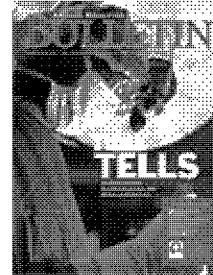


Bulletin: Winter 2005 (Volume 14, Issue 4)

Work Hour Restrictions: Impact on Neurosurgical Resident Training at the University of UtahBy: Todd McCall, MD,
Ganesh Rao, MD,
and John Kestle, MD[\(Click to view PDF\)](#)**AANS Neurosurgeon in Action**

formerly AANS Bulletin
[Print This Article](#)
[Share This Article](#)
[Comment on This Article](#)
[Back to Table of Contents](#)
[Subscribe](#)
[Get RSS](#)
[Search the Archives](#)
[About AANS Neurosurgeon](#)
[AANS Neurosurgeon Home](#)

Introduction

In April 2001, the Committee of Interns and Residents, the American Medical Student Association, and Public Citizen sent a petition to the Occupational Safety and Health Administration requesting restrictions on resident work hours for all medical specialties (4,9). As a result, Rep. John Conyers Jr., D-Mich., and Sen. Jon Corzine, D-N.J., introduced the Patient and Physician Safety and Protection Act in the 107th Congress (H.R. 3236 and S. 2614) (5,6). Around the same time, the Accreditation Council for Graduate Medical Education developed its own nationwide guidelines that as of July 1, 2003, restricted resident duty hours to 80 averaged over four weeks.

Arguably, of all surgical residencies, these work hour limitations have hit neurosurgical residencies the hardest.

Unlike many other busy medical and surgical residencies, neurosurgical residencies usually have only one, and occasionally two or three, residents per class. The neurosurgical service at a major hospital often has a patient census and operative schedule that is as busy as any surgical service. The impact of the ACGME work hour restrictions on neurosurgical residencies is sure to be significant.

More than two years after the work hour restrictions were mandated, little objective information is available regarding their impact on the surgical experience and education of neurosurgical residents. Many recent reports in the literature that discuss perceived effects of the 80-hour workweek reflect the experience of general surgery. Most of these reports are based on surveys and discuss quality of life, continuity-of-care issues, and whether or not the rules are beneficial to surgical training (1,2,8,9). Cohen-Gadol et al. recently performed a survey of residents and program directors in neurosurgery training programs that evaluated the perceived impact of the ACGME regulations (4),

Abstract

Resident work hour restrictions imposed by the Accreditation Council for Graduate Medical Education became effective on July 1, 2003. To evaluate the effect of these regulations on resident operative experience, we reviewed and compared the surgical experience of junior and senior neurosurgical residents four years before and one year after the ACGME restrictions were implemented. Resident work hours since May 2003 and operative caseload during the study period were recorded in commercially available data systems. The mean number of hours worked per week by junior and chief residents decreased from 104 and 110 hours before the ACGME work hour restrictions to 81 and 84 hours afterward, respectively. During the four academic years before the work hour limitations took effect, the mean number of major cases performed each year was 802.5 for the chief residents and 849.3 for the junior residents. Following the restrictions, little changed for the chief residents. However, the junior residents averaged only 467 cases, a 45 percent decrease from the previous years studied. The mean number of cases covered by each junior resident per month decreased by 30.5 percent after the work hour restrictions were instituted, and the mean number of cases covered per post-call junior resident in one month declined 47.8 percent, from 23 to 12. At our institution, the ACGME work hour restrictions have resulted in decreased resident work hours for all residents at the expense of the operative experience for junior residents. The operative caseload for chief residents has not been affected.

PEER-REVIEWED RESEARCH

**Todd D. McCall, MD,
Ganesh Rao, MD,
and John R.W. Kestle,
MD**

Department of
Neurosurgery,
University of Utah and
Primary Children's
Medical Center,

Received: Nov. 2, 2005
Accepted: Nov. 14, 2005

AANS Bulletin
14:17–22, 2005

Key Words: ACGME;
resident work hours
Abbreviations: ACGME,

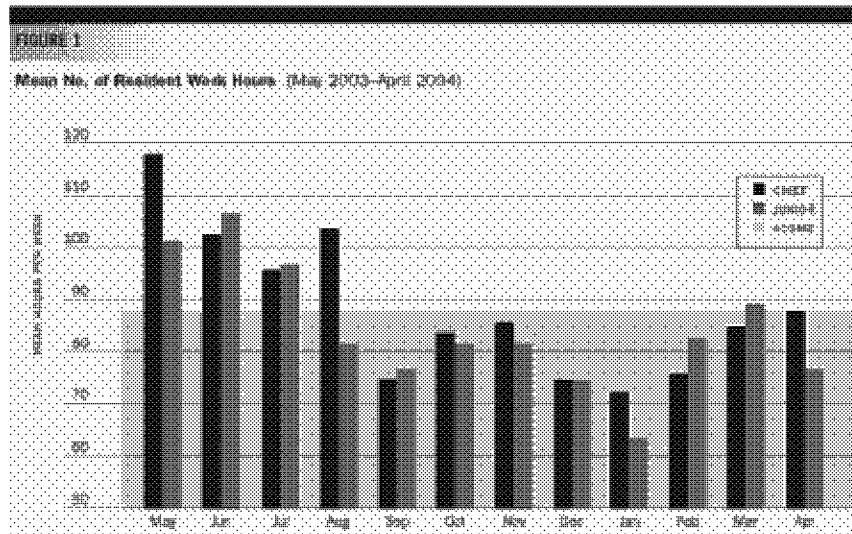
but objective data that assess the effect of these regulations is scarce in the neurosurgical literature.

Salt Lake City, Utah

Accreditation
Council for Graduate
Medical Education

The University of Utah neurosurgery service has been compliant with the ACGME workweek rules beginning with the 2003–2004 academic year. We reviewed the impact of the work hour restrictions on the surgical experience at the junior and senior neurosurgical resident levels.

Correspondence to:
J. Kestle,
john.kestle@hsc.utah.edu



The work hours of residents were recorded beginning in May 2003. The mean number of resident work hours per week is graphed on a monthly basis for both junior and chief residents over one year. The shaded background represents the maximum of 88 hours averaged over four weeks that residents can work under the new ACGME guidelines. The 88-hour maximum includes an eight-hour extension that the ACGME granted to the University of Utah neurosurgical residency program.

Methods

Work Hours Resident work hours were recorded beginning in May 2003, before implementation of the work hour restrictions. Residents were required to report their work hours weekly using the software TimeClock Plus (Data Management, Inc., San Angelo, Texas).

On July 1, 2003, the ACGME work hour restrictions took effect. Briefly, these rules limit the workweek to 80 hours averaged over a four-week period and place restrictions on the number of hours a resident may work after on-call service. The University of Utah neurosurgery service was granted the optional 10 percent exception, which allowed our residents to work an 88-hour average workweek.

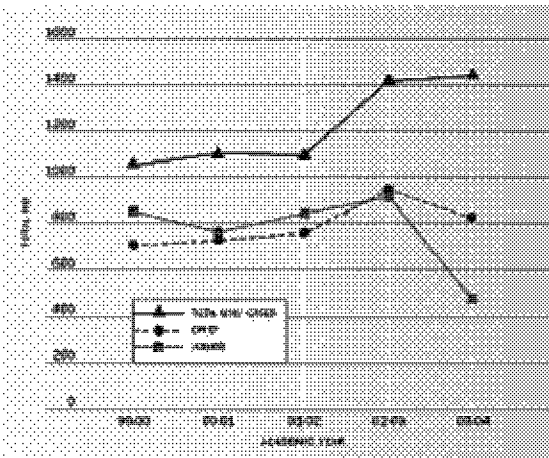
We implemented three changes to the University of Utah neurosurgery service to comply with the new work hour regulations. First, a senior resident was moved from service at the veterans hospital to the University of Utah Hospital for coverage of junior call responsibilities one day per week and chief call one weekend each month. Second, the residents on the research elective were each required to cover junior call one Friday and one Sunday per month. Third, the intern no longer took call with a junior resident and became available every weekday to help with work on the ward. No physician extenders were hired.

Operative Case Load For the duration of the reported years (1999–2004), all neurosurgical operative cases at the University of Utah Hospital were recorded in a FileMaker database (FileMaker Inc., Santa Clara, Calif.). The data for each case included the attending physician, assisting residents, date, and description of the case. We reviewed the caseload for chief residents and for junior residents (those in the first or second year of neurosurgery residency) in each academic year beginning in 1999 and ending in 2004, for a total of five academic years. The number of major operative cases performed by junior and chief residents as first assistant and second assistant was totaled for each academic year. The number of major cases performed by junior residents per month was totaled. Minor procedures, as defined on the ACGME institutional data forms (biopsy, intracranial pressure monitors, halo tongs, and other), and cases done with fellows or residents on research or on neurocritical care rotations were not included. Pediatric cases, placement of lines, and neurosurgical cases managed nonoperatively were not included.

| | 2002-2003 | 2003-2004 |
|--------------------------------|-----------|-----------|
| Total Cases | 1,601 | 1,917 |
| Cases Covered by Residents | 1,455 | 1,277 |
| Cases Not Covered by Residents | 146 | 240 |
| Junior Resident Cases | 143 | 256 |
| Chief Resident Cases | 1,312 | 1,041 |

FIGURE 2

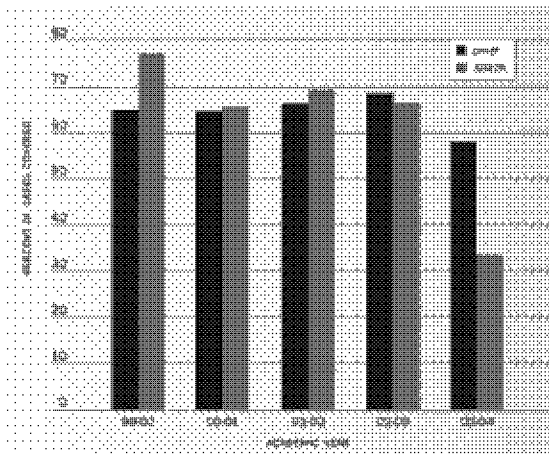
Total No. of Major Operative Cases (July 1999-June 2004)



For five consecutive academic years beginning in July 1999, the total number of major neurosurgery cases performed at the University of Utah Hospital is reported along with the number of cases with junior resident and chief resident involvement. ACGME guidelines for resident duty hours took effect at the beginning of the 2003–2004 academic year. Junior resident cases combine both first and second assistant experiences. The sum of junior resident and chief resident cases can be more than the total number of cases for a given year because two residents may be involved with a single case.

FIGURE 3

Percentage of Cases Covered by Junior and Chief Residents



The percentage of total neurosurgery cases covered by junior and chief residents was calculated for each academic year to correct for the variable number of total operative cases in each year.

Before the implementation of the work hour restrictions, the post-call day typically was considered protected operating time for the junior residents. However, the new regulations require residents to leave the hospital within six hours of the end of their shift. To assess the impact of the work hour rules on the post-call day's operative experience, we totaled the number of cases in one month (May) that were performed on the post-call days by the junior residents before and after the work rules were instituted. Additionally, to determine differences in operative experience when taking at-home and in-hospital call, the total number of junior resident cases in May at the University of Utah Hospital was compared with similar data at the Primary Children's Medical Center, where the junior resident takes home call and therefore is not required to leave the facility following on-call service.

Results

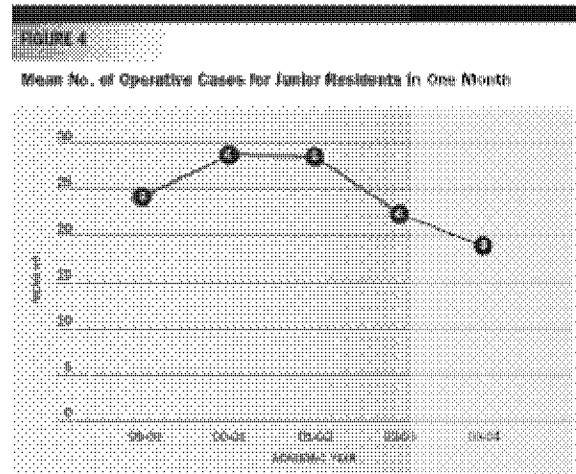
Work Hours

The mean number of hours junior residents and chief residents worked per week (averaged over four weeks) from May 2003 to April 2004 is summarized in Figure 1. Before July 1, 2003, junior residents averaged 104 hours per week and the chief residents averaged 110 hours per week. With the implementation of changes to conform to the work hour regulations after July 1, 2003, the number of hours worked per week decreased to below 88 hours for both junior residents (80.7 hours) and chief residents (84.2 hours).

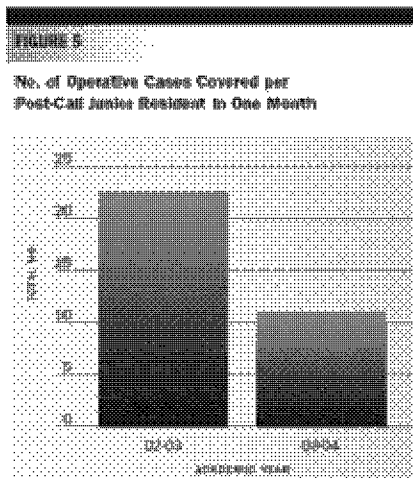
Operative Case Load

The total number of major operative cases performed at the University Hospital has increased steadily over the last five years (Figure 2). There was a 26.9 percent increase in cases, from 1,123 during the 1999–2000 academic year to 1,425 during the 2003–2004 academic year. During the four academic years preceding implementation of the work hour limitations, the mean number of major cases performed by the two chief residents was 802.5 per year. The mean number of major cases performed by junior residents during these same four years was 849.3, including 269.5 as the first assistant and 579.8 as the second assistant. For the academic year 2003–2004, after the work hour regulations became effective, the mean number of cases performed by the chief residents was 809, but the mean number of junior resident cases during that same period was 467, including 151 as the first assistant and 316 as the second assistant. This represents a 45 percent decrease in the number of cases performed by junior residents.

Both the number of operative cases and the number of junior residents varied in each academic year studied. To correct for the variable number of operative cases in each year, the percentage of total neurosurgery cases covered by junior residents and chief residents was calculated for each academic year (Figure 3). There was a 52.5 percent decline in the percentage of total neurosurgery cases at the University of Utah Hospital with junior resident involvement. To correct for the variable number of junior residents each year, the mean number of cases per junior resident per month was calculated (Figure 4). During the 2003–2004 academic year, each junior resident was involved in an average of 18 cases per month, which represents a 30.5 percent decline from the previous four academic years, when each junior resident averaged involvement in 25.9 cases per month.



The mean number of operative cases for a single junior resident per month was calculated to correct for the variable number of junior residents each year. For each time point, the number of junior residents that year is indicated. In the 2003–2004 academic year the number of junior residents decreased by 50 percent from the previous year. Therefore, even though there were more total operative cases on the university service per junior resident, the number of cases per month that junior residents operated still declined.



The total number of operative cases performed by post-call junior residents during one month was tallied for the academic years before (2002–2003) and after (2003–2004) the ACGME guidelines became effective. There was a 47.8 percent decline in junior residents' operative experience after implementation of the work hour restrictions.

To evaluate the impact of the work hour restrictions on the post-call operative experience of junior residents, operative data for May 2003 was compared with data for May 2004. The number of cases covered per post-call junior resident declined from 23 before the restrictions to 12 after they were instituted (Figure 5). At University Hospital the total number of cases performed by all post-call junior residents declined from 50 before the restrictions to 25 after the restrictions, compared with a decline from 42 to 36 cases at Primary Children's Medical Center (Figure 6).

Discussion

Several studies have evaluated the attitudes of both resident and attending general surgeons toward the work hour limitation (1,2,8-10). Not surprisingly, the attitudes toward the new rules have been mixed. Many studies have shown that senior residents and faculty view these new rules as having a negative impact on surgical training, whereas junior residents tend to view them favorably. However, these studies do not objectively address the impact that the restricted work hours have on the technical aspects of training a surgeon. The authors of one survey-based study reported that among surgical residents, 44 percent believed that the work hour restrictions would negatively impact the surgical experience (1). This same study showed that the number of cases performed by graduating chief residents actually increased after the work hour restrictions were in place. More recently, Cohen-Gadol et al. reported that the majority of residents (61 percent) and program directors (79 percent) believed that the ACGME guidelines have had a detrimental effect on their training programs (4).

No study to date has examined the impact of the ACGME regulations on the junior resident operative experience.

Residents at the junior levels are those who take in-hospital call, work 24-hour shifts, are primarily responsible for patient care, and are the target of the work hour restrictions. These are the residents who likely will lose out on operative experience. Our study shows that, indeed, residents at the junior levels suffer a decrease in operative experience.

Since the implementation of the restrictions on work hours, at our institution the number of cases with junior resident involvement has declined by 45 percent, and the percentage of cases covered by junior residents declined by 52.5 percent. The absolute number of cases performed by junior residents can be influenced by several factors, such as the total number of available operative cases and the number of junior residents. At our institution, the total number of operative cases has increased 26.9 percent in the past five years, suggesting that without the new ACGME regulations, the operative volume of the junior residents would have increased. We corrected for the varying number of junior residents each year by calculating the mean number of operative cases for a single junior resident per month. In the four years before the ACGME regulations were implemented, each junior resident averaged 25.9 cases per month and the year after, 18 cases per month, a 30.5 percent decline. Therefore, we believe that the decline in the number of cases performed by junior residents in the 2003–2004 academic year most likely is explained by the ACGME work restrictions.

To be compliant, programs have had to make drastic changes in the way their resident staff is used. These changes have included the addition of physician extenders, such as nurse practitioners or physician assistants, as well as drawing residents from the previously protected research rotations into the clinical service (3).

We did not employ physician extenders at our institution during the period of this study. Instead, residents on their research year took additional junior call, and a senior resident from the veterans hospital was added to the University of Utah service. As a result, the added senior resident was able to provide operative coverage that was lost when junior residents began going home following their on-call service. The post-call operative experience that had been significant at our program for junior residents decreased 47.8 percent after we became compliant with the new ACGME guidelines. At Primary Children's Medical Center, where the junior resident takes home call and therefore does not leave the facility after on-call service, total junior resident operative cases for one month only declined 14.3 percent after the new work hour restrictions were implemented compared with a 50 percent decline at the University of Utah Hospital service. Chief residents generally are not affected by the post-call restrictions, and therefore their operative caseload has not diminished.

We considered a number of strategies for improving the operative experience of our junior residents. In one study, 22 percent of resident work hours were unrelated to educational activities (2). We therefore hired a physician assistant to perform noneducational duties, freeing the junior residents for the operating room. Since this change, the monthly operative caseload for the junior residents has increased to 21 per month. Less desirable options, which we have not implemented, include increasing the length of residency, decreasing the research training period, or having chief residents cover junior duties and allowing the junior residents to operate on less complicated cases.

Conclusions

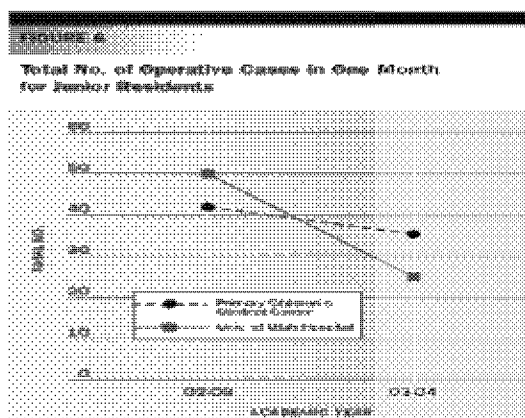
The ACGME restrictions on resident work hours represent a paradigm shift in the education of surgical residents in the United States. These new restrictions are likely to affect several issues, including patient care, resident training, resident health, and resident quality of life. This study addresses one aspect of resident training: the operative experience. At our institution, we have managed to comply with the 80-hour workweek at the expense of the operative experience of the junior residents. Any analysis of the ACGME work hour restrictions will need to consider the impact of these regulations on several different aspects of resident training, such as number of publications, board scores, and serial faculty evaluations, as well as on patient care. As additional objective data become available for assessing the impact of the ACGME regulations, residency programs will need to be able to develop strategies to optimize the residents' learning experience while maintaining high standards of patient safety.

Acknowledgements

The authors thank Kristin Kraus for her assistance in preparing this manuscript for submission and publication.

References

1. Barden CB, Specht MC, McCarter MD, Daly JM, Fahey T J 3rd: Effects of limited work hours on surgical training.



The total number of operative cases per formed by all post-call junior residents during one month at Primary Children's Medical Center was compared with the number at the University of Utah Hospital for the academic years before (2002–2003) and after (2003–2004) the ACGME guidelines became effective.

J Am Coll Surg 195(4):531–538, 2002

2. Brasel KJ, Pierre AL, Weigelt JA: Resident work hours: what they are really doing. Arch Surg 139(5):490-493; discussion 493–494, 2004
3. Chandra RK: The resident 80-hour work week: how has it affected surgical specialties? Laryngoscope 114(8):1394–1398; discussion 1319, 2004
4. Cohen-Gadol AA, Piegras DG, Krishnamurthy S, Fessler RD: Resident duty hour reform: results of a national survey of the program directors and residents in neurosurgery training programs. Neurosurgery 56(2):398–402, 2005
5. Conyers JR: Patient and Physician Safety and Protection Act of 2001. H.R. 3236, 2001
6. Corzine JS: Patient and Physician Safety and Protection Act of 2002. S. 2614, 2002
7. Friedman WA: Resident duty hours in American neurosurgery. Neurosurgery 54(4):925–931; discussion 931–933, 2004
8. Niederee MJ, Knudtson JL, Byrnes MC, Helmer SD, Smith RS: A survey of residents and faculty regarding work hour limitations in surgical training programs. Arch Surg 138(6):663-669; discussion 669–671, 2003
9. Underwood W, Boyd AJ, Fletcher KE, Lypson ML: Viewpoints from generation X: a survey of candidate and associate viewpoints on resident duty-hour regulations. J Am Coll Surg 198(6):989–993, 2004
10. Whang EE, Perez A, Ito H, Mello MM, Ashley SW, Zinner MJ: Work hours reform: perceptions and desires of contemporary surgical residents. J Am Coll Surg 197(4):624–630, 2003

Article ID: 37387