Impact of Duty Hour Regulations on Medical Students' Education: Views of Key Clinical Faculty

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BACKGROUND: Teaching faculty have valuable perspectives on the impact of residency duty hour regulations on medical students.

OBJECTIVE: The objective of this study was to elicit faculty views on the impact of residency duty hour regulations on medical students' educational experience on inpatient medicine rotations.

DESIGN AND PARTICIPANTS: We conducted a National Survey of Key Clinical Faculty (KCF) at 40 internal medicine residency programs affiliated with U.S. medical schools using a random sample stratified by National Institutes of Health funding and program size.

MEASUREMENTS: This study measures KCF opinions on the effect of duty hour regulations on students' education.

RESULTS: Of 154 KCF targeted, 111 responded (72%). Fifty-two percent of KCF reported worsening in the overall quality of students' education compared to just 2.7% reporting improvement ($p < 0.001$). In multivariate analysis adjusted for gender, academic rank, specialty, and years of teaching experience, faculty who spent ≥ 15 hours per week teaching were more likely to report worsening in medical students' level of responsibility on inpatient teams [odds ratio (OR) 3.1; 95% confidence interval (CI) 1.3–7.6], ability to follow patients throughout hospitalization (OR 3.2; 95% CI 1.3–7.9), ability to develop working relationships with residents (OR 2.3; 95% CI 1.0–5.2), and the overall quality of students' education (OR 3.3; 95% CI 1.4–8.1) compared to faculty who spent less time teaching.

CONCLUSION: Key clinical faculty report concerns about the impact of duty hour regulations on aspects of medical students' education in internal medicine. Medical schools and residency programs should identify ways to ensure optimal educational experiences for students within duty hour requirements.

KEY WORDS: medical students; residents; duty hours; key clinical faculty; internal medicine.

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In July 2003, the Accreditation Council for Graduate Medical Education (ACGME) implemented duty hour limitations for residents at accredited U.S. residency programs to reduce the risk of adverse events resulting from sleep deprivation among residents.¹ Studies evaluating the effect of these regulations have shown improvements in residents' well-being,^{2–4} but mixed effects on residents' education and patient care.^{2,5} Recent reports demonstrate decreased mortality among patients at Veterans Affairs hospitals after duty hour reform,⁶ but no change in mortality for Medicare patients in non-federal U.S. hospitals.⁷ Faculty have reported increased work loads and decreased satisfaction with teaching as a result of duty hour limits.^{8–10} However, few studies have evaluated the effect of residency duty hour regulations on the educational experience of medical students.

Students at U.S. medical schools receive much of their clinical education in internal medicine on inpatient hospital services, and residents provide a substantial portion of inpatient teaching for medical students on these services.¹¹ Reductions in residents' duty hours may adversely affect medical students' education by decreasing residents' availability for teaching and mentoring students.¹² Conversely, reducing residents' duty hours may enhance students' education because residents may be more effective teachers when well rested.¹³ Furthermore, in 2004, the Liaison Committee on Medical Education indicated that medical students' duty hours should be monitored and should not exceed that of residents.¹⁴

Initial studies evaluating the effect of residency duty hour regulations on medical students' education at single institutions have shown mixed results with some studies reporting decreased student satisfaction with teaching and clerkships^{15,16} and others demonstrating unchanged or improved satisfaction or time available for teaching.^{16–19} A national survey of clerkship directors by Kogan et al.²⁰ highlighted clerkship directors' concerns about potential adverse effects of duty hour regulations on time for teaching, "shift-work mentality", and students' continuity with teams.

Teaching faculty have valuable perspectives on the impact of duty hour changes, yet few studies have included faculty views. We sought to elicit the perspectives of faculty who have been identified by program directors as having substantial resident contact and administrative responsibilities in residency programs. Therefore, we surveyed a national sample of "key clinical faculty" (KCF) at internal medicine residency programs affiliated with U.S. schools of medicine, as defined by the ACGME.²¹ We previously reported KCF perspectives on

the impact of duty hour reform on residents and faculty.¹⁰ In this study, we examine the views of these teaching faculty on the effect of duty hour regulations on medical students' educational experience in the inpatient setting.

METHODS

We conducted a national survey of a stratified random sample of 154 key clinical faculty at 40 ACGME-accredited categorical internal medicine residency programs affiliated with schools of medicine in the United States. This study was approved by the Johns Hopkins Medical Institutions Review Board.

Study Population: Key Clinical Faculty

We sought to survey faculty physicians who have a high degree of contact with residents and medical students on inpatient internal medicine hospital services. The Residency Review Committee of the ACGME requires internal medicine residency programs to designate institutionally based key clinical faculty (KCF).²¹ These faculty are required to dedicate at least 15 hours per week to teaching residents on average throughout the year.²¹ KCF is a residency program designation that does not require specific teaching responsibilities for medical students. Each internal medicine program has between 4 and 10 KCF depending on program size.

Sampling

The aim of this study was to characterize KCF views on the effect of duty hour reform on medical students' education at residency programs affiliated with medical schools. Although community-based residency programs are responsible for a substantial portion of residency education and often have medical students on inpatient rotations, we chose to sample KCF from among the primary academic residency programs affiliated with the 125 U.S. medical schools to elicit views from KCF who regularly interact with trainees.

To obtain a sample representative of all academic residency programs affiliated with schools of medicine, we stratified schools of medicine by National Institutes of Health (NIH) funding and residency program size. First, we stratified all 125 medical schools in the United States by dollars of research funding received from the NIH in the 2004 fiscal year.²² Second, we divided medical schools into two groups: those in the top half of NIH awards and those in the lower half of NIH awards. Third, we stratified each of these two groups by the total number of ACGME-approved internal medicine resident positions for the 2004 academic year (greater than or equal to the median number of resident positions versus less than the median number of resident positions).²³ We then used a computer-generated table of random numbers to select 10 schools of medicine from each of the 4 strata. Finally, we identified the categorical internal medicine residency program affiliated with each of the 40 schools of medicine using the ACGME website.²³ If more than one residency program was affiliated with a school of medicine, the program with the greatest number of resident rotations at the primary hospital affiliated with the school of medicine was selected. We contacted directors of selected residency programs using postal and e-mail addresses provided on the ACGME website and

asked them to supply contact information for 4 KCF in their program, as designated to the ACGME. If a program director declined to provide KCF contact information, another program was randomly selected using the same sampling process. Two programs declined to provide KCF contact information and were thus replaced by 2 randomly selected programs. One program provided only 2 KCF, and 1 program agreed to participate but then did not provide contact information for their KCF before the conclusion of data collection; therefore, a total of 154 key clinical faculty from 39 programs were included in the sample.

Survey Development, Content, and Administration

The survey instrument was developed by a team of medical education researchers and clinical faculty. Content validity was demonstrated using an iterative process and repeated rounds of pilot testing among groups of clinical faculty who frequently teach students and residents in the inpatient setting and who would not be study participants. Survey content was modified based on faculty feedback. The survey assessed faculty characteristics including demographics, academic rank, number of years teaching as a faculty member, and the average number of hours per week spent teaching. The survey also assessed faculty opinions about the impact of residents' duty hour regulations on aspects of medical students' educational experience on inpatient teams. We did not ascertain faculty time spent specifically teaching students. Faculty opinions regarding the impact of duty hour regulations on students' education were measured using 5-point Likert scales (improved a lot, improved a little, no change, worsened a little, worsened a lot). The survey was sent to faculty members by mail in May 2005. To encourage full participation, non-respondents were contacted by repeat mailings, electronic mail, and telephone calls.

Data Analysis

We used descriptive statistics to summarize responses to all survey questions. We used the sign test to evaluate whether faculty were more likely to report "worsening" vs. "improvement." We applied the sign test to the 5 category outcome by assigning "-2" to "worsened a lot" and "-1" to "worsened a little", "0" to "no change", and "+1" to "improved a little" and "+2" to "improved a lot."²⁴ The findings are presented as 3 categories for ease of presentation (worsened a lot and worsened a little, no change, improved a little and improved a lot).

We performed bivariate and multivariable analyses using general estimating equations (GEE)²⁵ to identify faculty characteristics associated with views of the effect of the duty hour regulations on medical students. GEE was selected to account for the potential correlation of faculty observations within medical schools. Faculty views of the impact of duty hours on medical students' education was the outcome variable, dichotomized as worsened a little and worsened a lot versus no change, improved a little, and improved a lot. Faculty covariates included gender, specialty (general internal medicine versus subspecialty internal medicine), years of experience teaching, and hours per week spent teaching on average (less than 15 hours per week versus 15 hours per week or more). Model variables were examined for evidence of co-linearity. All covariates were included in full model regressions. Results are

reported as adjusted odds ratios (OR) with 95% confidence intervals (CIs). Data were analyzed using STAT 8.0 (STATA Corp., College Station, Texas).

RESULTS

Faculty Characteristics

Of 154 faculty surveyed, 111 responded (72.1%). A majority (69%) of faculty were male, and approximately half (57%) held an academic rank of Associate Professor or Professor (Table 1). The distribution of KCF gender and academic rank in this sample was similar to all faculty at U.S. medical schools.²⁶ Three quarters of faculty had 5 or more years of experience teaching. More than half of faculty spent an average of 15 hours or more per week teaching, and 29% spent more than 20 hours per week teaching on average.

Faculty Views of Impact of Duty Hour Regulations on Medical Students' Education

Approximately half (51.8%) of faculty reported worsening in the overall quality of the educational experience for medical students on inpatient internal medicine services as a result of duty hour regulations compared to just 2.7% reporting improvement ($p < 0.001$, Fig. 1). However, 45.5% of faculty felt that the overall quality of medical students' educational experience had not changed. Fifty-six percent of faculty believed that medical students' ability to develop working relationships with residents had worsened as a result of residents' duty hour regulations ($p < 0.001$). One third of faculty perceived a decline in medical students' level of responsibility on inpatient teams, and 30% felt that medical students' ability to follow individual patients throughout hospitalization had worsened (both $p < 0.001$). However, a majority of faculty did not perceive a change

in these 2 outcomes. Less than 10% of faculty reported improvement in any of the 4 outcomes of medical students' education studied (Fig. 1).

Influence of Time Spent Teaching on Faculty Views of the Impact of Duty Hours Regulations

Figure 2 shows the views of KCF who spent ≥ 15 hours per week on average teaching compared to those who taught < 15 hours per week. In multivariate analysis using GEE adjusted for gender, academic rank, specialty, and years of teaching experience, faculty who spent ≥ 15 hours per week on average teaching were more likely to report worsening in medical students' level of responsibility on inpatient teams (OR 3.1; 95% CI 1.3–7.6), ability to follow individual patients throughout hospitalization (OR 3.2; 95% CI 1.3–7.9), ability to develop working relationships with residents (OR 2.3; 95% CI 1.0–5.2), and the overall quality of medical students' educational experience on inpatient internal medicine rotations (OR 3.3; 95% CI 1.4–8.1) compared to faculty who spent fewer than 15 hours per week teaching. We did not find any significant associations between faculty views and faculty gender, academic rank, specialty, or years of teaching experience.

DISCUSSION

We report the perspectives of a national sample of teaching faculty regarding the impact of residency duty hour regulations on medical students' education at 39 U.S. schools of medicine with affiliated academic internal medicine residency programs. While faculty were more likely to report worsening than improvement in all the outcomes studied, a substantial proportion of faculty did not perceive a change in most aspects of medical students' education.

More than half of key clinical faculty reported worsening in the overall quality of the educational experience for medical students on inpatient internal medicine clerkships as a result of duty hour regulations, while less than 3% reported improvement. The adverse effects of duty hour regulations on medical students' educational experience may have important implications for the recruitment of students to internal medicine because students' career choice is influenced, in part, by their satisfaction with internal medicine clerkships in medical school.^{27–29} Our results suggest that students may experience decreased levels of responsibility, less continuity with patients, and poorer relationships with residents in medicine clerkships as a result of duty hour reform, all of which may attenuate students' interests in internal medicine.

Approximately one third of faculty in this study believed that students' ability to follow patients throughout hospitalization had worsened as a result of duty hour reform. Continuity with individual patients is an important element of clinical skills training for medical students.³⁰ Residency duty hour regulations may result in decreased patient care experiences for students because students are working limited hours similar to residents,³¹ and therefore may not be present for certain clinical experiences, or residents have less time available to supervise students' clinical activities. Additionally, duty hour regulations may have increased the work load of clinical faculty,^{8,10,32,33} making it unlikely that faculty will have

Table 1. Characteristics of 111 Teaching Faculty Respondents

Characteristic	KCF (%)*
Age, mean (SD)	44 years (9.7)
Male	77 (69%)
Specialty	
General internal medicine	63 (57%)
Subspecialty	48 (43%)
Academic rank	
Instructor	3 (3%)
Assistant professor	45 (40%)
Associate professor	38 (34%)
Professor	25 (23%)
Years of experience teaching or supervising residents	
0–5 y	26 (24%)
6–10 y	29 (26%)
11–15 y	19 (17%)
16–20 y	17 (15%)
>20 y	20 (18%)
Average number of hours per week teaching or supervising residents†	
≤5 h	5 (5%)
6–10 h	29 (26%)
11–14 h	15 (14%)
15–20 h	28 (26%)
>20 h	32 (29%)

*No. of Key Clinical Faculty (%) except as noted

†Data missing for 2 faculty

Figure 1. Faculty views on the impact of duty hour regulations on medical students' education. Sign test $p < 0.001$ for all outcomes

additional time available to supervise students. To improve continuity with patients in the era of duty hour reform, medical schools may encourage students to follow individual patients longitudinally throughout a variety of ambulatory and inpatient clinical encounters during the principal clinical year, as was done in the Harvard Medical School–Cambridge Integrated Clerkship model.³⁴

A substantial portion (45%) of KCF surveyed did not meet the teaching requirement (≥ 15 hours per week on average) established by the ACGME. Faculty who met the ACGME requirement were significantly more likely to perceive adverse effects of duty hour limits on medical students' education than faculty with less teaching responsibilities. Our results do not suggest an explanation for this observation; however, we

Figure 2. Influence of time spent teaching on faculty views of the impact of duty hours regulations

speculate that faculty with the greatest involvement in teaching may have more opportunities to observe the effects of duty hour changes on medical students' education. Additionally, these faculty may be more likely to experience potential adverse effects of ACGME duty hours on their own careers such as increased workload and decreased satisfaction,^{8,9,10} making them more sensitive to duty hour issues. Finally, the 2004–2005 academic year (when our survey was conducted) was a period of adjustment for many programs, as faculty struggled to adapt to this major policy shift in graduate medical education. Highly involved teaching faculty may have experienced temporary resistance to this substantial change,³⁵ and views may be different once faculty have fully adjusted to the new requirements.

This study has several limitations. First, this is an observational study that relies on self-report of faculty regarding the impact of duty hour limitations on students' education. Second, this is a study of faculty at academic residency programs affiliated with medical schools; therefore, their views may not reflect those of faculty at community-based programs where a substantial portion of medical student education occurs.³⁶ Third, although we demonstrate some degree of content validity for survey items based on our iterative process of survey development among teaching faculty, we do not provide any measure of criterion validity for survey items. Fourth, we did not collect data on teaching methods (e.g., didactic vs. bedside), and therefore, we can not examine differences in KCF views based on this variable. Fifth, we categorized KCF specialties as general internal medicine versus subspecialty internal medicine; we did not ask faculty whether they were hospitalists. Finally, this survey was conducted 1 y after ACGME duty hour requirements were instituted, and it is likely that some programs may not have achieved full compliance.³⁷

These limitations notwithstanding, the results of this study indicate that key clinical faculty believe duty hour regulations have worsened important aspects of medical students' education in internal medicine. Medical schools and residency programs must identify ways to ensure optimal educational experiences in internal medicine for medical students while maintaining compliance with residency duty hour requirements.

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Conflict of Interest: None disclosed.

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