

Physician Extenders Impact Trauma Systems

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Background: The implementation of revised surgical resident work hours has led many teaching hospitals to integrate health care extenders into the trauma service. We undertook this review to assess the effectiveness of these individuals in meeting the goals of the work hour restrictions and whether they impact other hospital and patient outcomes.

Methods: During the year 2002, we integrated two nurse practitioners into the trauma service of a teaching hospital. We prospectively collected data a year before (2001), during (2002), and a year after

(2003) the integration that included number of admissions, hospital length of stay, intensive care stay, floor length of stay, mortality, direct cost per case, and weekly resident work hours on 44 residents at all levels.

Results: After the incorporation of physician extenders, we observed statistically significant reductions in floor, intensive care unit, and overall hospital lengths of stay. Patient mortality and cost per patient remained unchanged. Furthermore, we were able to obtain compliance with the Accreditation Council for Graduate Medical Education requirements for resi-

dency work hour limitations, as the average number of hours worked per resident on the trauma service decreased from 86 hours to 79 hours per week.

Conclusion: As graduate medical education becomes ever more regulated, physician extenders can be successfully integrated into busy academic Level I trauma centers. This integration positively impacts patient flow and resident work hours without altering patient outcomes or direct hospital cost.

Key Words: Resident work hours, Nurse practitioners.

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Libby Zion, a 19-year-old college student, was admitted to the New York Hospital–Cornell Medical Center Emergency Department on March 4, 1984, suffering from fever and agitation. By the following morning, she was dead, the alleged result of a medical error. Little did anyone expect that this would become the inciting event for medical education reform in the United States. A contributing factor in her death was the administration of meperidine in combination with Nardil, a monoamine oxidase inhibitor ordered by an on-call resident. Libby's father, Sidney Zion, a former federal prosecutor and journalist for *The New York Times*, filed suit against the hospital, the residents, and the attending physician responsible for her care that evening. Although a grand jury failed to bring criminal indictments against either the hospital or the physicians in 1985, the ramifications from this event were hardly over.¹

In 1985, the New York State Health Commission established a committee, chaired by Dr. Bertrand Bell, and given the responsibility of investigating the conditions of medical education at the state's teaching facilities. On review, the

New York Board of Regents ultimately determined that those involved with Ms. Zion's care were grossly negligent and expressed their belief that excessive resident work hours played a causal role in death of Ms. Zion.²

The commission concluded that residents were working excessive hours with inadequate attending physician supervision. These findings, combined with the growing national opinion that resident fatigue jeopardizes patient safety, prompted the commission to take action.

The recommendations of the Bell Commission became law in 1989 as part of the New York State Health Code (Title 10, Section 405.4) mandating that residents work no more than 80 hours per week, with no longer than 24 hours on call, and a mandatory 24-hour period off duty each week. The commission cited as its goals improvement in the quality of life for residents with increased supervision by attending physicians and, ultimately, better patient care.³

A series of inspections conducted in 1998 at 12 different hospitals in New York propelled the issue to the forefront once again. It was discovered that each of these institutions consistently violated the regulations outlined by the Bell Commission. As a result, the New York Health Care Reform Act 2000 outlined new compliance requirements and stricter penalties for noncompliance.² However, when the Occupational Safety and Health Administration threatened federal regulation in 2000, the Accreditation Council for Graduate Medical Education (ACGME) chose to act. On July 1, 2003, the ACGME implemented mandatory requirements limiting resident work hours to 80 hours per week and cited the following goals: more time for sleep and study, improvement in examination scores, and increased personal time. Part and parcel of this change was also the realization that an adverse

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attitude about such duty hours had promoted the deterrence of domestic medical school graduates away from surgical careers for years. Medical educators were forced to modify their systems to fulfill these requirements while maintaining resident education and patient care. Concerns arose about the continuity of patient care and the evolution of shift-type work schedules and night float systems with frequent “sign-outs” and “hand-offs.”² More importantly, concerns emerged about the impact on the overall quality of patient care. Many educators feared an increase in medical errors with neglected follow-up on diagnostic tests, radiographs, and duties. How would they maximize resident education and maintain commitment to the total care of patients in an era of work hour limitations?

The implementation of surgical resident work hours prompted many teaching hospitals to further integrate health care extenders into their trauma services. Although both Miller et al.⁴ and Oswanski et al.⁵ previously demonstrated the efficacy of physician extenders on trauma services, their effect in conjunction with surgical residents on patient care and resident work hours has not yet been reported. We undertook this review to assess the effectiveness of these individuals in meeting the goals of the work hour restrictions and whether they impact hospital course and patient outcome at an academic Level I trauma center.

PATIENTS AND METHODS

During 2001, 2002, and 2003, we prospectively collected data regarding the number of patients admitted to the trauma service, along with hospital length of stay, intensive care stay, floor length of stay, mortality, and direct cost per patient. In 2002, we began mandatory tracking of resident hours. Residents were instructed, at various times of the year, to accurately record their work hours per day in 2-week increments. In July 2002, we integrated two nurse practitioners into the trauma service. To assess the impact of the nurse practitioners on the trauma service, we compared patient throughput, outcome, and resident work hours. Student's *t* test and χ^2 were used for statistical analysis. A value of $p < 0.05$ was significant and data were expressed as mean \pm SD or as a percentage.

RESULTS

After the incorporation of nurse practitioners, we observed a statistically significant shorter floor length of stay, intensive care unit length of stay, and total hospital length of stay. Patient mortality remained unchanged (Fig. 1). Furthermore, the number of hospital admissions remained constant and there was no change in the cost per patient (Fig. 2).

Before the incorporation of the physician extenders, we speculate that those resident work hours on the trauma service averaged greater than 90 hours per week. During 2002, residents on the trauma service worked an average of 86 hours per week. This was significantly reduced to 79 hours per week in 2003 after the integration of two nurse practitioners

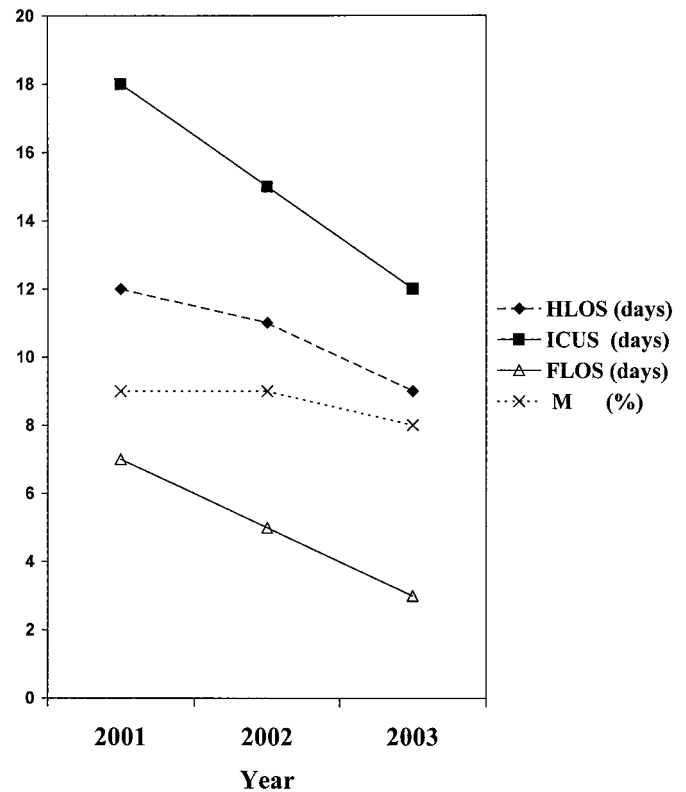


Fig. 1. Length of stay (days)/mortality (percentage).

(Fig. 3), and current data suggest that further small reductions have occurred.

DISCUSSION

Physician assistants have been used since the 1960s to supplement the capabilities of primary care physicians, to meet deficiencies in physician maldistribution, and to assist in the control of health care costs.⁴ In July 2002, we inte-

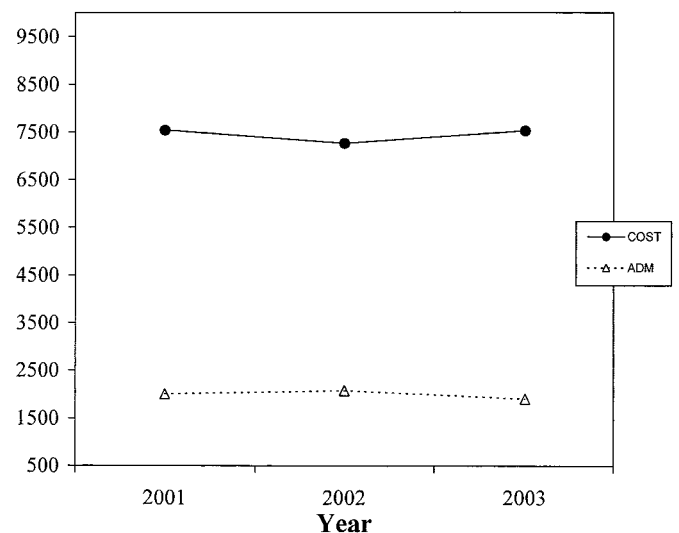


Fig. 2. Admissions and costs (in dollars).

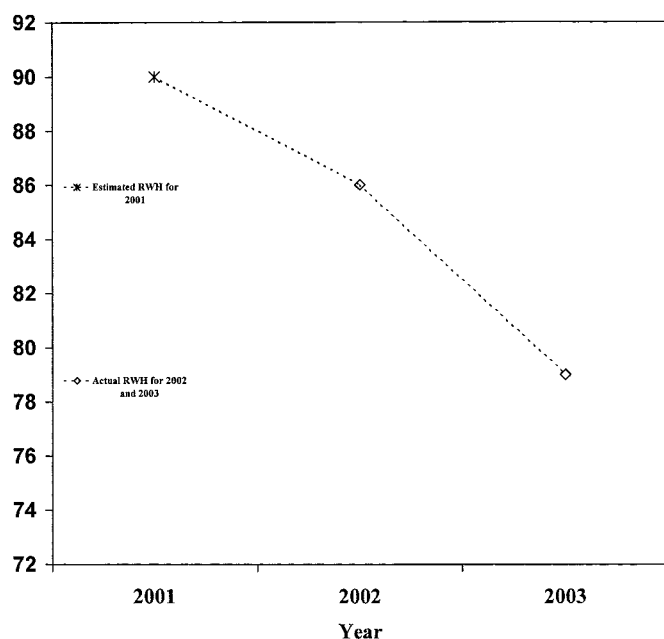


Fig. 3. Average number of hours worked per week.

grated two nurse practitioners into the trauma service. The functions of the nurse practitioners include writing daily progress notes; evaluating laboratory work and radiographic studies; and conducting liaison activities among patients, families, nurses, and physicians. They also play an integral role in discharge management and coordination of follow-up care.

Integration of care extenders into our trauma service significantly reduced total hospital length of stay and resident work hours without adversely effecting mortality. The physician extenders expedited patient dispositions, as both floor and hospital length of stay significantly decreased after their incorporation. This further translates into shorter intensive care unit stays, as patients were downgraded more promptly because of an increased availability of floor beds. Similar findings were reported by Miller et al. in 1998 after the incorporation of physician assistants in place of residents. They reported a 13% decrease in total hospital length of stay, a 20% decrease in transfer time to the floor, and a 33% decrease in the length of stay for their neurotrauma intensive care unit.⁴ We speculate that physician extenders promote patient flow for multiple reasons. First, they are more readily available to patients, discharge planners, and social services coordinators. Although residents and attending staff may be away from the hospital during postcall days, the physician extenders remain available every weekday. As a result, they promptly address social, family, and other patient care issues that arise during the absence of the resident members of the primary team. Although the practitioners are not available on weekends, we propose this has little effect on patient flow, as most rehabilitation centers and nursing homes will not accept transfers during weekends.

The implementation of resident work hour restrictions raised many concerns about the impact on the quality of patient care. Many academic medical centers adopted a system of night float services with frequent hand-offs and sign-outs. The transfer of patient care among services breeds an environment prone to medical errors, as duties and diagnostic studies may be easily overlooked. The presence of the nurse practitioners involved in the daily care of our patients provides a source of partial protection against these errors. They remain available to review laboratory tests, radiographs, and other diagnostic studies when their respective trauma teams are away from the hospital. Furthermore, they provide continuity of care and a point of contact for our trauma patients in a system in which residents rotate on a monthly basis. In this study, we observed a slightly lower mortality rate after the incorporation of our physician extenders (8% in 2003 compared with 9% in 2001 and 2002), although this was not statistically significant.

Before the work hour restrictions imposed by the ACGME in 2003, the surgery residents on our trauma service certainly worked well in excess of 90 hours per week. When the ACGME announced its intent to limit resident work hours in June 2002, we were voluntarily reevaluated and restructured our trauma service to achieve compliance with these requirements a year in advance. During the transition year (2002), our residents averaged 86 hours per week. However, in 2003, we were able to meet the ACGME specifications, as trauma residents reported an average of 79 hours per week. The presence of our nurse practitioners certainly contributed to this achievement. A recent study conducted by Brasel et al. estimated that residents spent as much as 17 hours per week in noneducational activities, such as searching for radiographs, coordinating care, and completing paperwork associated with patient dispositions.⁶ The presence of two nurse practitioners, each at 50 hours per week, has greatly reduced the time spent by residents in these activities. Furthermore, our study shows that the daily presence of these practitioners provides for more efficient patient flow while maintaining their quality of care. Some may contend that decreased hospital stays are now the norm in the era of managed care, but clearly this is in no way a novel concept that would interfere with this study.

Finally, the addition of two nurse practitioners to the trauma service at a cost of \$135,580, exclusive of benefits, did not increase the direct cost per patient. As the number of uninsured patients grows and reimbursement decreases, we must optimize the management of our available funds. Furthermore, in an era of rising health care costs and diminishing resources for education, this presents a significant achievement and model for academic trauma centers.

Like all clinical studies, this too presents flaws. Because of the regional nature and volatility of the current health care market, this is a single-institutional study that has no possibility of prospective multi-institutional analysis. Second, because of the recent implementation of resident work hour

restrictions, only 2 years of prospective data are available for analysis. However, preliminary data for 2004 indicate a further overall decrease in resident work hours at this institution. Also, we acknowledge that mortality is, by no means, an ideal method for the quantification of patient care. The analysis of mortality alone excludes complications and provides no true assessment of medical errors.

The implementation of resident work hour restrictions in July 2003 stimulated the reformation of residency training programs in the United States. Most programs adopted night float systems, consolidated their residents, or added ancillary staff to achieve compliance. We chose the latter for our trauma service, with better-than-anticipated results. Also, it appears that surgical specialty areas have become more attractive to our domestic medical graduates. This study shows that as graduate medical education becomes more regulated, nurse practitioners can be successfully integrated into busy academic Level I trauma centers. This integration positively

impacts patient flow and resident work hours without adversely altering patient outcomes or direct hospital costs.

REFERENCES

1. Kohman LJ. "Beat the clock": Will there be time in the new millennium to train surgeons and care for patients? [The Cardiothoracic Surgery Network]. June 4, 2002. Available at: <http://www.ctsnet.org/doc/5821>. Accessed September 8, 2004.
2. Whang EE, Mello MM, Ashley SW, et al. Implementing resident work hour limitations. *Ann Surg.* 2003;237:449–455.
3. Stimmel B. The Libby Zion case revisited: what have we learned? *Mt Sinai J Med.* 1998;65:301–302.
4. Miller W, Riehl E, Napier M, et al. Use of physician assistants as surgery/trauma house staff at an American College of Surgeons-verified Level II trauma center. *J Trauma.* 1998;44:372–376.
5. Oswanski MF, Sharma OP, Shekhar SR. Comparative review of use of physician assistants in a Level I trauma center. *Am Surg.* 2004; 70:272–279.
6. Brasel KJ, Pierre AL, Weigelt JA. Resident work hours. *Arch Surg.* 2004;139:490–493.