non-teaching hospitals. They assessed whether mortality improved differentially following implementation of the duty hour reform, which primarily affected more intensive teaching hospitals.
- The comparison with less intensive teaching hospitals allowed the investigators to control for technological improvements in care, changes in market conditions, and Medicare-specific initiatives such as pay-for-performance.

Resident duty hour reform was not associated with changes in mortality for Medicare patients in the first two years of implementation

Volpp, Silber, and colleagues analyzed data from more than 8.5 million Medicare patients admitted to 3321 hospitals across the country. They adjusted for differences in patients' age, gender, comorbidities, and hospital site.

- About 69% of the hospitals were non-teaching (treating 51% of patients) and about 9% were major teaching hospitals (treating 14% of patients).
- Compared to the two years before duty hour reform was implemented, patients in more intensive teaching hospitals post-reform were no more or less likely to die within 30 days than patients in less intensive or non-teaching hospitals.
- The only condition for which there was a relative increase in mortality post-reform in teaching hospitals was stroke, but this trend began before the onset of duty hour reform.

In the VA, resident duty hour reform was associated with improved mortality in medical patients, but not surgical patients

The results were somewhat different when the investigators analyzed the effects of duty hour reform in VA hospitals. That study included more than 300,000 patients from 131 VA hospitals.

- VA hospitals were teaching-intensive, with about 85% being teaching hospitals and more than 50% being major teaching hospitals.
 - After adjusting for baseline differences, the investigators found significant differences for medical patients in more vs. less intensive teaching hospitals by post-reform year 2 (2004-2005). For example, the odds of surviving for a patient admitted with heart attack or the other medical conditions in post-reform year 2 improved 17% more in major teaching hospitals than in non-teaching hospitals. No comparable change in mortality was observed for surgical patients.
-

-
- The investigators considered several explanations for the differences in the Medicare and VA studies. VA teaching hospitals are more teaching-intensive than non-VA teaching hospitals, thereby amplifying the effects of resident work hour reform. Differences in autonomy for residents or in staffing models or clinical volume might also account for the differing results, as could unmeasured changes that occurred in teaching VA hospitals only.

Residents report that reduced fatigue-related errors have been offset by errors related to discontinuity of care

Another way to assess the impact of work regulations is to ask the residents themselves, especially those who experienced residency both before and after duty hour reform. In 2005, a team led by Myers and Volpp surveyed 200 residents at six residency programs (three internal medicine, three general surgery) at five academic medical centers. The survey asked about residents' perceptions about the impact on quality of patient care, residency education, and the residents' quality of life. The response rate was 80% (159 residents).

- The average number of sleep hours in the previous week was 45.9, just slightly greater than the American Academy of Sleep Medicine's cutoff for chronic sleep deprivation, which is 42 hours. It is notable that 27% of residents in the study reported sleeping less than 42 hours, and thus, by definition, were still sleep-deprived even after duty hour reform.
- Residents reported that fatigue-related errors decreased slightly, but errors related to reduced continuity of care significantly increased.
- It is possible that the quality of the medical educational experience declined. Residents reported somewhat decreased opportunities for formal learning, bedside education, and procedures.
- Residents, particularly surgical trainees, reported improvements in their quality of life and reduced burnout because of the restrictions on work hours.

POLICY IMPLICATIONS

These studies indicate that the net effects of resident duty hour reform remain unclear. It is clear that the restrictions did not increase patient mortality, and it appears that only within VA hospitals was there a possible benefit in terms of decreased mortality.

- Given the lack of evidence on adverse patient outcomes, it is likely that the duty hour restrictions for residents are here to stay, given concerns about the relationship between sleep deprivation and cognitive performance and resident quality of life. The days of 100-hour work weeks for physicians-in-training are likely over. The United States has lagged behind reforms in Europe, where residents are allowed to work no more than 56 hours per week, and by 2009, no more than 48 hours per week.
- As the resident survey indicates, the work rules may have had an effect on outcomes other than mortality. Quantifying the degree to which the regulations affected discontinuity of care, other patient safety measures, resident work intensity and education, and hospital costs should be a focus of future research.

Continued on back.

POLICY IMPLICATIONS

Continued

- These studies did not address whether the current design of work rules is optimal, as other studies have found lower rates of errors with 16-hour vs. 24-36 hours shifts. Further research should examine different approaches to duty hour design, as well as different hospital efforts to realign care in response to duty hour reform.

This Issue Brief is based on the following articles: K.G. Volpp, A.K. Rosen, P.R. Rosenbaum, P.S. Romano, O. Even-Shoshan, A. Canamucio, L. Bellini, T. Behringer, J.H. Silber. Mortality among patients in VA hospitals in the first 2 years following ACGME resident duty hour reform. JAMA, September 5, 2007, vol. 298, pp. 984-992; K.G. Volpp, A.K. Rosen, P.R. Rosenbaum, P.S. Romano, O. Even-Shoshan, Y. Wang, L. Bellini, T. Behringer, J.H. Silber. Mortality among hospitalized Medicare beneficiaries in the first 2 years following ACGME resident duty hour reform. JAMA, September 5, 2007, vol. 298, pp. 975-983; J.S. Myers, L.M. Bellini, J.B. Morris, D. Graham, J. Katz, J.R. Potts, C. Weiner, K.G. Volpp. Internal medicine and general surgery residents, attitudes about the ACGME duty hours regulations: a multicenter study. Academic Medicine, December 2006, vol. 81, pp. 1052-1058.

*Published by the Leonard Davis Institute of Health Economics, University of Pennsylvania, 3641 Locust Walk, Philadelphia, PA 19104-6218.
Janet Weiner, MPH, Associate Director for Health Policy, Editor (215-573-9374)
David A. Asch, MD, MBA, Executive Director*

Visit us on the web at www.upenn.edu/ldi

Welcome to the new look of the Issue Brief. Same great content. Also this year, we will introduce an occasional supplement to our series, called "Clinical Briefs," which will have special relevance to basic science, clinical, and biotechnology audiences.

Issue Briefs synthesize the results of research by LDI's Senior Fellows, a consortium of Penn scholars studying medical, economic, and social and ethical issues that influence how health care is organized, financed, managed, and delivered in the United States and internationally. The LDI is a cooperative venture among Penn schools including Dental Medicine, Medicine, Nursing and Wharton, and the Children's Hospital of Philadelphia. For additional information on this or other Issue Briefs, contact Janet Weiner (e-mail: weinerja@mail.med.upenn.edu; 215-573-9374).

© 2007 Leonard Davis Institute

Published by the
Leonard Davis Institute
of Health Economics
University of Pennsylvania

Issue Brief



3641 Locust Walk
Philadelphia, PA 19104-6218
215.898.5611
fax 215.898.0229
ADDRESS CORRECTION REQUESTED

Nonprofit Organization
U.S. Postage
PAID
Permit No. 2563
Philadelphia, PA 19104