A National Cross-Sectional Study of Surgery Residents Who Underreport Duty Hours

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OBJECTIVE: Previous work demonstrates that many surgery residents underreport duty hours. The purpose of this study was to identify characteristics of these residents and better understand why they exceed duty hours.

DESIGN: During the winter of 2015 we conducted an anonymous cross-sectional survey of Accreditation Council for Graduate Medical Education accredited general surgery programs.

SETTING: A total of 101 general surgery residency programs across the United States.

PARTICIPANTS: A total of 1003 general surgery residents across the United States. Respondents' mean age was 29.9 ± 3.0 years; 53% were male.

RESULTS: Study response rate was 31.9%. Residents age <30 were more likely to exceed duty hours to complete charting/documentation (68% vs. 54%, $p < 0.001$). Females more often cited guilt about leaving the hospital (32% vs. 24%, $p = 0.014$) as to why they exceed duty hours. Programs with >40 residents had the highest rates of underreporting (82% vs. 67% in other groups $p < 0.001$) and residents who worked >90 hours on an average week more frequently cited external pressure ($p = 0.0001$), guilt ($p = 0.006$), and feeling it was expected of them ($p < 0.0001$) as reasons why they underreport compared to those who worked fewer hours.

CONCLUSIONS: Underreporting and duty-hour violations are a complex issue influenced by many variables including age, sex, and internal and external pressures. (J Surg Ed 74:928-933. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: underreporting, duty hour violations, graduate medical education

COMPETENCIES: Patient Care, Professionalism

INTRODUCTION

The Accreditation Council for Graduate Medical Education's (ACMGE) 2011 duty-hour reforms caused significant controversy in the medical education community.[1-5] Advocates of the reforms feel that they decrease medical errors and reduce resident fatigue[6]; critics argue that the reforms are detrimental to residents' education, increase hand-offs, and negatively affect patient care.[2,4] However, general surgery patient outcomes, resident examination performance, and readmission rates following these duty-hour reforms showed no significant change.[2-4] Thus, some have questioned the 2011 reforms and called for more flexible policies.[1,4,7] Relevant to past and current duty-hour policies are underreporting.

Underreporting is a known issue among residency programs, including general surgery.[1,5,8] We recently reported preliminary findings from a similar national study of general surgery residents where 72% of respondents underreported duty hours.[8] That study ran at the same time as the Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) Trial[4]; further, 52 of the hospitals enrolled in the FIRST Trial were dual-enrolled in our study.

A subsequent follow-up report from authors of the FIRST Trial confirms that multiple types of duty-hour violations were present in this study.[9] Many residents in this

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study attribute providing clinical care, completing documentation, and ward rounding as reasons behind duty-hour violations; however, this study was unable to explore what role internal and external pressures such as guilt or coercion may play.[9] Further, little is known regarding the characteristics of those who underreport and whether there are age-, sex-, or program-specific differences. Given the high rates of burnout, depression, substance abuse, and suicide among resident physicians across the country, it is important to better understand these characteristics and motivations.[10,11]

MATERIAL AND METHODS

We conducted a cross-sectional survey of general surgery residents enrolled in any ACGME-accredited US general surgery residency program during the winter of 2015. Program directors and coordinators from 256 programs were solicited via publicly available e-mail addresses. Programs that expressed an interest were enrolled and provided a hyperlink to an anonymous, online, Qualtrics-based questionnaire (Provo, UT) that could be forwarded to their residents. Programs that were not interested were excluded from further solicitation and programs that did not respond after a total of 3 solicitation attempts were presumed to be not interested; neither of these groups were given access to the survey. Our manner of solicitation was based on previously published methods.[1,5] Institutional review board approval for the study, survey vehicle, and solicitation material was received from The University of North Carolina at Chapel Hill (institutional review board 15-0053). To help ensure respondent anonymity, demographic questions were limited to age, sex, state, and residency program size; information regarding postgraduate year was not obtained. For individual survey questions, subjects who did not answer the question were excluded from the analysis. For bivariate analysis, chi-square tests were used to compare survey responses among different groups characterized by resident age, sex, region/program size of residency program, and self-reported average hours worked per week. For multivariable analysis, logistic regression models were used to examine the independent effects of each factor on dichotomized survey responses. The cut points for age (<30 vs. ≥ 30) were chosen because of median age of respondents (29.9); given the structure of the results, a cutoff of 30 resulted in the highest power for statistical comparisons. For program size, original questioning allowed for 6 possible categories (1-10, 11-20, 21-30, 31-40, 41-50, and >50); these groups were collapsed into 3 symmetrical groups (as opposed to dichotomization) to preserve the original order of size while increasing sample size of individual groups for analysis. These analyses were repeated using multiple cutoffs for age and program size, and the trends that were observed remained consistent. All analyses were conducted using SAS (SAS Institute, Cary, NC) version 9.4.

RESULTS

Participants

A total of 101 programs expressed interest and were provided with access to the survey. We received responses from 1003 of the total 3146 possible residents (31.9% response rate). Respondents represented 30 states across the United States, the District of Columbia, and Puerto Rico; 53.2% (534) were male and the average age was 29.9 years (standard deviation $\pm$ 3.0 y). Most residents (48.7%) were in programs of between 21 and 40 residents (Table 1).

Age

Given that the mean age of respondents was 29.9, respondents were split into the following 2 groups: less than 30 years old and 30 years or older in the analysis (Table 2). Respondents age 30 or older were not more likely to underreport duty hours in the bivariate analysis (74% vs. 69%, $p = 0.07$) but a difference became statistically significant after adjusting for other factors in the multivariable model with an adjusted odds ratio of 1.35 (1.02-1.80). Age was also found to be a significant predictor for some reasons why residents exceeded duty hours; residents younger than 30 more frequently cited charting and documentation (68% vs. 54%, $p < 0.001$) and preventing signing out unfinished tasks (84% vs. 75%, $p = 0.0002$).

TABLE 1. Respondent Demographics

	N	%
All	1003	100
Age		
<30	477	48
>30	503	50
Sex		
Female	466	46
Male	534	53
Other	3	0
Region		
Midwest	276	28
Northeast	305	30
South	241	24
West	174	17
Program size		
1-10	58	6
11-20	175	17
21-30	229	23
31-40	260	26
41-50	142	14
>50	139	14

Not all questions equal given that not all respondents answered all questions. Age mean (+SD) was 29.9 (+3). SD, standard deviation.

TABLE 2. Age-Specific Differences

	Age < 30	Age ≥ 30	p*	aOR† (95% CI) ≥30 vs. <30
Underreporting	69% (65-73)	74% (70-78)	0.07	1.35 (1.02-1.80)
Exceeding duty hours 2- 3 times/wk or more‡	14% (11-19)	15% (12-19)	0.83	0.91 (0.54-1.54)
Work from home to avoid duty violations	34% (29-38)	39% (34-43)	0.12	1.14 (0.86-1.51)
Work from home 2-3 times/wk or more to avoid duty violations	12% (9-15)	14% (11-18)	0.24	1.14 (0.76-1.7)
Why have you exceeded duty hours?‡				
Prevent adverse patient outcomes	59% (54-65)	63% (58-68)	0.28	1.12 (0.82-1.54)
Emergency cases/long procedures	72% (66-77)	76% (72-80)	0.17	1.19 (0.83-1.69)
Charting/documentation	68% (63-73)	54% (49-60)	0.0002	0.51 (0.37-0.71)
Guilt about leaving hospital	30% (26-36)	25% (20-29)	0.08	0.74 (0.52-1.04)
External pressure from authority figures	26% (21-31)	23% (19-28)	0.48	0.88 (0.62-1.26)
Felt it was expected of you	45% (39-51)	41% (36-46)	0.26	0.80 (0.58-1.1)
Prevent signing out unfinished tasks	84% (80-88)	75% (70-79)	0.002	0.50 (0.34-0.74)
Ward rounding	32% (27-37)	32% (27-37)	0.99	1.00 (0.72-1.39)

*p Value from bivariate analysis using a chi-square test.
†aOR: adjusted odds ratio from logistic regression models that included age, sex, region, program size, and average hours worked per week.
‡Question was skipped if respondent did not underreport.

Sex

There were no differences in rates of underreporting between males or females, but females were more likely to report working from home to avoid duty-hour violations (42% vs. 32%, p = 0.001). Females also more frequently cited emergency cases and long procedures (78% vs. 71%, p = 0.022), and guilt about leaving the hospital (32% vs. 24%, p = 0.014) as reasons why they exceeded duty hours (Table 3). There were no sex-specific differences regarding external pressure from authority figures.

Program Size

Programs were grouped by sizes of 1 to 20 (23%), 21 to 40 (49%), and >40 (28%) residents to evenly distribute responses across the groups. Respondents from programs with more than 40 residents were significantly more likely to underreport duty hours compared to residents from programs with 1 to 20 or 21 to 40 residents (82% vs. 67% and 67%, p < 0.001, Table 4). As program size increased, so did the percentage of respondents who cited emergency cases or long procedures as a reason why they were exceeding duty-hour limits; 66% in programs with 1 to 20 respondents, 74% for 21 to 40 residents, and 81% for >40 residents (p = 0.004). There were no program size-specific differences regarding guilt about leaving hospital, external pressure authority figures, or feeling that it was expected of them.

Average Hours Worked

Among respondents who acknowledged underreporting, the number of hours these respondents indicating working on an average week was grouped into <80 (40%), 81 to 90 (43%), and >90 hours (18%). As expected, resident

TABLE 3. Sex-Specific Differences

	Female	Male	p*	aOR† (95% CI) Male vs. female
Underreporting	73% (69-77)	70% (66-74)	0.30	0.90 (0.68-1.20)
Exceeding duty hours 2-3 times/wk or more‡	16% (12-20)	14% (11-18)	0.50	0.60 (0.35-1.03)
Work from home to avoid duty violations	42% (37-46)	32% (28-36)	0.001	0.62 (0.47-0.82)
Work from home 2-3 times/wk or more to avoid duty violations	13% (10-17)	13% (10-16)	0.77	0.89 (0.60-1.33)
Why have you exceeded duty hours?‡				
Prevent adverse patient outcomes	63% (57-68)	60% (55-65)	0.50	0.91 (0.67-1.25)
Emergency cases/long procedures	78% (73-82)	71% (66-75)	0.022	0.64 (0.45-0.92)
Charting/documentation	62% (56-67)	60% (54-65)	0.56	0.87 (0.63-1.20)
Guilt about leaving hospital	32% (27-37)	24% (19-28)	0.014	0.64 (0.45-0.90)
External pressure from authority figures	23% (19-28)	25% (21-30)	0.54	0.98 (0.69-1.41)
Felt it was expected of you	39% (34-44)	46% (41-51)	0.05	1.25 (0.91-1.71)
Prevent signing out unfinished tasks	83% (78-86)	76% (72-81)	0.041	0.70 (0.48-1.03)
Ward rounding	34% (29-39)	29% (25-34)	0.19	0.77 (0.56-1.07)

*p Value from bivariate analysis using a chi-square test.
†aOR: adjusted odds ratio from logistic regression models that included age, sex, region, program size, and average hours worked per week.
‡Question was skipped if respondent did not underreport.

TABLE 4. Program Size-Specific Differences.

	1-20	21-40	>40	p*	aOR† (95% CI) 21-40 vs. 1-20	aOR† (95% CI) >40 vs. 1-20
Underreporting	67% (61-73)	67% (63-72)	82% (77-86)	<0.001	0.96 (0.68-1.36)	2.34 (1.53-3.57)
Exceeding duty hours 2-3 times/wk or more‡	18% (13-25)	10% (7-13)	19% (14-25)	0.002	0.51 (0.26-1.01)	1.43 (0.73-2.79)
Work from home to avoid duty violations	34% (28-40)	36% (32-40)	39% (34-46)	0.37	1.19 (0.83-1.70)	1.11 (0.75-1.64)
Work from home 2-3 times/wk or more to avoid duty violations	13% (9-17)	13% (10-17)	13% (9-18)	0.95	1.17 (0.70-1.94)	0.89 (0.51-1.56)
Why have you exceeded duty hours?‡						
Prevent Adverse patient outcomes	59% (50-66)	62% (56-67)	63% (56-69)	0.688	1.17 (0.78-1.76)	1.14 (0.74-1.75)
Emergency cases/long procedures	66% (58-73)	74% (69-79)	81% (75-86)	0.004	1.54 (1.00-2.38)	2.12 (1.31-3.43)
Charting/documentation	54% (46-62)	63% (57-68)	63% (56-69)	0.16	1.66 (1.10-2.51)	1.54 (0.99-2.38)
Guilt about leaving hospital	33% (26-41)	27% (22-32)	25% (20-31)	0.20	0.85 (0.55-1.32)	0.72 (0.45-1.16)
External pressure from authority figures	28% (21-36)	22% (18-27)	24% (18-30)	0.40	0.83 (0.53-1.31)	0.86 (0.53-1.39)
Felt it was expected of you	48% (40-56)	44% (38-49)	37% (31-44)	0.12	1.02 (0.68-1.54)	0.67 (0.43-1.04)
Prevent signing out unfinished tasks	77% (70-83)	79% (74-83)	81% (75-86)	0.64	1.29 (0.79-2.09)	1.28 (0.76-2.15)
Ward rounding	35% (28-43)	29% (24-35)	33% (27-39)	0.42	0.86 (0.56-1.31)	0.97 (0.62-1.52)

*p Value from bivariate analysis using a chi-square test.
†aOR: adjusted odds ratio from logistic regression models that included age, sex, region, program size, and average hours worked per week.
‡Question was skipped if respondent did not underreport.

respondents who worked >90 hours on an average week were significantly more likely to report exceeding duty hours 2 to 3 times a week or more (54% vs. 11% or 1%, $p < 0.001$), to work from home to avoid duty hours (53% vs. 46% or 37%, $p < 0.001$), and to work from home more than 2 to 3 times a week (30% vs. 18% or 8%, $p < 0.01$) (Table 5). Further, this same population was significantly more likely to cite most of the reasons as to why they exceeded duty-hour limits: preventing adverse patient outcomes (71% vs. 61% or 57%, $p = 0.04$), charting/documentation (74% vs. 65% or 50%, $p < 0.001$), guilt about leaving the hospital (37% vs. 29% or 22%, $p < 0.001$), external pressure from authority figures (37% vs. 24% or 18%, $p < 0.01$), feeling it was expected of them (64% vs. 44% or 31%, $p < 0.01$), preventing signing out unfinished tasks (88% vs. 78% or 77%, $p = 0.03$), ward

TABLE 5. Hours Worked-Specific Differences

	<80	81-90	>90	p*	aOR† (95% CI) 81-90 vs. <80	aOR† (95% CI) >90 vs. <80
Exceeding duty hours 2-3 times/wk or more‡	1% (0-3)	11% (8-15)	54% (45-63)	<0.0001	35.0 (4.7-259)	351 (46.9-2626)
Work from home to avoid duty violations	37% (31-43)	46% (40-52)	53% (44-62)	0.007	1.56 (1.10-2.21)	2.26 (1.43-3.55)
Work from home 2-3 times/wk or more to avoid duty violations	8% (5-12)	18% (14-23)	30% (22-38)	<0.0001	2.98 (1.71-5.19)	6.33 (3.37-11.89)
Why Have you Exceeded Duty Hours?‡						
Prevent adverse patient outcomes	57% (51-63)	61% (56-67)	71% (62-78)	0.039	1.31 (0.93-1.84)	1.95 (1.22-3.12)
Emergency cases/long procedures	78% (72-83)	71% (66-76)	73% (64-81)	0.20	0.75 (0.50-1.11)	0.85 (0.51-1.43)
Charting/documentation	50% (44-56)	65% (59-70)	74% (65-81)	<0.0001	1.85 (1.30-2.62)	3.21 (1.96-5.25)
Guilt about leaving hospital	22% (17-28)	29% (24-34)	37% (29-46)	0.006	1.41 (0.95-2.08)	2.24 (1.37-3.67)
External pressure from authority figures	18% (14-23)	24% (20-30)	37% (29-46)	0.0001	1.39 (0.92-2.10)	2.58 (1.58-4.23)
Felt it was expected of you	31% (25-37)	44% (39-50)	64% (55-73)	<0.0001	1.81 (1.27-2.58)	4.35 (2.71-7.00)
Prevent signing out unfinished tasks	77% (71-82)	78% (73-83)	88% (81-93)	0.025	1.12 (0.75-1.68)	2.94 (1.54-5.62)
Ward rounding	27% (22-33)	32% (27-38)	40% (31-49)	0.042	1.26 (0.87-1.81)	1.68 (1.05-2.67)

*p Value from bivariate analysis using a chi-square test.
†aOR: adjusted odds ratio from logistic regression models that included age, sex, region, program size, and average hours worked per week.
‡Question was skipped if respondent did not underreport.

rounding (40% vs. 32% or 27%, p = 0.04), and even "other" and providing their own free-text response (p < 0.01, data not shown). All the findings remained statistically significant in the multivariable models when comparing between those who reported working >90 hours on an average week to those who reported working <80 hours.

CONCLUSION

Previous studies evaluating the effects of ACGME duty-hour reforms have assumed that residents are uniformly compliant with work hour restrictions.[2-4] Our work supports that of others suggesting that this is incorrect.[1,5,8,9] This study also finds that there are multiple variables affecting residents who underreport and/or exceeds duty hours. Moreover, these data identify a number of internal and external pressures that are present among our respondents and drive them to violate duty-hour limits.

Within our study, we find that younger respondents were more likely to exceed duty hours to chart and document. These findings are in the setting of results from a study of FIRST trial participants demonstrating that many interns violate duty hours to document.[9] Given that demographic information we collected reflected age (not postgraduate year), we are unable to determine whether this is driven by interns. However, this collectively suggests that beyond those enrolled in the FIRST Trial, many young surgery residents across the country exceed duty hours to complete tasks that do not directly involve patient care. Programs should better identify avenues by which these residents' workloads reflect meaningful patient experiences as compared to less-educational activities. Regarding sex, we found that female respondents more often cited exceeding duty hours owing to the guilt about leaving the hospital. This is in the setting of previous work demonstrating that female surgery residents have higher rates of burnout compared to their male counterparts.[10] Interestingly, the largest of programs were much more likely to underreport and cite exceeding duty hours due to emergency cases and long procedures but not due to internal or external pressures. This tendency to underreport in larger programs could be connected to size-specific program culture. Finally, our data suggest that respondents who worked the most hours were more likely to cite external pressure, guilt, and that they felt it was expected of them as reasons why they exceeded duty hours. This is in the setting of previous work identifying higher rates of burnout among residents who work longer hours.[10] Programs should be cognizant of the internal and external pressures encountered by residents and continue to promote a culture of safety for their trainees. Residents should feel empowered to take care of themselves, not pressured to work far beyond their duty-hour limits given that fatigue increases the risk of medical errors.[12]

The findings of this study must be interpreted in the context of several limitations, namely response rate and the concern of generalizability. Many studies aimed at identifying rates of underreporting have been limited by low response rates (25% and 23%).[1,5] Our response rate was higher than other works on the topic (32%) and our rates of underreporting are consistent with prior national studies. Additionally, our respondents' mean age (29.9 + 3.0) and sex distribution (53% male) are similar to that of ACGME national data (mean age of postgraduate year 1 surgery resident at 29.1 with sex distribution of 59% males).[13] As such, given this work's sufficiently large sample size, we submit that this minimizes potential concerns of generalizability or non-response bias.[13-15] Further, our work exists in the context of a similar study that ran concurrently with ours[9]; this report confirms the presence of multiple types of duty-hour violations within those enrolled in the FIRST Trial. Together, these works argue that underreporting and duty-hour violations remain an issue for surgery residency programs and is likely not limited to those within the FIRST Trial. It is an issue within the greater surgical community that requires attention.

Future research should acknowledge the internal and external pressures that many residents routinely face; residents may risk their professional futures as well as that of their program if they report duty-hour violations. Programs with frequent duty-hour violations garner warnings, site visits, probation, or possible loss of ACGME accreditation. Finally, these findings are in the setting of a time where residents are plagued by high rates of burnout, depression, substance abuse, and suicide.[10,11] In a profession that loses one physician each day to suicide, resident well-being has far-reaching implications beyond the clinic.[11]

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SUPPORTING INFORMATION

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