ORIGINAL ARTICLE

Surgical Training, Duty-Hour Restrictions, and Implications for Meeting the Accreditation Council for Graduate Medical Education Core Competencies

Views of Surgical Interns Compared With Program Directors

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Objective: To describe the perspectives of surgical interns regarding the implications of the new Accreditation Council for Graduate Medical Education (ACGME) duty-hour regulations for their training.

Design: We compared responses of interns and surgery program directors on a survey about the proposed ACGME mandates.

Setting: Eleven general surgery residency programs.

Participants: Two hundred fifteen interns who were administered the survey during the summer of 2011 and a previously surveyed national sample of 134 surgery program directors.

Main Outcome Measures: Perceptions of the implications of the new duty-hour restrictions on various aspects of surgical training, including the 6 ACGME core competencies of graduate medical education, measured using 3-point scales (increase, no change, or decrease).

Results: Of 215 eligible surgical interns, 179 (83.3%) completed the survey. Most interns believed that the new duty-hour regulations will decrease continuity with patients (80.3%), time spent operating (67.4%), and coordination of patient care (57.6%), while approximately half believed that the changes will decrease their acquisition of medical knowledge (48.0%), development of surgical skills (52.8%), and overall educational experience (51.1%). Most believed that the changes will improve or will not alter other aspects of training, and 61.5% believed that the new standards will decrease resident fatigue. Surgical interns were significantly less pessimistic than surgery program directors regarding the implications of the new duty-hour restrictions on all aspects of surgical training ($P < .05$ for all comparisons).

Conclusions: Although less pessimistic than program directors, interns beginning their training under the new paradigm of duty-hour restrictions have significant concerns about the effect of these regulations on the quality of their training.

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On July 1, 2011, the Accreditation Council for Graduate Medical Education (ACGME) implemented new resident duty-hour standards that include increased supervision and a 16-hour shift maximum for postgraduate year 1 residents.[1] The new regulations are part of an evolving debate that can be traced back to the death of Libby Zion in 1984, which prompted the State of New York to pass the first legislation regulating resident duty hours.[2-5]

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The duty-hour restrictions have been applied uniformly across the diverse array of medical specialties, and surgeons have debated the relevance of these standards to their specialty.[6] In a recent survey examining program directors' perceptions of the proposed ACGME mandates, general surgery program directors were more likely than internal medicine directors to believe that the new standards will hinder residents' acquisition and performance in the 6 ACGME core competencies (patient care, medical knowledge, practice-based learning and improvement, interpersonal and communication skills, professionalism, and systems-based practice).[7]

In this study, we elicited the perspectives of first-year surgical residents (in-

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terns) regarding the potential implications of the new duty-hour regulations on surgical training and the 6 core competencies of graduate medical education. We also compared surgical interns' attitudes with the attitudes of a national sample of 134 surgery program directors described elsewhere.[7]

METHODS

DESIGN, SETTING, AND PARTICIPANTS

All 215 surgical interns at 11 general surgery residency programs (University of Alabama, University of Chicago, University of Florida, University of Iowa, Iowa Methodist, The 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 the summer of 2011, surgical interns were sent an electronic letter informing them of the study, indicating that participation was voluntary and the responses were confidential. Participants were not given an incentive for completing the survey. Some programs sent residents a paper copy of the survey, whereas others used an electronic survey form. This study was deemed exempt from review by the Mayo Clinic institutional review board.

SURVEY DESIGN AND CONTENT

The survey was designed to assess surgical interns' perceptions of how the new duty-hour requirements will affect continuity of care, resident fatigue, and their development in the 6 core ACGME competencies. The content validity of the instrument was supported by the iterative development of items using specific language taken from the ACGME recommendations and the ACGME General Competency Standards,[8] with minor modifications as needed. The survey items were reviewed and modified by individuals with content expertise in duty hours, graduate medical education, and survey development.

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 effect 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."

Surgical interns' perceptions were measured using 3-point scales (indicating increase, no change, or decrease) for each item. Participants' demographic characteristics (age and sex), geographic region (West, Midwest, South, and Northeast), and surgical program (categorical or preliminary) were also collected.

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 as odds ratios (ORs) (95% CIs).

We used χ^2 tests to compare interns' opinions with those of the previously surveyed sample of surgery program directors. All reported *P* values were 2-sided and were not adjusted for multiple statistical comparisons. All analyses were performed using commercially available software (SAS, version 9.1; SAS Institute, Inc).

RESULTS

STUDY PARTICIPANTS

Of the 215 eligible interns, 179 (83.3%) completed the survey. Response rates of individual programs varied from 67% to 100%. Most of the participants were male (68.7%) and younger than 29 years (73.0%). Respondents included 102 categorical interns (57.0%) and 76 preliminary interns (42.5%) (1 individual, who completed most items, failed to complete this item), with 56 from the South (31.3%), 53 from the West (29.6%), 53 from the Midwest (29.6%), and 17 from the Northeast (9.5%).

CORE COMPETENCIES

Regarding the 6 ACGME core competencies, most interns believed that the new duty-hour regulations will decrease their ability to achieve continuity with hospitalized patients (80.3%), and approximately half of all interns believed that the changes will decrease the coordination of patient care (57.6%) and acquisition of medical knowledge (48.0%). Surgery interns were less pessimistic in other areas, however, with most reporting that the new duty-hour changes will increase or not change the following competencies: quality and safety of patient care (66.5%); residents' ability to effectively communicate with patients, families, and other health professionals (72.1%); residents' investigation and self-evaluation of their own patient care (74.7%); and residents' responsiveness to patient needs that supersede self-interest (70.2%) (**Table 1**).

SURGICAL EDUCATION

Most of the surgical interns (67.4%) believed that the duty-hour limits will decrease their time spent in the operating room. However, interns were split in their beliefs about how the new standards might change their development of surgical skills (52.8% believe it will decrease), time spent with patients on the floor (52.8% believe it will decrease), and their overall educational experience (51.1% believe it will decrease). Nearly two-thirds (61.5%) of interns believed that the new standards will decrease resident fatigue (**Figure**).

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Table 1. Views on How the New Duty Hours Will Affect the ACGME Core Competencies and Additional Aspects of Graduate Medical Education

	No. (%) of Respondents[a]						
	Surgery Interns			Surgery Program Directors[b]			
Item	Decrease	No Change	Increase	Decrease	No Change	Increase	*P* Value
Patient care	60 (33.5)	69 (38.5)	50 (27.9)	88 (65.7)	42 (31.3)	4 (3.0)	<.001
Medical knowledge	86 (48.0)	67 (37.4)	26 (14.5)	103 (76.9)	22 (16.4)	9 (6.7)	<.001
Practice-based learning and improvement	45 (25.3)	75 (42.1)	58 (32.6)	89 (66.4)	40 (29.9)	5 (3.7)	<.001
Interpersonal and communication skills	50 (27.9)	92 (51.4)	37 (20.7)	94 (70.1)	36 (26.9)	4 (3.0)	<.001
Professionalism	53 (29.8)	83 (46.6)	42 (23.6)	102 (76.1)	26 (19.4)	6 (4.5)	<.001
Systems-based practice	102 (57.6)	52 (29.4)	23 (13.0)	117 (87.3)	15 (11.2)	2 (1.5)	<.001
Continuity with hospitalized patients	143 (80.3)	31 (17.4)	4 (2.2)	121 (90.3)	10 (7.5)	3 (2.2)	.04
Resident fatigue	110 (61.5)	45 (25.1)	24 (13.4)	20 (14.9)	104 (77.6)	10 (7.5)	<.001

Abbreviation: ACGME, Accreditation Council for Graduate Medical Education.
[a] Percentages have been rounded and might not total 100. Numbers may not sum to 179 because not all respondents answered all the questions.
[b] Described in Antiel et al.[7]

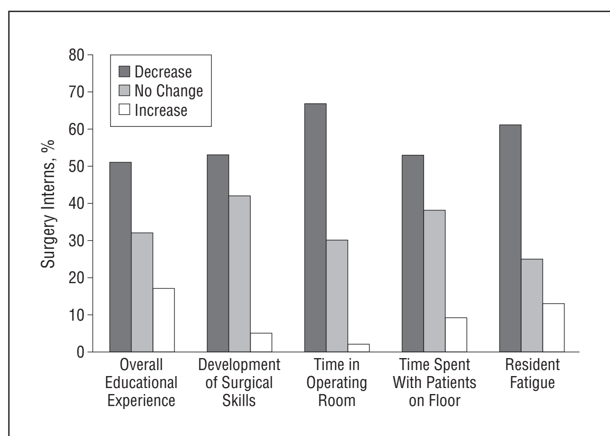

Figure. Surgical interns' views on how the new Accreditation Council for Graduate Medical Education duty-hour regulations will affect aspects of graduate medical education.

VARIATION AMONG INTERNS

In multivariable logistic regression analyses, female interns were less likely than male interns to believe that the new distribution of duty hours would decrease resident fatigue (OR, 0.5 [95% CI, 0.2-0.9]). Interns who were 30 years or older were less likely than their younger colleagues to believe that the duty-hour changes would decrease surgical skills (OR, 0.4 [95% CI, 0.2-0.9]) (**Table 2**).

Surgery interns in Midwestern programs, in comparison with southern programs, were significantly less likely to believe that the duty-hour changes would decrease the quality of patient care (OR, 0.3 [95% CI, 0.1-0.7]) or communication skills (OR, 0.4 [95% CI, 0.2-0.9]) (**Table 3**). Midwestern interns were also significantly more likely to believe that the changes would decrease resident fatigue (OR, 4.7 [95% CI, 1.8-11.8]) (Table 2).

Finally, compared with preliminary interns, categorical interns were more likely to believe that the changes would decrease both the quality and safety of patient care (OR, 2.6 [95% CI, 1.3-5.2]). Categorical interns were also less likely to believe that resident fatigue would decrease (OR, 0.5 [95% CI, 0.2-0.9]) (Table 2).

COMPARISON WITH PROGRAM DIRECTORS

Compared with a national sample of surgery program directors,[7] a significantly higher proportion of interns believed that the new changes would improve or not change residents' performance in the following competencies: quality and safety of patient care; residents' ability to effectively communicate with patients, families, and other health professionals; residents' investigation and self-evaluation of their own patient care; and residents' responsiveness to patient needs that supersedes self-interest ($P < .001$ for all comparisons) (Table 1). Likewise, although most interns and program directors agreed that the new changes will decrease coordination of patient care and residents' acquisition of medical knowledge, a significantly larger proportion of program directors expressed these views compared with interns (87.3% vs 57.0% [$P < .001$] and 76.9% vs 48.0% [$P < .001$]), respectively.

Interns and program directors agreed that the new regulations would decrease continuity of care (80.3% vs 90.3% [$P = .04$]). However, although most interns (61.5%) believed that the new changes would decrease fatigue, program directors overwhelmingly believed (85.1%) that fatigue would remain unchanged or increase with the new standards ($P < .001$) (Table 1).

COMMENT

This study provides important insights into the attitudes of the first class of surgical interns who have begun their training under the new 2011 duty-hour regulations. In this multisite assessment, surgical interns reported substantial concerns regarding the potential effect of the duty-hour changes on coordination and continuity of care, acquisition of medical knowledge, time spent in the operating room, development of surgical skills, and their overall educational experience. However, interns were more optimistic than program

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Table 2. Odds That Non–Core Competency Aspects of Graduate Medical Education Will Decrease Because of the New ACGME Duty Hours[a]

Resident Characteristic	Aspects of Graduate Medical Education, OR (95% CI)				
	Continuity of Care	Resident Fatigue	Development of Surgical Skills	Time in the Operating Room	Time With Patients on the Floor
Sex					
Male	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
Female	1.3 (0.6-3.2)	0.5 (0.2-0.9)[b]	1.1 (0.5-2.1)	1.7 (0.8-3.6)	1.0 (0.5-1.9)
Age, y					
<30	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
≥30	0.7 (0.3-1.8)	1.2 (0.5-2.8)	0.4 (0.2-0.9)[b]	0.6 (0.3-1.3)	0.9 (0.4-1.9)
Region					
South	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
West	0.5 (0.2-1.4)	1.5 (0.7-3.5)	0.7 (0.3-1.5)	1.0 (0.4-2.2)	0.7 (0.3-1.5)
Northeast	0.4 (0.1-1.5)	1.7 (0.5-5.3)	3.1 (0.9-11.4)	1.9 (0.5-6.7)	1.2 (0.4-3.8)
Midwest	1.1 (0.4-3.1)	4.7 (1.8-11.8)[b]	1.0 (0.5-2.3)	1.6 (0.7-3.7)	1.9 (0.9-4.3)
Program type					
Preliminary	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
Categorical	1.8 (0.8-3.8)	0.5 (0.2-0.9)[b]	1.4 (0.7-2.6)	0.6 (0.3-1.2)	0.9 (0.5-1.7)

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; OR, odds ratio.
[a] All ORs have been adjusted for the other variables.
[b] $P < .05$.

Table 3. Odds That ACGME Core Competencies Will Decrease Because of the New ACGME Duty Hours[a]

Resident Characteristic	ACGME Core Competencies, OR (95% CI)					
	Patient Care	Medical Knowledge	Practice-based Learning and Improvement	Communication Skills	Professionalism	Systems-based Practice
Sex						
Male	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
Female	1.1 (0.5-2.2)	1.1 (0.6-2.1)	1.3 (0.6-2.8)	1.4 (0.7-2.9)	0.6 (0.3-1.2)	1.1 (0.5-2.2)
Age, y						
<30	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
≥30	0.8 (0.3-1.8)	1.3 (0.6-2.8)	0.6 (0.2-1.5)	0.4 (0.2-1.2)	0.6 (0.2-1.4)	1.1 (0.5-2.3)
Region						
South	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
West	0.6 (0.3-1.3)	1.1 (0.5-2.3)	1.4 (0.6-3.4)	0.7 (0.3-1.7)	1.0 (0.4-2.3)	0.7 (0.3-1.7)
Northeast	0.7 (0.2-2.2)	1.0 (0.3-3.1)	0.6 (0.1-2.3)	0.6 (0.2-2.1)	1.3 (0.4-4.5)	0.4 (0.1-1.2)
Midwest	0.3 (0.1-0.7)[b]	1.1 (0.5-2.5)	0.5 (0.2-1.2)	0.4 (0.2-0.9)[b]	1.0 (0.4-2.4)	0.3 (0.1-0.8)
Program type						
Preliminary	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]	1.0 [Reference]
Categorical	2.6 (1.3-5.2)[b]	1.2 (0.7-2.2)	1.3 (0.6-2.7)	1.5 (0.8-3.1)	1.8 (0.9-3.6)	2.1 (1.1-4.1)[b]

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; OR, odds ratio.
[a] All ORs have been adjusted for the other variables.
[b] $P < .05$.

directors regarding the implications of the new duty-hour restrictions on all aspects of surgical training.

Many concerns regarding duty-hour restrictions have been raised within the surgical specialties. After the 2008 Institute of Medicine report recommended further work-hour restrictions,[9] the American Board of Surgery, the American College of Surgeons, the Resident and Associate Society of the American College of Surgeons, and the Association of Program Directors in Surgery all issued statements opposing additional work-hour restrictions.[10-13] These statements emphasized the following major concerns: the lack of evidence that extended resident work hours negatively affect patient safety; the contrary evidence suggesting that work-hour restrictions have no or negative effects on the safety of surgical patients; the adverse effects of work-hour restrictions on continuity of care; the decrease in residents' operative volumes and postoperative patient care experiences; and the limitations on residents' ability to prepare for the professional and ethical obligations of realistic surgical practice after residency training.

The American Board of Surgery statement concluded that the Institute of Medicine recommendations were "incompatible with the realities of surgical resident training."[11] Given the unique requirement of surgical trainees to develop technical skills and clinical reasoning,

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surgeons have instead called for specialty-specific flexibility within work-hour regulations.[11,14] This sentiment within the surgical community may explain, in part, why program directors were more pessimistic than new interns regarding the new duty-hour standards.

Surgical interns raised important concerns about continuity of care under the new duty-hour rules. This view is to be expected because the national discussion has emphasized the negative implications of increased "handoffs" resulting from fewer work-hours.[15-17] However, interns' reservations about their acquisition of medical knowledge under the new rules are more surprising because time away from the hospital for individual study is believed to be one of the benefits of work-hour reduction.[18] Although our study cannot confirm the reasons for these views, interns may believe that decreased patient exposure will impair their ability to acquire medical knowledge.

Surgical interns' belief that their time in the operating room will decrease under the new work-hour restrictions may stem from previous studies demonstrating reduced operative experience after the 2003 duty-hour regulations.[19-22] Surgical subspecialty fellowships are one solution to decreased exposure in residency, but surgical training is already lengthy. These concerns, coupled with program directors' concerns, raise a significant issue for surgical patients. Like other fields of medicine that care for the critically ill, changes in surgical patients' status often occur quickly, making continuity of care a critical issue for patient safety and education.[11]

Interns and program directors disagreed about the likely effect of further duty-hour reductions on resident fatigue. This difference in opinion may reflect program directors' understanding that fatigue is influenced by factors other than the absolute number of hours worked[23]; workload and residents' psychological well-being also contribute.[24] Program directors may be concerned that work typically performed by residents will be compressed into shorter periods, thus increasing work intensity and resident stress. Potential benefits of the new work-hour restrictions for relieving fatigue could be offset by the high-pressure environment that results when too few residents are present to safely and adequately perform the clinical duties required. Adding midlevel providers (at a great financial cost) may help with some aspects of patient care but will not replace lost educational opportunities.

Several important limitations of this study should be considered. Attitudinal associations may not be stable. In other words, if these same residents were surveyed after their intern year, their attitudes may have changed. However, the explicit purpose of this study was to understand up front the perceptions of incoming interns as they experienced implementation of the new standards. Selection bias may also be present because surgical programs were not selected at random. We included just 2 programs from the northeast region. Furthermore, the survey of program directors included nearly all US programs, whereas the survey of interns was obtained from a smaller sample of mainly university programs in which an investigator was available to distribute the instrument. Although our response rate was high, it is possible that the attitudes of respondents and nonrespondents differ. Finally, surveys do not provide definite evidence of the effect of work-hour regulations on surgical training, but no standardized tool is currently agreed upon to measure the effect of these regulations on surgical education. Surveys of those intimately involved in surgical education may be the best metric available. If surgical residents and educators do not believe in these policies, they may lead to discontent, disengagement, and dishonesty in reporting hours.

Notwithstanding these limitations, this study provides important insights into the perceptions of new surgical interns who constitute the first group to begin their training under the new 2011 work-hour restrictions. As residency programs attempt to adapt to the new regulations, surgical interns have significant concerns about the implications of these regulations on their training. The opinions of these interns, although markedly more optimistic than those of surgical program directors, reflect a persistent concern within the surgical community regarding the effects of work-hour restrictions on surgical training.

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INVITED CRITIQUE

A Triumph of Hope Over Experience?

This study[1] suggests that surgery interns are more idealistic and hopeful about the ACGME 2011 duty-hour restrictions than their program directors, who, for the most part, felt that the recommendations in the 2008 Institute of Medicine report were "incompatible with the realities of surgical training," particularly for interns. Eliminating 2 important limitations of this study might have put the interns more "in sync" with the program directors. First, large university programs constituted 10 of the 11 programs surveyed. I suspect that those residents would be less concerned about duty-hour restrictions—because more of them subsequently chose to do fellowships and are less likely to go straight into general surgery practice—than those from nonuniversity or community programs. Second, preliminary interns constituted 42.5% of those surveyed, with no distinction made between those hoping to go into general surgery vs those on track for surgical subspecialties, anesthesia, or radiology. The general surgery–bound preliminary interns would most likely be more concerned about the restrictions than the others. In fact, the categorical interns surveyed were more concerned about continuity of care and less likely to believe that fatigue would decrease than preliminary residents. Regarding resident fatigue, many of the interns may not have realized that the loss of the "golden weekend" coupled with 6 straight days of 14-hour duty may be even more fatiguing than the work week before 2011. Interestingly, the differing perceptions of decreased continuity of care between interns and program directors barely met statistical significance.

The loss of surgical resident "ownership" of the patient and the promulgation of a shift-work mentality are concerns of every surgical educator. Even when ignoring the limitations of this study, I believe it shows that the "line in the sand" for the entire surgical community—residents and attendings—is no further resident duty-hour restrictions.

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1. Antiel RM, Van Arendonk KJ, Reed DA, et al. Surgical training, duty-hour restrictions, and implications for meeting the Accreditation Council for Graduate Medical Education core competencies: views of surgical interns compared with program directors. *Arch Surg*. 2012;147(6):536-541.

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