

Effect of the 80-Hour Workweek on Resident Burnout

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Hypothesis: With the introduction of the newly mandated restrictions on resident work hours, we expected improvement in subjective feelings of personal accomplishment and lessened emotional exhaustion and depersonalization.

Design: Residents and faculty members completed an anonymous online Maslach Burnout Inventory Human Services Survey (3rd ed; Consulting Psychologist Press Inc, Palo Alto, Calif) and work-hour registry before and after implementation of new restrictions.

Setting: Urban, university-based department of surgery.

Participants: All house staff (n=37) and faculty (n=27).

Intervention: Introduction of new Institutional Standards for Resident Duty Hours 2003.

Main Outcome Measure: Resident work hours and levels of emotional exhaustion, perceived degree of depersonalization, and personal accomplishment.

Results: Resident work hours per week decreased from 100.7 to 82.6 ($P<.05$) with introduction of the new schedule. Home call and formal educational activity time within working hours (eg, clinical conferences) significantly ($P<.05$) decreased from 11.5 and 4.8 hours to 4.6 and 2.5 hours per week, respectively. Operating room hours, clinic time, and duration of rounds did not show a significant change. Changes in parameters of resident and faculty emotional exhaustion, depersonalization, and personal accomplishment did not show statistical significance ($P>.05$).

Conclusions: Despite successful reductions in resident work hours, measures of burnout were not significantly affected. However, important clinical activities such as time spent in the operating room, clinic, and making rounds were maintained. Formal in-hospital education time was reduced.

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SINCE THE EARLY 1900S, SURGERY residents were educated according to the Halsteadian ideals of strict discipline and complete dedication to the training. This paradigm started to change after 1984 when the death of Libby Zion, a patient at a New York hospital, raised an issue of resident exhaustion. Mandated work-hour restrictions, introduced in July 2003, were designed to improve patient safety by reducing resident fatigue.

In this study we sought to demonstrate how surgery residents' subjective perceptions of "burnout" changed with the implementation of the new work-hour rules. How these changes affected attending surgical faculty perceptions was also tested. We expected resident burnout, a long-tolerated adverse effect of surgical training, to improve as a direct result.

METHODS

The clinical and academic programs of the University of California, Irvine (UCI), Department

of Surgery are based at the following California locations: UCI Medical Center, Long Beach Veterans Affairs Medical Center, Long Beach Memorial Medical Center, Children's Hospital of Orange County, Orange, and Kaiser Hospital Anaheim. The UCI Medical Center General Surgery residency program is a 5-year program accepting 5 residents per year. The participants included postgraduate year 1 residents from urology, anesthesia, orthopedic and plastic surgery, and the ear, nose, and throat departments undergoing their general surgery internship. Residents (n=37) and faculty members (n=27) of the Department of Surgery completed an anonymous online Maslach Burnout Inventory (MBI) Human Services Survey¹ and work-hour registry 1 week before and 6 months after implementation of an 80-hour workweek. New interns or residents (starting July 1, 2003) did not participate in the study. To provide anonymity because of the sensitive nature of the survey and the few participants, we chose not to stratify the respondents demographically (eg, only 1 of postgraduate year 2 and postgraduate year 3 residents were female) or by postgraduate year level.

All residents and attending surgeons daily recorded their hourly activity on an Internet-

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	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Midnight	OD	OD	OD	HC	OD	OD	OD
1 AM	OD	OD	OD	HC	OD	OD	OD
2 AM	OD	OD	OD	HC	OD	OD	OD
3 AM	OD	OD	OD	HC	OD	OD	OD
4 AM	OD	OD	OD	HC	OD	OD	OD
5 AM	OD	OD	OD	HC	PR	OD	OD
6 AM	OD	PR	PR	PR	RD	PR	OD
7 AM	OD	RD	RD	RD	ED	RD	PR
8 AM	OD	OR	CL	FL	ED	OR	RD
9 AM	OD	OR	CL	FL	FL	OR	OR
10 AM	OD	OR	CL	FL	OR	OR	OR
11 AM	OD	OR	CL	OD	OR	FL	OR
Noon	OD	FL	ED	OD	OR	FL	FL
1 PM	OD	FL	ED	OD	FL	CL	FL
2 PM	OD	FL	FL	OD	FL	CL	FL
3 PM	OD	FL	FL	OD	FL	CL	FL
4 PM	OD	FL	FL	OD	FL	CL	PR
5 PM	OD	PR	PR	OD	PR	PR	RD
6 PM	OD	RD	RD	OD	RD	RD	OD
7 PM	OD	OD	HC	OD	OD	OD	OD
8 PM	OD	OD	HC	OD	OD	OD	OD
9 PM	OD	OD	HC	OD	OD	OD	OD
10 PM	OD	OD	HC	OD	OD	OD	OD
11 PM	OD	OD	HC	OD	OD	OD	OD

Figure 1. Sample of Internet-based work-hours registry. CL indicates clinic; ED, formal education; FL, floor work; HC, home call; OD, off duty; OR, operating room; PR, prerounds; RD, rounds.

based form for 2 weeks. Survey options included time spent making prerounds and rounds, attending to floor work, being on home call, being at the clinic, being in formal educational activities, and being in the operating room. Ancillary tasks (“scut”) were included under floor work. To accommodate for specifics of attending surgeons’ work, time spent at the “academic office” was included in the survey as well as the number of cases handled with and without a resident present. The options were color labeled and included off-duty hours (**Figure 1**).

The Maslach Burnout Inventory–Human Services Survey, recognized as the foremost standardized measure of burnout syndrome, assesses a 3-dimensional structure of the condition, looking simultaneously at levels of emotional exhaustion, depersonalization, and personal accomplishment.¹ These 3 subjective aspects of burnout syndrome are evaluated through a series of 22 brief questions, each assessing frequency of several job-related feelings. Respondents chose the frequency of each feeling on a Likert scale from 0 to 6: 0 indicates never; 1, a few times a year; 2, once a month or less; 3, a few times a month; 4, once a week; 5, a few times a week; and 6, every day. Once the responses are tabulated, a score for each area is established. The score may be expressed as low, moderate, or high. Burnout is present with high emotional exhaustion, high depersonalization, and low personal accomplishment. The Maslach Burnout Inventory–Human Services Survey was sent to each participant as an e-mail attachment. We used a title of Human Services Survey instead of Maslach Burnout Inventory to prevent respondent bias. Returned surveys were separated by post-graduate year and attending status by secretarial staff not involved with the study. Names of respondents were kept anonymous. Statistical analyses of both duty-hour data and burnout survey results were done using χ^2 and *t* tests. Statistical significance was defined as $P < .05$.

RESULTS

Resident response to the work-hour survey was 89% ($n = 33$). Owing to a significantly low initial response rate of 18.5%, we excluded attending surgeons from further work-hour surveys. Two affiliated hospitals did not completely implement Accreditation Council for Graduate Medical Education (ACGME) duty hour requirements before the July 1, 2003, deadline and were excluded from the survey after the 80-hour workweek was in place. Resident work hours per week decreased from 100.7 to 82.6 with the introduction of the new schedule in the participating hospitals ($P < .05$). Off-duty hours increased from 67.4 to 85.5 ($P < .05$). Most of the time in both surveys, 41.7 and 40.5 h/wk, respectively, was occupied by floor work. This hourly decrease was not statistically significant. Home call and formal educational activity time within working hours (eg, clinical conferences) showed a statistically significant decrease from 11.5 and 4.8 hours to 4.6 and 2.5 hours, respectively. Operating room hours, clinic time, and duration of making prerounds and formal rounds did not change significantly (**Figure 2**).

The overall response rate for the Maslach Burnout Inventory–Human Services Survey was 69% for residents year 1 through 5 ($n = 26$). The average response rate for attending surgeons was low (26%, $n = 7$). During the initial survey, completed 1 week before duty-hour change, 50% of the residents scored high in emotional exhaustion and 56% scored high in depersonalization. However, only 20% of the residents acknowledged a low level

of personal accomplishment. In contrast, only 12% of attending surgeons showed high emotional exhaustion, with 25% of the responses being consistent with a high level of depersonalization. None of the faculty scored low for personal accomplishment (Table).

The second survey, done 6 months after restriction of duty-hour changes, showed 47% of residents scoring high on the emotional exhaustion scale and 70% scoring high on depersonalization. Once again, only a minority of residents showed a low level of personal accomplishment (23%). No faculty members scored high in emotional exhaustion or depersonalization or low in personal accomplishment (Table). The *t* test analysis showed that changes in the mean parameters of resident emotional exhaustion, depersonalization, and personal accomplishment did not show statistical significance ($P > .05$) (Figure 3). χ^2 Test analysis showed that changes in the percentage of residents and attending surgeons scoring high, moderate, and low for each burnout category were not statistically significant.

COMMENT

While studying in Vienna, Austria, and Leipzig and Würzburg, Germany (1878-1880), William S. Halstead had an opportunity to experience the merits of the German method of surgical training. Impressed with the highly structured, academically oriented programs of Europe, he described his plan to adopt this method in his newly established surgical program at The Johns Hopkins Hospital, Baltimore, Md, during a lecture titled "The Training of the Surgeon" given at Yale University, New Haven, Conn, in 1904.² Following success of the Johns Hopkins residency, other surgical residencies throughout the country adopted what became known as the "Halstead method." Residents were going through a rigorous surgical training that required exacting discipline and total dedication to the art and science of surgical care. Family was not a priority, and young surgeons were required not to leave the walls of the hospital (making them true residents of their institution). The basic principles of the Halsteadian method were embedded in surgical residency and remained unchanged until recently. A decrease in surgical residency programs from 723 in 1959 to 251 in 2003 because of strict enforcement by the Residency Review Committee for Surgery of the highest standards in resident training, ensured competition by senior medical students for available positions and acceptance of the rigorous 5 years of training.

The event stimulating change in resident training occurred in 1984 after the death of an 18-year-old woman in a New York hospital whose in-hospital care was provided by residents who were on duty for more than 18 hours. The New York State legislature was impressed by the role of fatigue in resident performance brought by the Libby Zion case and subsequently the New York State Department of Health passed regulations 405.4, better known as the "Bell regulations," limiting resident working hours.^{3,4} Named after Bertram Bell, MD, the chairman of the commission, the regulations were introduced originally in December 1986 and were signed into law as part of the Health Care Reform Act of the State of

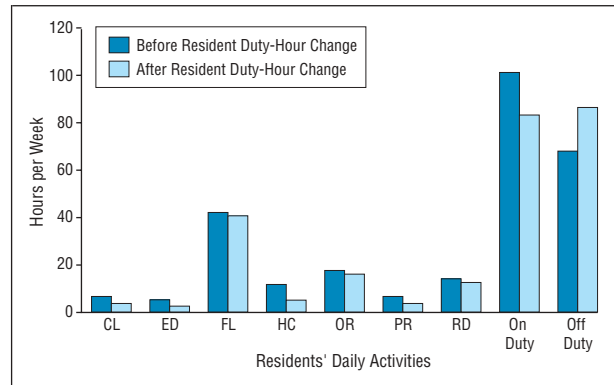


Figure 2. Residents' weekly activity 1 week before and 6 months after the introduction of duty-hour change. CL indicates clinic; ED, formal education; FL, floor work; HC, home call; OD, off duty; OR, operating room; PR, prerounds; RD, rounds.

New York in 2000.⁵ Special provisions were made to accommodate the specifics of surgical residency; for example, the on-call hours were excluded from an 80-hour week limit if "the hospital can document that during such night shifts postgraduate trainees are generally resting."⁶ Surgical residency programs were left to define generally resting for their residents.

Until recently, the Bell regulations remained mostly limited to New York State residencies. Frustrated with the perceived lack of effort by the ACGME to establish and enforce reasonable work-hour regulations throughout the country, a petition was filed with the Occupational Safety and Health Administration by Public Citizen, Committee on Interns and Residents, and the American Medical Student Association in April 2001.⁷ On November 6, 2001, Rep John Conyers, Jr (D-Michigan) introduced House Resolution 3236 Patient and Physician Safety and Protection Act of 2001 in the US House of Representatives.⁸ Later reintroduced by Sen Jon S. Corzine (D-New Jersey) at the 107th US Senate Congress in June 2002 as S 2614 Patient and Physician Safety and Protection Act of 2002 it established specific limits on work hours, allowing residents to file anonymous complaints regarding violations, and imposed financial penalties for noncompliance.^{9,10} However, the Occupational Safety and Health Administration eventually denied the petition citing the ACGME and other involved nonfederal entities as being "well-suited to address work-duty restrictions of medical residents and fellows."¹¹ Indeed, in June 2002, the ACGME set new standards on resident work hours and beginning July 1, 2003, these rules have been strictly implemented.¹²

Recent surveys have pointed to a change in medical students' sets of values and their attitudes toward general surgery as a future career.¹³ Issues of controllable lifestyle, amount of work, and more importantly level of stress in their future profession have become paramount for medical students replacing humanistic values of altruism and self-sacrifice.

In an attempt to evaluate how pervasive these attitudes were in the surgical profession, a recent survey of practicing surgeons was done by Campbell et al.¹⁴ The survey showed that attending surgeons were developing burnout at an alarming rate with younger surgeons

Resident and Faculty Scoring on the Maslach Burnout Inventory—Human Services Survey Subscales*

Variable	Subscale Score								
	High			Moderate			Low		
	EE	DP	PA	EE	DP	PA	EE	DP	PA
1 Week Before Resident Duty-Hour Change									
PGY1-5	58	56	62	26	26	18	14	18	20
Faculty	12	25	38	38	50	62	50	25	0
6 Months After Resident Duty-Hour Change									
PGY1-5	47	70	65	35	12	12	18	18	23
Faculty	0	0	83	33	50	17	67	50	0

Abbreviations: DP, depersonalization; EE, emotional exhaustion; PA, personal accomplishment; PGY, postgraduate year.

*Data are given as the percentage of respondents. The total study population included 37 residents and 27 faculty members. Adapted from Maslach et al.¹

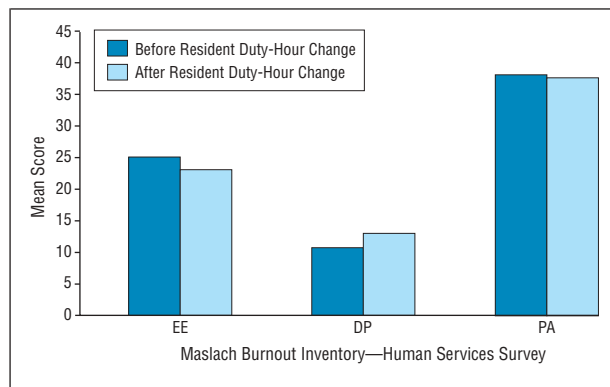


Figure 3. Residents mean score for emotional exhaustion (EE), depersonalization (DP), and personal accomplishments (PAs) activity 1 week before and 6 months after the introduction of duty-hour change.

being more susceptible than older ones. The authors suggested a change in a perceived social expectation with stronger emphasis on lifestyle issues (family, personal growth) and lack of control once again being at the root of the problem. Although, no association was noted between the caseload and burnout for attending surgeons, a high correlation was shown between subjective feeling of being overwhelmed with work and burnout.¹⁴

Attempts to identify concerns of surgical residents have been done in the past. In 1995 Gabram et al¹⁵ surveyed 501 residents in 21 surgical residency programs. The most important issues as perceived by residents in the order of importance were work hours followed by personal finances, quality of formal education, and family plans. An earlier study by Ruby et al¹⁶ of New England surgical residents' attitudes toward a need for work-hour change showed 72% in support. In a recent, region-wide survey by Whang et al¹⁷ of New England surgical residents, 83% of the respondents believed work-hour restrictions had a positive effect on the personal life of residents and 65% thought that it would also improve the quality of work done by residents.

Following successful implementation of duty-hour restrictions in 3 affiliated hospitals, we were able to show an appropriate decrease in weekly work hours. The categories that showed significant decrease were home call and formal educational activity time within working hours

(from 11.5 and 4.8 hours to 4.6 and 2.5 hours). By joining teams that traditionally have had every-other-day home call schedule (cardiothoracic and transplant surgery) with the teams that have not, we were able to abandon home call at the UCI Medical Center. Establishing a 12-hour shift coverage for trauma and night call, provided by 2 trauma surgery teams, we were able to establish adequate coverage for all surgical patients at off-duty hours. Coverage during weekends was carried out by 1 of 3 "elective" surgery teams rotating on a once-every-3-week call schedule. There was no significant call-schedule changes made at the affiliated Long Beach Veterans Affairs Medical Center. Kaiser Hospital, Anaheim, started every fourth night call schedule with residents required to leave the hospital by 11 AM on a day after being on call. These schedule changes were devised by a team consisting of the program director (R.A.W.) and 1 resident from each year.

We are disappointed to see a decrease in a formal education time that is the primary purpose of a residency as defined by American College of Surgeons.¹⁸ We believe that it was a temporary and correctable by-product of the duty-hour restriction. Several changes have already been made in our program to address this problem and further improvements are underway. The changes included mandatory weekly American Board of Surgery In-Training Examination (ABSITE) review and oral board review done at all participating institutions, a weekly mortality and morbidity conference at each hospital, and grand rounds with required attendance by residents regardless of their assignments, mandatory monthly journal club meetings, and monitored attendance at weekly vascular, gastrointestinal, trauma, thoracic, and tumor board conferences. Concurrently with a decrease of on-duty hours one would expect an increase in the time available for residents to study at home during off-duty hours. Indeed, in a study by Barden et al¹⁹ of residents' scores on ABSITE at New York State the mean composite percentile scores had significantly improved after the reduction of working hours.

When examining resident daily duties, the highest portion of daily activities was spent on floor work (41.7 and 40.5 hours), followed by operating room time (17 and 15 hours) and daily rounds (13 and 12 hours) as a distant second and third. Floor work included entering

of routine orders using a computer, follow-up on laboratory work and other diagnostic studies, administrative duties of admitting and discharging patients, and other nonpatient-related activities. It also included direct patient care in the period between morning and evening rounds. One weak point of our study was that we did not separate floor work into direct patient care-related and ancillary duties. This was not done, however, to avoid confusion since some of these duties fall under several categories (eg, transferring unstable patient to radiology, bedside procedures, and others). The floor work hours did not show a statistically significant decrease after implementation of duty-hour restriction. Furthermore, when looking at hours of floor work as a percentage of the total on-duty hours per week, we noted an actual increase from 41.4% to 49.0% of time spent doing floor work. Several approaches have been suggested for decreasing the ancillary work of residents. Some of these tasks can be assumed by physician extenders such as ward secretaries, nurse practitioners, and physician assistants. Although expensive for the hospital, this personnel can provide an invaluable support for the residents in their everyday work.²⁰ Time spent answering pages and responding to nursing requests was included under floor work as well. Several studies have looked at the effect of paging on residency training and patient care. Katz and Schroeder²¹ showed that avoiding unnecessary pages and postponing nonurgent ones could result in 42% reduction in disruptions to patient care and more rest for residents. Beebe²² pointed out that the root of the problem lies in the apparent discrepancy in the perception of urgency of calls between residents and nurses. This can be reduced by educating nursing staff on the definition of an urgent call and by implementing a system requiring newly graduated nurses to review a need for an urgent page with an experienced supervising nurse.

Burnout is a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that carries a potentially serious implications for a health care provider as well as his or her patients. With increasing emotional exhaustion, residents and faculty may feel unable to express empathy and compassion. Development of depersonalization may become apparent in cynical attitudes toward a patient's needs and in blaming the patient for his or her condition. Lastly, a perception of low personal accomplishment may be manifested by feelings of incompetence and self-depreciation. A high level of burnout has been related to physical and mental dysfunction, increase in substance abuse and job turnover, marital problems, and overall low morale of affected health professionals. Moreover, burnout can lead to a drop in the level of patient care.²³

Maslach and Leiter²⁴ define the following 6 general areas that play a role in development of burnout in a health professional: workload, control, reward, community, fairness, and values. An implementation of new Institutional Standards for Resident Duty Hours gave us an opportunity to study the relationship between surgical residents' burnout and the resident work hours as a marker of resident workload. We expected a decrease in the burnout index after implementation of new work-hour standards. However, although successful reduction of duty hours was

achieved in the university and 2 university-affiliated institutions, the levels of resident and faculty emotional exhaustion, depersonalization, and personal accomplishment did not show statistically significant change. Emotional exhaustion is considered to be a central component of burnout and is closely related to depersonalization with moderate correlation between them.²⁵ Throughout both of our surveys a significant portion of residents showed high emotional exhaustion (58% and 47%) and high depersonalization (56% and 70%). The personal accomplishment subscale has been consistently ranked low by only a small percentage of residents (20% and 23%) and none of the staff in both surveys. Maslach and colleagues^{23,24} have shown that personal accomplishment has low correlation with emotional exhaustion and depersonalization. It has been suggested that personal accomplishment develops in parallel with the other 2 components of burnout without any causal relations between them.²⁶ This led some authors to exclude personal accomplishment from the burnout surveys of physicians and surgeons.^{14,27} Feelings of personal accomplishment as judged by a resident or attending, the resident's peers as well as by the resident's patients in a form of reciprocity and appreciation has always been an important part of being a physician. We believe that even one's expectation of high level of personal accomplishment can play a crucial role in choosing surgery as a future career. It has been shown by Cordes et al²⁸ that frustration of these expectations can be devastating to an individual and can contribute to development of burnout.

CONCLUSIONS

Our survey makes 2 important points. First, it is possible to reduce the resident duty hours without significantly compromising operative room experience, clinic work, and patient care. Although formal education was decreased in our program, the total time that can be used for study was increased and we expect that this will be reflected in better ABSITE scores. Second, burnout, as measured by emotional exhaustion and depersonalization, seems to be high among most residents and does not show statistically significant change before and after introduction of work-hour reduction. To the same extent the new schedule requires that the residents still accomplish a large workload under time pressure. Yet, the feeling of personal accomplishment remains high, allowing us to believe that further structural improvements in the residency program and education will improve the burnout index.

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DISCUSSION

Karen E. Deveney, MD, Portland, Ore: I want to commend the authors on looking at the issues involving the new ACGME work-hour regulations in a positive fashion and analyzing the out-

come with a view toward further improving resident satisfaction and the quality of their education. All general surgery residents and faculty at their institution were asked to complete an anonymous standardized and validated questionnaire that assesses burnout and also to complete a 2-week-long work-hour registry before and after institution of the ACGME-mandated 80-hour workweek. Their study does not provide all of the answers, but does gather important data relative to the question of what effect the ACGME-mandated work-hour restrictions will have on surgical residents' satisfaction. As a program director, I am concerned about that issue because I do not want residents to drop out. I am equally concerned, however, about how to preserve and enhance the surgical training system that, although demanding, has traditionally produced the best surgeons in the world during the last century. Perhaps without purposefully setting out to do so, this study also suggests strongly that factors other than work hours may contribute to resident stress and frustration.

It is distressing for me to note that 1 of the 2 casualties of compliance with the 80-hour workweek in this study was formal education time. Formal education time occupied the smallest portion of any component that was measured, both before and after institution of the 80-hour workweek. The fact that neither floor work nor burnout significantly changed after the work hours were reduced is, in my mind, a telling point and one that may ultimately offer the greatest opportunity simultaneously to improve our educational system and streamline and improve patient care as well as nursing, physician, and patient satisfaction. We need to study formally and in-depth what residents are being called about and asked to do in the line of floor work. Through creative analysis and partnering with our other health care professions, we may be able to restructure the workload. For example, developing care plans and standing orders may improve the efficiency of patient care as well as physician and nursing satisfaction.

I was disappointed that the faculty did not respond in high numbers to the survey. The information about faculty is equally important to evaluate, since an unfortunate outcome of the new work-hour restrictions for residents may be that faculty burnout and dissatisfaction increase. The numbers of faculty responding to your study was too small to make any meaningful determination of that.

I have several questions for you. First, were you surprised that there was no improvement on resident scores on the MBI? As a corollary, what are your views as to why there was no change in burnout?

Next, a quick question regarding your methods. Although the survey was anonymous, did you know whether the respondent's before and after the implementation of the reduced work hours were the same people. Did you only calculate scores on the MBI if residents or faculty responded to each of the 2 surveys? Or, were you unable to know that information with your protocol.

You did not mention in your paper whether institutional review board approval was obtained for this study. There is some disagreement in our institution as to whether institutional review board approval is required when looking at issues such as patient safety, quality improvement, or educational issues.

I also wonder how reliable you feel that self-reported work hours are? Are there other more accurate ways to gather these data that are feasible? My question is prompted by the fact that we in our residency have difficulty getting residents to report their work hours accurately. I know that some of them chronically underreport their hours. I also would be interested in whether your hospitals have assumed any of the responsibility for helping to solve the workload problem of residents by financing physician extenders. As you know, residents are the biggest bargain in the health care budget, and hospitals often

receive more direct and indirect Medicare dollars per resident than they pay residents in salary. By rights, the floor work done by residents directly benefits the hospital's bottom line. Are they stepping up to the plate in your institution to offset some of the burden of workload that has been progressively stacked onto the residents' shoulders as the complexity of problems and acuity of patients have become higher over the years? Again I enjoyed the paper very much and think that it adds significant data to factor into our equation as we seek to improve our systems of surgical education.

Theodore X. O'Connell, MD, Los Angeles, Calif: I have several questions regarding any conclusions you can draw from this study. The first is that the results are from 1 surgical residency program, so how can you take that and say that is what the universe is. I think that that university program that may be the conclusion, but you cannot draw conclusions beyond that and apply it to all residency programs.

The other one is, how can you really draw conclusions when the timeframe followed up was so short? The work restrictions have only been in place officially for less than a year. So how can you say that you are not going to have time to see the change over 1, 2, 3, or 4 years? You may not see the change until many years pass.

Really, what you are presenting in this study is that residents who are already burned out are burned out and you cannot reverse that in a short time. What we are trying to do is prevent burnout. They should not have those burnout scores to begin with. Whether you can change them, those are the residents already burned out. You really have to look to the future. How can you prevent burnout in the first place? I think you are already beginning to see it because, as you know, the last 5 years we have been having a decreasing amount of general surgical applicants, but this last year applications are up by one third, so we may be attracting students because of the hour changes who were not being attracted in the past. These may be students who in the past were afraid of getting burned out, and therefore did not apply to surgery. They now are brought into the equation and applying. Here may be different types of students, which have also had a positive effect on residency. So I think to be really honest and fair, we have to give the work-hours change a longer time to see if we can change the whole paradigm in surgical education.

Frederic W. Grannis, Jr, MD, Duarte, Calif: There is no question in my mind that the residents who are working with me are doing fewer cases. We have had to send them home from cases. We have caught them gaming to try to underestimate the number of hours so that they would not have to go home. The remaining question is how to measure how much less they are operating now. I think that one way to do that will be to ask residents how many cases they had to leave behind over a period or else to look at historical controls. I think that this system is going to require increasing the length of training to get them equivalent operative exposure, and I ask the authors to comment on that.

Matt Slater, MD, Portland: I would like to thank the authors for bringing a little bit of science toward essentially a politically driven mandate for us to change the way we train residents. This work-hour reduction assumes that there is some threshold beneath which the residents will suddenly become happy. That threshold has been placed at 80 hours. I think that is a false assumption. I think there are a lot of people working maybe at 7 to 11 hours or somewhere else that work 40 hours a week and are unhappy. Do the authors think there is a threshold beneath which the residents will demonstrate statistically significant happiness or if they think that that is an arbitrary way of looking at this question, just looking at this threshold or this number of hours? Should we take a more comprehensive look and determine items they would like to look at in the

residency that they think will actually play out as being more important?

John T. Vetto, MD, Portland: I have 2 questions. My first stems from Dr O'Connell's question. Has the MBI instrument you used been validated as a change instrument? In other words, can it measure change or is it a personality instrument? If it is a personality measure, then what we are really seeing here is that residents as a group are burned out because of the work they do and not necessarily because of the number of hours they work.

My second question hinges on Dr Grannis' point. I thought I did see some changes in some of the burnout measures, particularly in the house staff. It actually looked to me like they were improving. Some of this may be sample size affect as you said there was no significant difference. Is it possible that as staff we are actually less burned out because we are operating more and enjoying our work more?

Lawrence W. Way, MD, San Francisco, Calif: I wonder about the premise here that there is a relationship here between work hours and what is being called burnout and whether we should expect there to be a relationship between the 2. It seems to me that the work-hours issue centers around sleep deprivation and ability to learn and not around happiness per se. There is a great deal of scientific inquiry into this study of satisfaction and happiness and what it shows overwhelmingly is that you do not achieve a certain plane in this scale as a result of objective events. It is much more subjective and has to do with environmental issues and spirit and that is why you can drive the Marines and they are the happiest people in the world. I am not sure that it is sophisticated to expect a change in work hours based on what the literature would say about happiness to have a major change on happiness. There are too many other factors involved.

Myriam Curet, MD, Stanford, Calif: I had 2 questions. First of all, it appeared to me from the data that you were depending a lot on home call, which many residency programs are doing. I think there is potential for enormous abuse in the home call situation because unless the resident comes in, the work does not count toward work hours, and they do not have to go home at noon. So potentially they could get no sleep but would still meet the 80-hour workweek restriction. So I wondered whether you did any monitoring of whether they got adequate rest, sleep, and personal time during their home call.

Second, I think it is not just the number of hours they work but what they are asked to do when they are working. We did a study at Stanford where we educated the nurses about when to call the residents, what to call them for, and to try to bunch those calls together. We found that by doing this we could consistently free up a 4-hour window of time from 1 to 5 AM during call nights, when the residents were not being called, where they could have some down time, study time, or sleep time. This really improved resident morale and resulted in a more positive work environment. So I wondered whether you did any work at all in terms of educating the nurses so that the residents were not being "nickled-and-dimed" to death all night long.

Thomas R. Russell, MD, Chicago, Ill: This issue of work hours has been debated and we must comply with the 80-hour workweek. This paper links burnout to 80 hours, which I look on as just the beginning to change surgical education. I personally think in 5 or 10 years we will look back to July 2003 as really a seminal time in surgical education. My question to the authors is that you tie everything to the 80-hour workweek but yet there are so many other things that we need to do to overcome these issues of emotional exhaustion, depersonalization, and personal accomplishment. Treating residents as true colleagues and treating them with respect and understanding of their personal problems, at the same time stressing education over service is the direction needed. So I would like the

authors to comment about some of the other things that we need to do other than just the 80-hour workweek restriction.

Roger E. Alberty, MD, Portland: I am well aware of the political background of why this program was instituted and I have always been curious, are the authors aware of any data that was done to validate this concept before it was put into place?

Dr Williams: Thank you for the comments and I would particularly like to thank Dr Deveney for her thoughtful analysis of the information.

Were we surprised that there was no improvement in resident burnout and feeling of satisfaction? Yes, we were. We thought that if the residents worked 80 hours, it would be a lot different from 110 hours, if they knew when they were going to be off and get home, things would be much better for them. But the burnout index did not change. The burnout index was developed by Maslach. She says burnout results from frequent episodes of stress and that is exactly what surgeons experience every day. The nature of surgery did not change.

Were the prerespondents and postrespondents the same? We do not know. This was an anonymous survey. I suspect that those people who were interested enough to fill it out did it consistently. We did not get institutional review board approval for this. They granted an exception, as it was judged by them to be more of a quality assurance study.

The hospital has not been forthcoming in supporting this. I do think that the answer to many of the problems relating to burnout and the hours that the residents spend on the ward doing scut work will come with hospital financial support. Residency will become less frustrating and a more professional job for the residents. Physician assistants, as is well known, work only 40 hours and are twice as expensive as residents. But that is the direction in which we need to move if we are to make inroads into the number of hours that the residents spend on these somewhat mindless tasks that contribute nothing to education and only add to dissatisfaction with the residency.

Dr O'Connell, I appreciate your comments and I do not know that our results are applicable to all programs. However, I can say that the program at UCI represents an average-sized program across the country, graduating 5 residents, and I would hazard a guess that similar results would be found across the country. For example, the MBI has been measured on medical students and in residents. Burnout was not present in medical students but developed from the first year on. We need to focus on what can be changed in the first year and subsequent years that lead to this.

Things may improve simply with the passage of time, Dr O'Connell, but not if we do not introduce the changes that will

relieve the residents of much of the scut work and nonprofessional mindless work that particularly interns and lower-level residents are expected to do.

At the City of Hope, Duarte, Dr Grannis related that residents are doing fewer cases. I think that depending on the way you structure this change so you will alter the number of cases that they do, particularly if you have to send them home the next day after they have been on duty. They will miss out on caring for patients they may have admitted for emergency treatment or other elective procedures scheduled for that day. One way to avoid this need to send residents home is develop a team that covers the night call exclusively so that the residents on elective surgery will no longer need to take night call. They will cover their elective surgery in the same way that they always have and, in fact, will be less disturbed because of the lack of interference with emergencies. That team structure works well to provide continued high numbers of cases for the residents.

I do not know what number of hours if it is the hours as Dr Way has alluded to, that will make the residents happy. I think it unlikely that we are going to limit duty time to an 80-hour workweek. The rest of the world has not. The next limitations will be heading toward somewhere near 40 hours and there will in all likelihood be some introduction of limited work hours for the attending surgeons.

Dr Vetto asked if this is a personality instrument measurement. Did we expect the burnout in the staff to decrease even further because they were doing more cases now that the residents were unavailable?

Actually, we thought the faculty would be more unhappy and that did not come across in the measure of faculty burnout at all. There are many, many more complaints from the faculty, grumbings, about not having residents to cover various clinical assignments or clinics. Residents are often working with more attending surgeons than in the past because of the need to combine services.

Dr Curet, you brought up the point about home call and it was one of the activities that was shown on that card. We have made a strong effort to eliminate home call. As you pointed out, it is something that can be abused and may interfere with the training of residents.

Dr Russell, I was glad to hear your comments, knowing your strong interest in surgery training. Indeed, you pointed out that it may not be only the hours, but also the job itself. We need to eliminate the demeaning and unprofessional activities that we ask residents to do for the hospital. To do this the hospital must be forthcoming with financial support.

Once again, I thank you very much. I appreciated the comments.