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Survey of Internal Medicine Physicians Trained in Three Different Eras: Reflections on Duty-Hour Reform

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Abstract

Objectives—To survey internal medicine physicians and residents who have completed residency in three different eras of medical training regarding their experiences during their intern year and their perceptions of duty-hour reform.

Methods—An online survey was administered to 268 residents, fellows, and staff physicians who had completed or were completing residency during one of three eras of training: before the 80-hour work week, after the 80-hour work week (instituted in 2003), and after the 16-hour limit on continuous shifts for interns (instituted in 2011). The survey assessed experiences during their intern year of residency and perceptions regarding resident duty-hour reform.

Results—The majority of respondents ($n = 32$; 54%) indicated that duty-hour restrictions would result in residents being less prepared for their future careers. In addition, 36% ($n = 21$) of respondents anticipated a decrease in the quality of patient care under the restricted duty hours. A total of 41% ($n = 24$) were undecided regarding the impact of duty-hour reform on patient care. Respondents reported time spent on independent study, research, and conference attendance did not increase following the institution of duty-hour restrictions.

Conclusions—Survey responses indicated that after 18 months of experience with the Accreditation Council for Graduate Medical Education duty-hour restrictions, physician opinions were mixed and a substantial number remain undecided regarding the impact of duty-hour restrictions on resident career preparedness and the quality of patient care.

Keywords

duty-hour reform; duty-hour restrictions; medical education; internal medicine residency; career preparedness

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In 2003 the Accreditation Council for Graduate Medical Education (ACGME) placed restrictions on the number of hours worked by resident physicians, limiting the work week to 80 hours averaged across 4 weeks.¹ These restrictions resulted in a structural change to many residency programs in which residents had previously routinely exceeded the 80-hour work week. It also initiated a debate about the ability to care for patients and to educate future physicians under the new guidelines.

After the institution of duty-hour restrictions in 2003, internal medicine (IM) residents reported spending less time teaching.² Satisfaction among residents within the clinical environment improved,³ and small improvements in residents' quality of life were reported.⁴ Residents did not develop a shift work mentality and were found to place the highest value on delivering high-quality patient care.⁵

In July 2011, further duty-hour restrictions went into effect, which had the largest impact on interns (postgraduate year 1), limiting their continuous duty hours to 16, and continuing to restrict the work week to 80 hours averaged across 4 weeks. Senior residents (postgraduate year 2 and up) are allowed to work 24 hours of continuous duty plus an additional 4 hours to complete work from a previous shift. As a result of these changes, the medical community is assessing the impact on resident education and the quality of patient care and safety.

Residents and residency program directors held mixed opinions of the proposed duty-hour restrictions before 2011. The majority of IM residents surveyed anticipated further duty-hour restrictions would "occasionally," "usually," or "always" improve patient care,⁶ with 66.99% indicating that resident fatigue (66.9%) "occasionally" could cause medical errors.⁶ Fifty-five percent of IM program directors anticipated that further duty-hour restrictions would result in either an increase or no change in patient safety, whereas 45% anticipated that patient safety would decrease.⁷ Although 82.2% of program directors believed the proposed duty-hour restrictions would have an adverse effect on the clinical experience during their intern year, the majority anticipated no change in the quality of fellowship applicants from residency programs.⁷

Studies piloting schedules in compliance with the 2011 ACGME duty-hour restrictions were completed before July 2011 and indicated that results were mixed regarding resident education, with one study finding resident education was not impaired based on resident performance on a postrotation examination.⁸ Another study found that residents were less likely to attend educational conferences under the pilot schedule.⁹ Neither study found a significant difference in patient care quality metrics, including mortality or length of stay.^{8,9}

The purpose of this study was to survey IM physicians and residents who will have completed their residency in three different eras of medical training and compare responses among groups with respect to experiences during their intern year and perceptions of duty-hour reform. Physicians' experience during their intern year and current career stage will affect their perceptions; therefore, understanding one another's perceptions of duty-hour reform will help the medical community work together to adapt to the challenges presented by duty-hour reform.

Methods

The Mayo Clinic institutional review board reviewed this study and determined it to be exempt. In January 2013, 268 residents, fellows, and staff physicians who completed or were completing their IM residency at the Mayo Clinic in Rochester, Minnesota, were sent an electronic survey via e-mail to assess their perceptions regarding resident duty-hour restrictions and their experiences during their intern year of residency in three different eras of medical training (online-only appendix, <http://links.lww.com/SMJ/A24>). To be eligible, subjects must have been an IM intern at the Mayo Clinic during one of the three study periods. The alumni association identified survey recipients who had completed their IM residency.

The survey respondents were divided into three groups based on the start date of their intern year, 1996–1999 (group 1), 2004–2006 (group 2), and July 2011 (group 3). Group 1 trained before the institution of the 80-hour work week. Group 2 trained during the era of the 80-hour work week, and group 3 completed their intern year with a 16-hour limit on continuous duty hours and an 80-hour work week. Physicians who trained between 2000–2003 and 2007–2010 were not included to avoid surveying physicians who may have trained under pilot schedules compliant with duty-hour restrictions before the mandatory institution of either phase of duty-hour reform.

Survey

Our research team developed the survey instrument based on a review of the literature and faculty input. Domains included training era, current employment, residency experience, and perceptions regarding the effect of duty-hour restrictions on career preparedness and quality of patient care (appendix, <http://links.lww.com/SMJ/A24>). Participation in the survey was voluntary and all of the responses were deidentified to protect the privacy of each respondent. The Mayo Clinic Survey Research Center independently managed the collection of data on our behalf. Study data were recorded and managed using the REDCap (Research Electronic Data Capture) system.¹⁰ This system is a secure, Web-based application designed to support data capture for research studies, providing an intuitive interface for validated data entry, audit trails for tracking data manipulation and export procedures, automated export procedures for seamless data downloads to common statistical packages, and procedures for importing data from external sources.¹⁰

Statistical Analysis

Survey responses were analyzed using JMP Pro 10.0.0 software (SAS Institute, Cary, NC). The χ^2 test of independence was used to assess the relation between training year group and response to individual survey questions. $P < 0.05$ was considered statistically significant.

Results

Responses were received from 63 (23.5%) survey respondents. Of these respondents, four were excluded because they began their IM residency training outside of the prespecified intervals. Of the remaining 59 respondents, 16 (27%) indicated they began training between 1996 and 1999 (group 1), 22 (37%) began training between 2004 and 2006 (group 2), and 21

respondents (group 3; 36%) began training after July 2011 (Table 1). The response rate from group 1 was 16%, group 2 was 18%, and group 3 was 44%. The majority of survey respondents indicated they work in an academic practice ($n = 43$; 73%). The majority of survey respondents consisted of practicing physicians working in both inpatient and outpatient settings ($n = 23$; 39%) and resident physicians ($n = 21$; 36%). The remaining respondents were fellows ($n = 7$; 12%), practicing physicians in an outpatient setting ($n = 4$; 7%), and practicing physicians in an inpatient setting ($n = 4$; 7%; Table 1). Overall, 92% ($n = 54$) of respondents indicated that patient care and related activities were the best or anticipated best preparation for their careers or future careers.

There was a trend toward working fewer hours per week on inpatient medicine as a result of the 2003 and 2011 duty-hour restrictions; however, this trend did not reach significance (Table 2). Respondents from group 3 reported admitting significantly fewer patients per on-call shift than groups 1 or 2 ($P < 0.0001$; Table 2). No relation was found among the reported number of hours per week spent on independent study, conference attendance, research, and era of training (Table 2). In addition, the average number of hours of sleep per night on noncall nights was independent of era of training. A trend toward interns achieving fewer hours of sleep per call night was observed following the 2003 and 2011 duty-hour restrictions (Table 2).

Fifty-four percent of respondents ($n = 32$) indicated that they anticipate that duty-hour restrictions will result in residents being less prepared for future careers, 22% ($n = 13$) anticipated that duty-hour restrictions will not affect resident preparedness, 7% ($n = 4$) anticipated that residents will be more prepared, and 17% ($n = 10$) were undecided. There was no relation between response to this question and era of training (Table 3).

Forty-four percent of physicians in group 1 indicated that it would be appropriate to lengthen the duration of residency training in response to duty-hour limitations, whereas none of the respondents in group 3 supported lengthening the duration of residency training (Table 3). Regarding the impact of duty-hour restrictions on the quality of patient care at teaching hospitals, 24% ($n = 14$) of survey respondents anticipated that the quality of care would improve, 36% ($n = 21$) anticipated it would decrease, and 41% ($n = 24$) were undecided (Table 3). Response to this question was independent of training era.

Discussion

After 18 months of experience with the 2011 ACGME duty-hour restrictions, the majority of respondents indicated they anticipate duty-hour restrictions would result in residents being less prepared for their future careers. This is consistent with concerns raised by a recent survey of residents from multiple specialties that the quality of resident education, preparation for more senior roles, and the safety of patient care were either unchanged or decreased following the implementation of duty-hour reform.¹¹

The response rate was too low to detect any significant differences among group perceptions of duty-hour reform; however, there was a trend toward respondents from groups 1 and 2 being more likely to indicate that duty-hour reform would result in residents being less

prepared for their future careers. Respondents from group 3 were more likely to be undecided about the impact of duty-hour reform on career preparedness, which is understandable because that is the only system they have known. In addition, respondents from group 1 were more likely to indicate that the duration of IM residency should be increased in response to duty-hour reform, whereas the majority of respondents from groups 2 and 3 indicated that no change in the duration of IM residency is necessary.

More than 90% of respondents indicated that patient care and related activities were the best form of career preparation. Survey responses indicated a trend toward interns working fewer hours per week and admitting fewer patients per on-call shift since the 2011 duty-hour restrictions were implemented. These trends are not unexpected given the shorter on-call shift length and limits on the number of admissions per call at the study institution to promote compliance with duty-hour regulations. Since July 2011, interns in inpatient general medicine at the study institution have used a 6-day call cycle, in which the night call shift has a late start (6 pm) to maintain compliance with the 16-hour shift limit. A night float system may result in more patient admissions per on call; however, current data are conflicting.^{12,13} It also is unknown whether the number of patient admissions during residency correlates with the quality of education that residents receive or with their preparedness for their future careers.

Respondents from group 3 reported getting less sleep while on call than respondents from groups 1 and 2; however, under the 16-hour restriction on continuous shifts, they have more time before and after call to sleep at home. One study found a nonsignificant trend toward increased sleep per 48-hour call period under schedules compliant with the 2011 ACGME duty-hour restrictions.¹³

Reduction in work hours was not associated with an increase in nonpatient care educational activities (research, independent study, conference attendance) or in sleep on noncall nights during their intern year. These findings are consistent with previous studies that noted that residents have fewer opportunities to attend teaching conferences¹³ and do not get any more sleep on noncall nights under the 2011 duty-hour restrictions.¹⁴ One possibility is that interns may be using at least some of their free time for personal activities (eg, spending time with family and friends). Despite potentially having more personal time, data regarding quality of life for interns since the 2011 duty-hour reform are conflicting, with one study suggesting the quality of life of senior residents has decreased.^{11,14}

Our study is not without limitations. One major limitation was the low response rate from survey recipients, which limited the reliability of statistical analyses. A reminder e-mail was sent 2 weeks after the initial e-mail inviting participation in the survey. Nonresponse bias could have affected survey results in that people with stronger opinions on the subject may have been more likely to complete the survey.

Another limitation was recollection bias, and this likely had the largest impact on physicians who trained from 1996 to 1999 when asked to recall information regarding their intern year. The exact number of admissions per call or hours worked per week was less important than confirming that the expected trend that work hours and admissions per call had decreased

under duty hours. The questions relating to perceptions of duty-hour reform were meant to be answered based on respondents' current perceptions, understanding that their previous experiences bias their answers.

The fact that this was a single-center study was another limitation. Experiences with duty-hour reform will vary significantly among institutions. Our primary goal was to examine how the era of training may influence perceptions of duty-hour reform. Most institutions will employ physicians who completed their medical training in all three eras surveyed; therefore, some trends observed herein are likely to be relevant at other institutions as well.

Conclusions

Although experiences with duty-hour reform will differ substantially among institutions, our study suggests that residents and practicing physicians still have mixed opinions regarding the impact of duty-hour restrictions on resident career preparedness and patient care. Physicians who trained before July 2011 tended to be more critical of duty-hour restrictions as they affect resident career preparedness and patient care than those who began their training after July 2011. This trend, however, did not reach statistical significance. In addition, a substantial number of respondents across all three groups remained undecided on the impact of duty-hour restrictions on patient care. Further study reviewing quantitative metrics such as American Board of Internal Medicine board certification pass rates, training examination scores, and patient care quality metrics is necessary to analyze the implications of duty-hour restrictions on both resident career preparedness and the quality of patient care. This type of study will help resolve the uncertainties that exist regarding the effects of duty-hour restrictions and minimize the impact of personal bias on physicians' impressions of duty-hour restrictions.

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Appendix 1. Survey Instrument

1. What year did you begin your Internal Medicine residency?
 1. 1996 to 1999
 2. 2004 to 2006
 3. July 2011 to present
 4. None of the above
2. Which of the following best describes your current level of employment?
 1. Resident
 2. Fellow
 3. Practicing physician, inpatient
 4. Practicing physician, outpatient
 5. Practicing physician, inpatient and outpatient
 6. Other, please specify:
3. Are you currently employed by Mayo Clinic?
 1. Yes
 2. No
 3. Other, please specify:
4. Do you see yourself working in an inpatient or outpatient setting in the future?

1. Inpatient
 2. Outpatient
 3. Both
 4. Other, please specify:
5. How many hours per week do you expect to work in your professional career?
1. Less than 60
 2. 60 to 70
 3. 71 to 80
 4. Greater than 80
6. Which of the following best describes the setting of your current medical practice?
1. Private practice
 2. Academic practice
 3. Other, please specify:
7. What activity during residency best prepared you (or do you anticipate will best prepare you) for your future career?
1. Patient care and related activities
 2. Attending lectures and conferences
 3. Independent study
 4. Other, please specify:
8. Approximately how many hours per week did you spend on patient care and related activities on inpatient general medicine as an intern?
1. 59 or less
 2. 60 to 70
 3. 71 to 80
 4. 81 or more
9. Approximately how many admissions per call did you have on inpatient general medicine as an intern?
1. 4 or less
 2. 5 to 10
 3. 11 or more
10. How many nights per 4-week month were you on-call on inpatient general medicine as an intern?
1. 4 or less

2. 5 to 10
 3. 11 or more
11. How many hours per week did you spend on independent study during your intern year?
1. 4 or less
 2. 5 to 10
 3. 11 or more
12. How many hours per week did you spend at lectures and conferences during your intern year?
1. 2 or less
 2. 3 to 5
 3. 6 or more
13. How many hours per week did you spend on research during your intern year?
1. 4 or less
 2. 5 to 10
 3. 11 or more
14. On average, how many hours of sleep did you get on a non-call night during your intern year?
1. 5 or less
 2. 6 to 8
 3. 9 or more
15. On average, how many hours of sleep did you get on a call night during your intern year?
1. None
 2. 1 or less
 3. 2 to 3
 4. 4 or more
16. What impact do you think duty hour restrictions will have on residents' preparation for their future careers?
1. Duty hour restrictions will result in residents being more prepared for their future careers.
 2. Duty hour restrictions will result in residents being less prepared for their future careers.

3. Duty hour restrictions will not impact resident preparedness for their future careers.
 4. Undecided
17. Which of the following changes to Internal Medicine Residency training do you believe would be most appropriate given the current duty hour restrictions?
1. The duration of residency should be increased.
 2. The duration of residency should be decreased.
 3. No change, the current system is appropriate.
 4. Undecided
18. How many hours per week do you currently spend on patient care and related activities?
1. 59 or less
 2. 60 to 70
 3. 71 to 80
 4. 81 or more
19. What impact do you think duty hour restrictions will have on patient care at teaching hospitals?
1. The quality of patient care will be improved.
 2. The quality of patient care will be decreased.
 3. Undecided
20. What factors contributed (or will contribute) most strongly to your choice of job after training?
1. Work schedule
 2. Research opportunities
 3. Geographic location of practice
 4. Salary
 5. Benefits (loan forgiveness, signing bonus, insurance plan, retirement plan)

Key Points

- The majority of respondents perceived that duty-hour reform would result in residents being less prepared for their future careers.
- The majority of respondents favored no change to the duration of internal medicine residency in response to duty-hour reform.
- More than 40% of respondents were still undecided regarding the impact of duty-hour reform on the quality of patient care.

Table 1

Demographic data for Mayo Clinic IM residency survey respondents, 2013

	Group 1 (1996–1999)	Group 2 (2004–2006)	Group 3 (July 2011)
What year did you begin your internal medicine residency training? (%)	16 (25)	22 (35)	21 (33)
Which of the following best describes your current level of employment? (%)			
Resident	0	0	21 (100)
Fellow	0	7 (32)	0
Practicing physician, inpatient	1 (6)	3 (14)	0
Practicing physician, outpatient	3 (19)	1 (5)	0
Practicing physician, inpatient and outpatient	12 (75)	11 (50)	0
Are you currently employed by Mayo Clinic? (%)			
Yes	8 (50)	9 (41)	21 (100)
No	8 (50)	13 (59)	0
How many hours per week do you currently spend on patient care and related activities? (%)			
59	8 (50)	8 (36)	1 (5)
60–70	6 (38)	11 (50)	9 (43)
71–80	2 (13)	1 (5)	9 (43)
81	0	2 (9)	2 (10)

IM, internal medicine.

Table 2

Survey respondents' experience during intern year of IM residency at Mayo Clinic

	Group 1 (1996–1999)	Group 2 (2004–2006)	Group 3 (July 2011)
How many hours per week did you spend on patient care and related activities on inpatient general medicine? (%)			
59	1 (6)	2 (9)	1 (5)
60–70	3 (19)	5 (23)	9 (43)
71–80	4 (25)	14 (64)	8 (38)
80	8 (50)	1 (5)	3 (14)
How many admissions per call did you have on inpatient general medicine? (%)			
4 admissions per call	2 (13)	6 (27)	17 (81)
5–10 admissions per call	14 (88)	16 (73)	4 (19)
How many hours per week did you spend on independent study? (%)			
4	7 (44)	14 (64)	8 (38)
5–10	9 (56)	6 (27)	9 (43)
11	0	2 (9)	4 (19)
How many hours per week did you spend at lectures and conferences? (%)			
2	0	2 (9)	0
3–5	10 (63)	14 (64)	15 (71)
6	6 (38)	6 (27)	6 (29)
How many hours per week did you spend on research? (%)			
4	15 (94)	16 (73)	15 (71)
5–10	1 (6)	3 (14)	3 (14)
11	0	3 (14)	3 (14)
On average, how many hours of sleep did you get on a noncall night? (%)			
5	2 (13)	2 (9)	2 (10)
6–8	14 (88)	20 (91)	19 (90)
On average, how many hours of sleep did you get on a call night? (%)			
1	3 (19)	9 (41)	18 (86)
2–3	13 (81)	13 (59)	3 (14)

IM, internal medicine.

Table 3

IM survey respondents' impressions of duty-hour restrictions, 2013

	Group 1 (1996–1999)	Group 2 (2004–2006)	Group 3 (July 2011)
What impact do you think duty-hour restrictions will have on residents' preparation for their future careers?			
Duty-hour restrictions will result in residents being more prepared	1 (6)	1 (5)	2 (10)
Duty-hour restrictions will result in residents being less prepared	10 (63)	14 (64)	8 (38)
Duty-hour restrictions will not affect resident preparedness	3 (19)	5 (23)	5 (24)
Undecided	2 (13)	2 (9)	6 (29)
Which of the following changes to IM residency training do you believe would be most appropriate given the current duty-hour restrictions?			
Duration of residency should be increased	7 (44)	6 (27)	0
Duration of residency should be decreased	0	0	0
No change, the current system is appropriate	4 (25)	12 (55)	18 (86)
Undecided	5 (31)	4 (18)	3 (14)
What impact do you think duty-hour restrictions will have on patient care at teaching hospitals?			
Quality of patient care will be improved	3 (19)	3 (14)	8 (38)
Quality of patient care will be decreased	8 (50)	8 (36)	5 (24)
Undecided	5 (31)	11 (50)	8 (38)

IM, internal medicine.