ORIGINAL ARTICLE

Effects of Duty Hour Restrictions on Core Competencies, Education, Quality of Life, and Burnout Among General Surgery Interns

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Objective: To measure the implications of the new Accreditation Council for Graduate Medical Education duty hour regulations for education, well-being, and burnout.

Design: Longitudinal study.

Setting: Eleven university-based general surgery residency programs from July 2011 to May 2012.

Participants: Two hundred thirteen surgical interns.

Main Outcome Measures: Perceptions of the impact of the new duty hours on various aspects of surgical training, including the 6 Accreditation Council for Graduate Medical Education core competencies, were measured on 3-point scales. Quality of life, burnout, balance between personal and professional life, and career satisfaction were measured using validated instruments.

Results: Half of all interns felt that the duty hour changes have decreased the coordination of patient care (53%), their ability to achieve continuity with hospitalized patients (70%), and their time spent in the operating room (57%). Less than half (44%) of interns believed that the new standards have decreased resident fatigue. In longitudinal analysis, residents' beliefs had significantly changed in 2 categories: less likely to believe that practice-based learning and improvement had improved and more likely to report no change to resident fatigue ($P < .01$, χ^2 tests). The majority (82%) of residents reported a neutral or good overall quality of life. Compared with the normal US population, 50 interns (32%) were 0.5 SD less than the mean on the 8-item Short Form Health Survey mental quality of life score. Approximately one-third of interns demonstrated weekly symptoms of emotional exhaustion (28%) or depersonalization (28%) or reported that their personal-professional balance was either "very poor" or "not great" (32%). Although many interns (67%) reported that they daily or weekly reflect on their satisfaction from being a surgeon, 1 in 7 considered giving up their career as a surgeon on at least a weekly basis.

Conclusions: The first cohort of surgical interns to train under the new regulations report decreased continuity with patients, coordination of patient care, and time spent in the operating room. Furthermore, suboptimal quality of life, burnout, and thoughts of giving up surgery were common, even under the new paradigm of reduced work hours.

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In 2011, the Accreditation Council for Graduate Medical Education (ACGME) enacted new duty hour regulations requiring increased supervision of residents and a 16-hour shift limit for interns.[1] These new regulations were intended to promote patient safety and reduce fatigue and burnout while still optimizing residents' attainment of the 6 ACGME core competencies.[2]

The 2011 duty hour regulations were received with some skepticism by the medical community, especially among surgeons who expressed several major concerns; many believed that the reduced work hours would not improve patient safety and care, the negative impacts of the restrictions on continuity of care, and the decrease in residents' operative and nonoperative training experiences.[3-7] In comparison with program directors in internal medicine and pediatrics, surgery program directors have voiced concerns about both the 80-hour work week restriction and the 16-hour duty period limit.[8] Furthermore, the majority of general surgery program directors believe that the 2011 duty hour reductions will negatively impact residents' performance in the 6 ACGME competencies while failing to decrease resident fatigue.[9]

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In a previous study examining new surgical interns at the commencement of their training, significant concerns were identified regarding the potential impact of the 2011 duty hour regulations on coordination and continuity of patient care, acquisition of medical knowledge, time spent in the operating room, development of surgical skills, and overall educational experience.[10] While this study identified concerns among surgical interns at the beginning of their internship, the actual experience of these surgical interns under the new duty hour limits as they moved through the remainder of their internship has not yet been reported. Whether interns' concerns persist through the completion of their first year under the new duty hour standards is unknown.

In addition to challenges regarding duty hour limits, the field of surgery also has a high rate of burnout.[11] Burnout among surgeons is associated with the number of hours worked and the number of calls taken per week, as well as other work-related factors.[11-14] The extent to which this burnout, and the development of lifestyle patterns that may either exacerbate or prevent it, originates during residency training is unclear. However, lifestyle is largely thought to contribute to the high rate of attrition from general surgery residency programs.[15] Duty hour limits are intended to reduce burnout, but the well-being and quality of life (QOL) of current surgical interns, the first cohort of trainees to begin their residency under the new duty hour rules, has not been examined.

The objectives of this study were to (1) assess the views of surgical interns regarding the impact of the new duty hour regulations on their training and patient care as they conclude their first year of training, (2) examine potential changes in these views from the beginning to end of internship, and (3) measure the current status of surgical interns' QOL and level of burnout near the conclusion of their intern year.

METHODS

DESIGN, SETTING, AND PARTICIPANTS

All 213 surgical interns at 11 general surgery residency programs (University of Alabama, University of Chicago, University of Florida, University of Iowa, Iowa Methodist, Johns Hopkins University, Mayo Clinic–Rochester, University of Pittsburgh, Stanford University, Vanderbilt University, and University of Washington) were eligible to participate in the survey. These programs were chosen because of their geographic location and the presence of a local investigator willing to distribute the instrument.

In May 2012, surgical interns were sent an electronic link to the survey. They were informed that participation was voluntary and responses were anonymous. Participants were not given an incentive for completing the survey. Nonresponders were contacted up to 2 additional times. This study was approved by the Mayo Clinic institutional review board.

We compared these 2012 survey data with baseline data obtained at the beginning of the residents' intern year (2011).[10] This allowed us to measure group differences in perceptions of the duty hour standards at the beginning and end of internship.

SURVEY DESIGN AND CONTENT

The survey was designed to assess surgical interns' perspectives of how the new duty hour requirements affected continuity of care, resident fatigue, and their development in the 6 core ACGME competencies during their intern year. In the 2012 follow-up survey, we also included validated measures to assess QOL, burnout, and career satisfaction. Demographic data gathered included sex, age, training program type (categorical general surgery, preliminary general surgery, and categorical other), geographic region (West, Midwest, South, and Northeast), relationship status (single, married, and nonmarried partner), whether the participant had children, and amount of educational debt.

Education Measures

The education survey measures have been previously described.[10] Briefly, interns were first asked to rate how the new ACGME duty hour standards would likely affect the following 6 areas, representative of the 6 ACGME core competencies: "quality and safety of patient care" (patient care); "acquisition of medical knowledge" (medical knowledge); "investigation and self-evaluation of own patient care" (practice-based learning and improvement); "effective communication with patients, families, and other health professionals" (interpersonal and communication skills); "responsiveness to patient needs that supersede self-interest" (professionalism); and "coordination of patient care" (systems-based practice).

Second, interns were asked to rate the likely impact of the duty hour standards on the following other general aspects of surgical training: "continuity with hospitalized patients," "development of surgical skills," "time in the operating room," "time spent with patients on the floor," "resident fatigue," and "overall educational experience."

Survey items were developed using specific language taken from the ACGME recommendations and the ACGME General Competency Standards,[2] thus supporting the content validity of the instrument. The survey items were reviewed and modified by individuals with content expertise in duty hours, graduate medical education, and survey development. Surgical interns' perceptions were measured using 3-point scales (increase, no change, or decrease) for each item.

Well-being Measures

The well-being of surgical interns was assessed with several previously validated tools that have been used in prior studies of residents.[16,17] These items were only included in the 2012 follow-up survey, given that we sought to measure QOL near the completion of internship training. To assess overall QOL, we used a Linear Analogue Self-Assessment that contained a single question: "Which of the following best describes your overall quality of life?" This item was scored on a scale of 1 to 5, with anchors: "as bad as it can be" (1), "somewhat bad" (2), "neutral" (3), "somewhat good" (4), and "as good as it can be" (5). A higher score on the Linear Analogue Self-Assessment reflects better functioning. We also assessed interns' balance between personal and professional life with a 5-point scale of "very poor" (1), "not great" (2), "neutral" (3), "acceptable" (4), and "very good" (5).

The 8-item Short Form Health Survey (SF-8) was used to assess general physical and mental health.[18] The SF-8 is a shortened version of the 36-item Short Form general health instrument.[19] Scores produce both a physical and mental health component summary score. The physical health component summary score is a summary of physical health in-

Table 1. Demographics of 156 General Surgery (GS) Interns (2012)

Variable	No. (%)
Sex	
M	106 (68)
F	50 (32)
Age, y	
<29	108 (69)
≥29	48 (31)
Program	
Categorical GS	64 (41)
Preliminary GS	43 (28)
Categorical other	49 (31)
Location	
Northeast	31 (20)
Midwest	53 (34)
South	42 (27)
West	30 (19)
Relationship status	
Single	79 (51)
Married	57 (36)
Nonmarried partner	20 (13)
Divorce	
Yes	2 (1)
Children	
Yes	20 (13)
Educational debt, $	
None	34 (22)
1-49 999	20 (13)
50 000-99 999	16 (10)
100 000-149 999	28 (18)
150 000-200 000	9 (6)
>200 000	49 (31)

cluding physical functioning, bodily pain, and general health. The mental health component summary score is a summary of mental health including emotional and social functioning, mental health, and vitality. The SF-8 has been validated in the general population and correlates well with the 36-item Short Form assessment.[18] The recall time frame for items on the SF-8 was the past 4 weeks.

To assess burnout, we used 2 items from the Maslach Burnout Inventory[20] that have been shown to correlate with important educational variables in prior studies of residents.[16] The first question measures emotional exhaustion by asking "how often do you feel burned out from your work?" The second question measures depersonalization by asking "how often do you feel you've become more callous toward people since you started your residency?" Responses to both items were measured on a scale of 1 to 7, with anchors ranging from "never" (1) to "daily" (7). High levels of emotional exhaustion and depersonalization have been shown to reflect burnout among medical professionals.[19-21] We defined high emotional exhaustion and high depersonalization to be reports of at least weekly symptoms.

Finally, we used the Satisfaction With Medicine Scale[21] to assess residents' attitudes toward their selection of surgery for a career. The first item asked participants how often they "reflect on the satisfaction I get from being a surgeon." The next question asked how often "I think of giving up surgery for another career." The final item asked how often "I regret my decision to have become a surgeon." Responses were measured on a scale of 1 to 7, with anchors ranging from "every day" (7) to "never" (1).

STATISTICAL ANALYSES

Responses to survey items were tabulated and summarized with frequencies and percentages. Multivariable logistic regression was performed to explore associations between interns' demographic characteristics and their opinions regarding the new duty hour restrictions. Results were summarized with odds ratios and 95% confidence intervals.

χ^2 Tests were used to compare interns' opinions at the beginning of their intern year with their opinions near the completion of their intern year. All reported *P* values were 2-sided and were not adjusted for multiple statistical comparisons. Surveys were blinded, thus precluding paired analyses of responses from 2011 to 2012. A conservative α threshold of .01 was used to account for multiple comparisons. All analyses were performed using JMP version 9.0 (SAS Institute Inc).

RESULTS

In May 2012, near the completion of their intern year, 156 of 213 surgical interns (73%) completed the survey. In our prior 2011 study, 179 of 215 interns (83%) completed a survey at the beginning of their intern year regarding the anticipated effects of the new duty hour restrictions on various aspects of surgical education and patient care (2 residents were no longer in their respective programs at the end of the year).[10] These 2011 data were used as the baseline for longitudinal comparisons.

In 2012, the majority of participants were male (106; 68%) and were younger than 29 years (69%). There were 64 categorical general surgery interns (41%), 43 preliminary general surgery interns (28%), and 49 other categorical interns (31%) who were completing a preliminary year in general surgery. These other specialties included urology, orthopedic surgery, otolaryngology, plastic surgery, anesthesiology, and radiology. There were 31 interns (20%) from the Northeast, 53 (34%) from the Midwest, 42 (27%) from the South, and 30 (19%) from the West. Half of participants (51%) were single, while 36% were married and 13% were in a relationship with a nonmarried partner. Only 2 participants (1%) had previously been divorced. Thirteen percent (n=20) of participants had children. There was a wide range of educational debt reported; the majority (55%) reported educational debt of at least $100 000 (**Table 1**).

CORE COMPETENCIES AND SURGICAL EDUCATION

Half of the participants believed that the duty hour changes have decreased the coordination of patient care (53%). Surgical interns were less pessimistic in other areas, however. The majority of participants reported that the new duty hour changes either did not change their ability to achieve competency or that the new hours increased their ability to achieve competency in the following areas: residents' investigation and self-evaluation of their own patient care (73%); residents' ability to effectively communicate with patients, families, and other health professionals (72%); residents' responsiveness to patient needs that supersede self-interest (70%); quality and safety of patient care (63%); and acquisition of medical knowledge (59%) (**Table 2**).

Table 2. Views on How the New Duty Hours Will Impact the ACGME Core Competencies and Additional Aspects of Graduate Medical Education of General Surgery Interns Who Responded in July 2011 and May 2012 to Our Questionnaire

	No. (%)						
	2011 Responders[10] (n = 179)			2012 Responders (n = 156)			
Item	No Change	Increase	Decrease	No Change	Increase	Decrease	*P* Value[a]
Patient care	69 (39)	50 (28)	60 (34)	72 (46)	27 (17)	57 (37)	.06
Medical knowledge	67 (37)	26 (18)	86 (48)	76 (49)	15 (10)	64 (41)	.08
Practice-based learning and improvement	75 (42)	58 (33)	45 (25)	87 (57)	25 (16)	42 (27)	.002
Interpersonal and communication skills	92 (51)	37 (21)	50 (28)	87 (56)	25 (16)	44 (28)	.53
Professionalism	83 (47)	42 (24)	53 (30)	84 (55)	23 (15)	47 (30)	.12
Systems-based practice	52 (29)	23 (13)	102 (58)	60 (39)	13 (8)	83 (53)	.14
Continuity with hospitalized patients	31 (17)	4 (2)	143 (80)	41 (26)	6 (4)	109 (70)	.08
Resident fatigue	45 (25)	24 (13)	110 (61)	66 (43)	21 (13)	68 (44)	.002
Surgical skills	75 (42)	9 (5)	95 (53)	68 (44)	7 (4)	81 (52)	.94
Time in operating room	54 (30)	4 (2)	121 (67)	59 (38)	8 (5)	88 (57)	.08
Time on floor	68 (38)	16 (9)	95 (53)	76 (49)	21 (13)	59 (38)	.02
Overall education	57 (32)	30 (17)	91 (51)	56 (36)	23 (15)	75 (49)	.69

Abbreviation: ACGME, Accreditation Council for Graduate Medical Education.
[a] χ^2 Test, *P* values are 2-sided.

The majority of surgical interns believed that the duty hour limits have decreased their ability to achieve continuity with hospitalized patients (70%) and have decreased their time spent in the operating room (57%). However, interns were split in their beliefs about how the new standards impacted their development of surgical skills (52% believe it decreased), their overall educational experience (49% believe it has decreased), and their time spent on the hospital floor (38% believed it has decreased). Less than half (44%) of interns believed that the new standards have decreased resident fatigue, while 43% report no change in fatigue and 13% report an increase in fatigue.

In longitudinal analysis, comparing these results with those of our previous 2011 study, there were 2 categories of surgical education in which residents' expectations at the beginning of their intern year were significantly different at the beginning of their intern year compared with their beliefs at the completion of their intern year. First, in July 2011, a significant minority of interns (33%) believed that the new duty hours would increase practice-based learning and improvement. However, by May 2012, that percentage decreased to only 16% ($P = .002$). Second, at the beginning of their intern year, the majority of surgeons assumed that the new duty hours would decrease fatigue (61%) while the others reported that there would either be no change (25%) or an increase in fatigue (13%). Near the end of their intern year, less than half (44%) of surgical residents reported that fatigue had decreased and 43% reported that there had been no change in resident fatigue ($P = .002$) (**Figure**).

WELL-BEING AMONG SURGICAL INTERNS

Near the conclusion of their internship in 2012, a minority of residents (18%) reported their overall QOL as being either "as bad as it can be" or "somewhat bad," while the majority (82%) of residents reported a neutral or good overall QOL. Interns' mean (SD) physical QOL score (physical health component summary score, SF-8) was 54.2 (5.2). Compared with the normal US population, 10 interns (6%) were 0.5 SD less than the mean (or in the bottom 30% of the normal distribution). Interns' mean (SD) mental QOL score (mental health component summary score, SF-8) was 46.5 (9.2). Compared with the normal US population, 50 interns (32%) were 0.5 SD below the mean (or in the bottom 30% of the normal distribution). Symptoms of emotional exhaustion were reported, at least weekly, by 44 interns (28%). Symptoms of depersonalization were reported, at least weekly, by 45 interns (28%).

One-third of surgical interns (32%) reported that their personal-professional balance was either "very poor" or "not great." Approximately 1 in 7 interns (14%) had considered giving up surgery on at least a weekly basis, and a minority of residents (4%) regretted becoming a surgeon on at least a weekly basis. Many interns (67%) reported that they reflect on their satisfaction from being a surgeon either daily or weekly (**Table 3**).

In multivariable logistic regression analyses, there were no significant differences in interns' well-being based on sex, age, program type, or location of training program ($P > .05$ for all).

COMMENT

This study provides important insight into the attitudes, QOL, well-being, and burnout among general surgery interns. This multi-institutional study assessed the first cohort of surgical interns training under the new ACGME duty hour regulations enacted in 2011.

EDUCATION AND PATIENT CARE

In this assessment, surgical residents raised important concerns over coordination of patient care and continuity

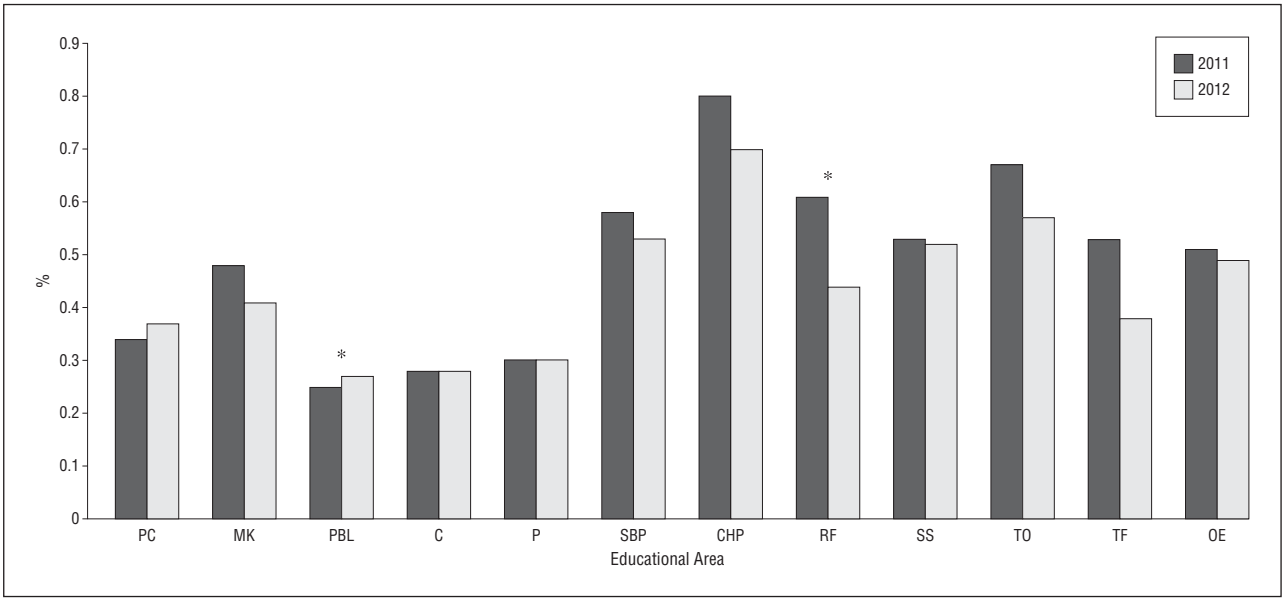

Figure. Percentage of 2011 surgical interns[10] who believe that the new duty hour regulations would cause a decrease in a particular educational area compared with 2012 interns who believe that the changes have caused a decrease in that educational area. $*P \leq .01$. C indicates interpersonal and communication skills; CHP, continuity with hospitalized patients; MK, medical knowledge; OE, overall education; P, professionalism; PBL, practice-based learning and improvement; PC, patient care; RF, resident fatigue; SBP, systems-based practice; SS, surgical skills; TF, time on floor; TO, time in operating room.

with hospitalized patients under the new duty hour standards. This is not surprising given the prominent national discussion of the impact of the new duty hour regulations on handoffs and continuity of care.[7,22,23] In a recent national study, 90% of general surgery program directors expressed concerns that the new duty hour limits would decrease continuity with patients.[8] Although not as dramatic, the current study demonstrates that 70% of surgical interns also believe continuity of care has decreased because of the duty hours.

Interns were more optimistic about how the duty hours have impacted the other 5 ACGME core competencies. However, a plurality (27%-37%) believe that the regulations have decreased their ability to achieve competency in patient care, medical knowledge, practice-based learning and improvement, communication skills, and professionalism.

We found that the majority of surgical interns believe that the new duty hour regulations have decreased their time in the operating room. Interestingly, they report that their time on the hospital floor caring for patients has not decreased as much as expected when they began their intern year. It appears that with fewer total work hours available, the cost has been in operating room time and not necessarily in postoperative patient care. This emphasizes the unique challenge to surgical training programs that are simultaneously seeking to develop technical skills and clinical reasoning. Indeed, in 2003, after a previous set of work hour restrictions went into effect, studies did report that operative experience was reduced.[24-27]

Another area that has failed to meet the expectations of most surgical trainees is that of resident fatigue. At the beginning of their intern year, the majority of interns believed that fatigue would decrease as a result of the new regulations. However, on completion of their first year of training, just 44% of interns believed that the changes did in fact decrease their fatigue, whereas 43% of interns believed that no change in fatigue occurred because of the decreased work hours. In a previous study of US general surgery program directors, we found that the overwhelming majority of program directors (85%) believed that the proposed duty hour regulations would not decrease resident fatigue.[8] Our data further support the assertion that fatigue, although influenced by work hours, is also influenced by other factors such as workload and psychological well-being.[17,28,29]

QOL AND WELL-BEING

Although previous studies have assessed QOL, burnout, and career satisfaction of practicing surgeons, few studies have focused on surgical residents in particular. Yet, younger surgeons in the early years of their practice are also at a higher risk for burnout than more experienced surgeons,[11] which underscores the importance of examining the mental health of surgical trainees as well. Surgical residents may be uniquely susceptible to burnout due to the large number of hours spent at work weekly (even with the restrictions), the pressure of mastering both technical expertise and medical knowledge (within a restricted number of hours), and the struggle to balance both personal and work responsibilities.[30-32]

Regarding overall QOL, there was no significant difference between this sample of surgical interns and a 2008 sample of US internal medicine interns.[16] We also found no significant difference between the current sample of surgical interns and a 2008 sample of US practicing surgeons[11] on both the Short Form Health Survey physical well-being and mental well-being.

In this study, approximately one-third of interns reported high emotional exhaustion and depersonalization, 2 important components of burnout. Although

Table 3. Quality of Life, Emotional Exhaustion, Depersonalization, Burnout, Satisfaction With Medicine, and Life-Work Balance of 156 General Surgery Interns

Variable	No. (%)
Overall QOL	
As bad as it can be	5 (3)
Somewhat bad	24 (15)
Neutral	38 (24)
Somewhat good	68 (44)
As good as it can be	21 (14)
SF-8	
PCS, mean (SD)	54.2 (5.2)
Residents with PCS 0.5 SD < population mean	10 (6)
MCS, mean (SD)	46.5 (9.2)
Residents with MCS 0.5 SD < population mean	50 (32)
Emotional exhaustion	
Never	10 (6)
A few times a year or less	23 (15)
Once a month	26 (17)
A few times a month	53 (34)
Once a week	19 (12)
A few times a week	20 (13)
Every day	5 (3)
Depersonalization	
Never	21 (14)
A few times a year or less	23 (15)
Once a month	27 (17)
A few times a month	40 (26)
Once a week	19 (12)
A few times a week	13 (8)
Every day	13 (8)
Reflect on satisfaction from being a surgeon	
Never	0
A few times a year or less	6 (4)
Once a month	17 (11)
A few times a month	28 (18)
Once a week	23 (15)
A few times a week	51 (33)
Every day	29 (19)
Think about giving up surgery for another career	
Never	62 (40)
A few times a year or less	41 (26)
Once a month	14 (10)
A few times a month	16 (10)
Once a week	4 (3)
A few times a week	10 (6)
Every day	8 (5)
Regret becoming a surgeon	
Never	85 (56)
A few times a year or less	35 (23)
Once a month	6 (4)
A few times a month	20 (13)
Once a week	1 (1)
A few times a week	4 (2)
Every day	1 (1)
Personal-professional balance	
Very poor	8 (5)
Not great	42 (27)
Neutral	32 (20)
Acceptable	65 (42)
Very good	9 (6)

Abbreviations: SF-8, 8-item Short Form Health Survey; MCS, mental health component summary score; PCS, physical health component summary score; QOL, quality of life.

previous work has demonstrated that in the past burnout has decreased after the implementation of work hour restrictions,[33] our findings still show a high percentage of burnout among surgical interns. The level of emotional exhaustion among our sample of surgical interns was also similar to a previous sample of US surgeons.[11] This magnitude of burnout among surgeons nearing the end of just their first year of training raises significant concerns and suggests that burnout does in fact already begin during residency training, even under the new work hour regulations. However, a lower percentage of surgical interns in this study reported emotional exhaustion compared with a 2008 study of medicine interns.[16] These data may suggest that the new duty hours have mitigated resident burnout to some extent; however, the separation of potential longitudinal changes over time (possibly due to duty hour regulations) from potential between-specialty differences is difficult without direct before and after comparisons of resident samples within both specialties (surgery and medicine).

Despite the 2011 duty hour reductions, one-third of surgical interns still perceive suboptimal balance between their personal and professional lives. This problem appears to be even worse among practicing surgeons; in 1 study, 63% of US surgeons reported that their work schedule fails to leave enough time for personal/family life.[11] Another study reported that more than one-third of surgeons report not having a desirable work-life balance.[31] Although most interns reported a high rate of reflection on satisfaction with their work, 1 in 7 interns still considered giving up their career as a surgeon on at least a weekly basis. This finding is very concerning given that the attrition rate of general surgery residents (1 in 5) is vastly higher than any other surgical specialty or internal medicine.[15,34-37] It is possible that medical school exposure to general surgery is not sufficient to give students realistic expectations regarding the pressures and stressors associated with surgical training. These results also highlight the importance of assessing and addressing dissatisfaction and burnout among surgical residents if the profession wishes to mitigate the high attrition rate present in general surgery. To address burnout, the surgical profession may need to reexamine and change education paradigms, beyond reducing hours, given that duty hour changes alone did not solve the problem. The increasing addition of midlevel providers and the shift to a more team-based approach to surgical patient care may also help reduce the burnout that appears to result because surgical residents may be expected to (or at least feel as though they must) perform all the same responsibilities but within less time.

Several important limitations of this study should be considered. Attitudinal associations may not be stable over time. It will be important to follow up this cohort through the end of their training to better understand how the duty hour changes have impacted their education, QOL, and well-being. We chose to only assess postgraduate year 1 residents in this study, yet the duty hour regulations may have different impacts on residents at different training levels. Previous research has shown that senior residents are more likely to view duty hour restrictions as a

barrier to their education. However, given that the major change to the 2011 duty hour regulations (the 16-hour shift-length rule) affected the most inexperienced residents, the explicit purpose of this study was to study first-year residents, despite their lack of experience with the previous regulations. Selection bias may also be present, because surgical programs were not selected at random, and these programs may not be representative of all general surgery training programs. Programs in this study were all university based and similar in size. Although our response rate was high, it is possible that the attitudes of respondents and nonrespondents differ. Also, there was a decrease in response rate from the beginning of intern year to the end. The extent to which this decreased response rate may actually reflect accumulating burnout over the course of the internship is not clear, but if related, our study may actually underestimate the level of burnout among surgical trainees as they near the completion of their internship. Furthermore, we chose to blind the surveys given the sensitive nature of the content. We were therefore not able to calculate how many individual residents changed their opinions on various items over their internship experience. Finally, surveys do not provide definite evidence for the effect of work hour regulations on surgical training, yet there is currently no agreed on standardized tool for measuring the impact of these regulations on surgical education. Surveys of those intimately involved in surgical education may be the best metric available.

In conclusion, this national study of general surgery interns suggests that the new duty hour regulations may negatively affect residents' continuity with patients, coordination of patient care, and time spent in the operating room. Fatigue, burnout, and attrition are still prominent issues in the field of surgery. The high rate of burnout among US surgeons appears to begin during residency training, even under the new paradigm of reduced work hours for surgical residents. Further investigation is needed to explore both how to better equip residents with the proper tools for management of workload and stress and how to change the current learning and patient care environments to prevent and reduce burnout among surgeons.

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Author Contributions: Dr Antiel had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. *Study concept and design:* Antiel, Reed, Van Arendonk, and Porterfield. *Acquisition of data:* Antiel, Van Arendonk, Wightman, Hall, Porterfield, Horvath, Terhune, and Tarpley. *Analysis and interpretation of data:* Antiel, Hall, Porterfield, Horvath, Tarpley, and Farley. *Drafting of the manuscript:* Antiel, Van Arendonk, Wightman, Tarpley, and Farley. *Critical revision of the manuscript for important intellectual content:* Antiel, Reed, Van Arendonk, Hall, Porterfield, Horvath, Terhune, Tarpley, and Farley. *Statistical analysis:* Antiel. *Administrative, technical, and material support:* Wightman and Porterfield. *Study supervision:* Reed, Porterfield, and Farley.
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