SPECIAL ARTICLE

Discrimination, Abuse, Harassment, and Burnout in Surgical Residency Training

Yue-Yung Hu, M.D., M.P.H., Ryan J. Ellis, M.D., M.S.C.I., D. Brock Hewitt, M.D., M.P.H., Anthony D. Yang, M.D., Elaine Ooi Cheung, Ph.D., Judith T. Moskowitz, Ph.D., M.P.H., John R. Potts III, M.D., Jo Buyske, M.D., David B. Hoyt, M.D., Thomas R. Nasca, M.D., and Karl Y. Bilimoria, M.D., M.S.C.I.

ABSTRACT

BACKGROUND

Physicians, particularly trainees and those in surgical subspecialties, are at risk for burnout. Mistreatment (i.e., discrimination, verbal or physical abuse, and sexual harassment) may contribute to burnout and suicidal thoughts.

METHODS

A cross-sectional national survey of general surgery residents administered with the 2018 American Board of Surgery In-Training Examination assessed mistreatment, burnout (evaluated with the use of the modified Maslach Burnout Inventory), and suicidal thoughts during the past year. We used multivariable logistic-regression models to assess the association of mistreatment with burnout and suicidal thoughts. The survey asked residents to report their gender.

RESULTS

Among 7409 residents (99.3% of the eligible residents) from all 262 surgical residency programs, 31.9% reported discrimination based on their self-identified gender, 16.6% reported racial discrimination, 30.3% reported verbal or physical abuse (or both), and 10.3% reported sexual harassment. Rates of all mistreatment measures were higher among women; 65.1% of the women reported gender discrimination and 19.9% reported sexual harassment. Patients and patients' families were the most frequent sources of gender discrimination (as reported by 43.6% of residents) and racial discrimination (47.4%), whereas attending surgeons were the most frequent sources of sexual harassment (27.2%) and abuse (51.9%). Proportion of residents reporting mistreatment varied considerably among residency programs (e.g., ranging from 0 to 66.7% for verbal abuse). Weekly burnout symptoms were reported by 38.5% of residents, and 4.5% reported having had suicidal thoughts during the past year. Residents who reported exposure to discrimination, abuse, or harassment at least a few times per month were more likely than residents with no reported mistreatment exposures to have symptoms of burnout (odds ratio, 2.94; 95% confidence interval [CI], 2.58 to 3.36) and suicidal thoughts (odds ratio, 3.07; 95% CI, 2.25 to 4.19). Although models that were not adjusted for mistreatment showed that women were more likely than men to report burnout symptoms (42.4% vs. 35.9%; odds ratio, 1.33; 95% CI, 1.20 to 1.48), the difference was no longer evident after the models were adjusted for mistreatment (odds ratio, 0.90; 95% CI, 0.80 to 1.00).

CONCLUSIONS

Mistreatment occurs frequently among general surgery residents, especially women, and is associated with burnout and suicidal thoughts.

From the Surgical Outcomes and Quality Improvement Center (SOQIC), Department of Surgery, Feinberg School of Medicine, Northwestern Medicine (Y.-Y.H., R.J.E., D.B. Hewitt, A.D.Y., K.Y.B.), the Division of Pediatric Surgery, Ann and Robert H. Lurie Children's Hospital (Y.-Y.H.), the American College of Surgeons (R.J.E., D.B. Hoyt, K.Y.B.), the Department of Medical Social Sciences, Northwestern University (E.O.C., J.T.M.), and the Accreditation Council for Graduate Medical Education (J.R.P., T.R.N.) — all in Chicago; and the Department of Surgery, Thomas Jefferson University Hospital (D.B. Hewitt), and the American Board of Surgery (J.B.) — both in Philadelphia. Address reprint requests to Dr. Bilimoria at the Surgical Outcomes and Quality Improvement Center (SOQIC), Department of Surgery, Feinberg School of Medicine, Northwestern Medicine, 633 N. St. Clair St., 20th Fl., Chicago, IL 60611, or at k-bilimoria@northwestern.edu.

Drs. Hu and Ellis contributed equally to this article.

This article was published on October 28, 2019, at NEJM.org.

DOI: 10.1056/NEJMsa1903759

Burnout, a syndrome of emotional exhaustion, cynicism, and reduced effectiveness at work, has been linked to poor health, alcoholism, depression, and suicide in physicians.[1,2] Burnout has adverse effects on patient care and the physician workforce, since burned-out physicians are more likely to report that they have made medical errors, more frequently reduce their work efforts, change jobs, or leave the field of medicine.[3,4] The prevalence of burnout appears to be higher among surgeons, trainees, and women than in other groups.[5]

The values espoused by an institution and the social support it provides are key determinants of whether its employees feel engaged or burned out.[3] Workplace mistreatment (i.e., discrimination, abuse, and harassment) can create a hostile work environment that may lead to burnout and other poor psychological outcomes, such as suicidality.[2] Such mistreatment is thought to be common in the field of medicine, particularly for women and trainees, who are subject to a power differential.[6-11] Surgery is considered to represent a particularly high-risk specialty.[6,9,11]

Despite surgical residents' particular vulnerability, little is known about the extent of mistreatment, burnout, and suicidal thoughts in this group. Previous estimates of mistreatment and burnout were based on surveys with low or unmeasurable response rates, small numbers of institutions, or inconsistencies in measurement or interpretation.[11-15] Moreover, although an association between mistreatment and burnout has been suggested by qualitative data,[16] it has yet to be examined empirically in a large population. A comprehensive national survey was administered to residents in all accredited U.S. general surgery residency programs to characterize the frequency and sources of mistreatment, examine the national prevalence of burnout and suicidal thoughts, and assess the association of mistreatment with burnout and suicidal thoughts.

METHODS

STUDY SETTING AND PARTICIPANTS

A multiple-choice survey was administered immediately after the January 2018 American Board of Surgery In-Training Examination (ABSITE), an annual computer-based examination taken by all residents training in general surgery programs accredited by the Accreditation Council for Graduate Medical Education (ACGME; see the survey in the Supplementary Appendix, available with the full text of this article at NEJM.org).[17,18] The survey was preceded by a statement explaining that the purpose of the survey was research, that data would be deidentified before analysis, and that program directors and chairs would not have access to the responses. There were no incentives or disincentives to participate.[18-20]

Survey responses were collected by the American Board of Surgery and were deidentified before being transferred to Northwestern University for analysis.[18,20] Excluded from all analyses were 837 residents who were clinically inactive (i.e., were taking dedicated time off for conducting research), 2 residents who were training in one program that averaged fewer than 1 resident per postgraduate year, and 4 residents whose surveys were missing responses to the burnout questions. Two programs that had no female residents were excluded from program-level analyses. The Northwestern University institutional review board office reviewed this study, including the survey and instructions to residents, and determined that it did not meet the federal definition of human-subjects research and therefore did not require full review and approval by the institutional review board.

SURVEY DEVELOPMENT

The 2018 survey items were adapted from previously published and validated instruments.[2,18,20-22] Pretest cognitive interviews were conducted with general surgery residents from multiple institutions to assess the overall coherence, balance, and clarity of the survey. The survey was then iteratively revised and retested in a larger sample of general surgery residents from multiple institutions.[18,20]

MISTREATMENT EXPOSURES

Respondents were asked to report the frequency (categorized as never, a few times a year, a few times a month, a few times a week, or daily), since the beginning of their residencies, with which they were subject to discrimination based upon their self-identified gender; racial discrimination; discrimination based on past, present, or expected pregnancy, childcare needs, or both; sexual harassment; physical abuse; and verbal or emotional abuse. No definitions of these exposures were provided. Residents who answered in

the affirmative were then asked to identify the primary source of the mistreatment: patients or patients' families, attending surgeons, other residents or fellows, administrators, or nurses or support staff. Mistreatment was categorized in several ways. Because perceived abuse, discrimination, and harassment were highly correlated with one another, we constructed a single composite indicator for primary comparisons. The composite represents the maximum reported frequency of any of the mistreatment exposures (discrimination on the basis of gender, race, or pregnancy or childcare; physical or verbal abuse; and sexual harassment). Residents were then categorized by frequency of exposure to mistreatment: no exposure, exposures a few times per year, or exposures a few times or more per month. Each type of exposure was also dichotomized (never vs. any) and modeled individually.

MAIN OUTCOME MEASURES

Symptoms of burnout were assessed with the use of the modified, abbreviated Maslach Burnout Inventory–Human Services Survey for Medical Personnel (aMBI), which examines emotional exhaustion and depersonalization with three questions each.[23,24] To facilitate interpretation and presentation of the data, residents were divided into those who reported at least weekly occurrence of any of the six items in the aMBI and those who reported that symptoms occurred less than once a week.[5] Sensitivity analyses were performed with other burnout definitions.[25]

Suicidal thoughts were assessed with the question, "During the past 12 months, have you had thoughts of taking your own life?"[2,26,27] Residents who responded in the affirmative during the online survey were immediately provided with information on the screen urging them to reach out to their program directors, make use of online resources, or contact the National Suicide Prevention Lifeline. No active outreach was possible because all data were deidentified and confidentiality had been assured as a precondition of survey completion.

RESIDENT AND PROGRAM CHARACTERISTICS

We obtained information on the following characteristics of the residents: gender, clinical postgraduate year (PGY, categorized as 1, 2–3, or 4–5), and relationship status (married or in a relationship, not in a relationship, or divorced or widowed). Program characteristics for which we obtained information included size (total number of surgical residents, divided into quartiles: <26, 26 to 37, 38 to 51, or >51 residents per program), type (academic, community, or military), and geographic location (Northeast, Southeast, Midwest, Southwest, or West). Residents were also asked to report the number of months during which they had violated the 80-hours-per-week (averaged over a month) duty-hour requirement in the previous 6 months (0, 1 or 2, or ≥3).

STATISTICAL ANALYSIS

Multivariable logistic-regression models were used to examine all available demographics of the residents (e.g., gender and marital status) and program characteristics (e.g., geographic location) associated with burnout and suicidal thoughts, both excluding and including mistreatment exposures (i.e., discrimination, abuse, and sexual harassment). The primary models examined the association of the composite mistreatment variable with burnout and with suicidal thoughts. Each mistreatment exposure variable was also modeled individually to examine associations with burnout and suicidal thoughts. All models were estimated with robust standard errors accounting for resident clustering within programs. Missing data were rare (<1%) and were excluded from the analyses. Effect modification between mistreatment and gender was explored by serial addition of multiplicative interaction terms. Several sensitivity analyses were performed, including those that used different thresholds for mistreatment exposures and those that used different definitions of burnout (e.g., continuous and different dichotomizations) to assess the robustness of the results.

Program-level values were calculated as the percentage of residents in each program who reported gender discrimination, racial discrimination, verbal or emotional abuse, physical abuse, sexual harassment, and duty-hour violations. The extent to which different mistreatment exposures occurred concurrently at the program level (e.g., whether programs with high rates of gender discrimination also had high rates of sexual harassment) was examined with weighted kappa statistics.

Point estimates are reported with confidence intervals, which have not been adjusted for multiple comparisons. All statistical analyses were

Table 1. Demographic Characteristics of Residents from 262 U.S. Surgical Residency Programs.*

Characteristic	Overall (N=7409)	Men (N=4438)	Women (N=2935)
		number (percent)	
Gender†			
Male	4438 (59.9)	—	—
Female	2935 (39.6)	—	—
Data not available	36 (0.5)	—	—
Clinical postgraduate year			
1	2108 (28.5)	1269 (28.6)	825 (28.1)
2–3	2893 (39.0)	1708 (38.5)	1167 (39.8)
4–5	2408 (32.5)	1461 (32.9)	943 (32.1)
Relationship status			
Married or in a relationship	5467 (73.8)	3537 (79.7)	1908 (65.0)
Not in a relationship	1812 (24.5)	838 (18.9)	961 (32.7)
Divorced or widowed	130 (1.8)	63 (1.4)	66 (2.2)
Program size — no. of residents			
Quartile 1: <26	2042 (27.6)	1309 (29.5)	723 (24.6)
Quartile 2: 26 to 37	1721 (23.2)	1033 (23.3)	679 (23.1)
Quartile 3: 38 to 51	1920 (25.9)	1124 (25.3)	786 (26.8)
Quartile 4: >51	1726 (23.3)	972 (21.9)	747 (25.5)
Program type			
Academic	4439 (59.9)	2567 (57.8)	1854 (63.2)
Community	2729 (36.8)	1711 (38.6)	1002 (34.1)
Military	218 (2.9)	148 (3.3)	68 (2.3)
Unknown	23 (0.3)	12 (0.3)	11 (0.4)
Program location			
Northeast	2424 (32.7)	1434 (32.3)	981 (33.4)
Southeast	1505 (20.3)	921 (20.8)	578 (19.7)
Midwest	1567 (21.1)	960 (21.6)	600 (20.4)
Southwest	876 (11.8)	527 (11.9)	343 (11.7)
West	1037 (14.0)	596 (13.4)	433 (14.8)

* Percentages may not total 100 because of rounding.
† Residents were asked to report their gender.

performed with Stata software, version 14.1 (StataCorp). There was no prespecified statistical analysis plan, but an a priori hypothesis was specified at the time of survey development.

RESULTS

RESPONSE TO SURVEY

Of 7464 eligible residents, 7409 (99.3%) had complete survey responses; 2935 of the residents who responded (39.6%) were women. The demographics of the study population are shown in Table 1, and Table S1 in the Supplementary Appendix.

MISTREATMENT

Details of residents' reports of mistreatment are provided in Tables 2 and 3. Gender discrimination was reported by 31.9% of all residents — 65.1% of women and 10.0% of men. Monthly occurrences were reported by 26.9% of women (Tables S2 and S3). Among women reporting gender discrimination, 49.2% identified the source as patients or patients' families, 23.6% as nurses or staff, and 17.6% as attending surgeons. Among men reporting gender discrimination, the source was most frequently attending surgeons (28.5%).

Racial discrimination was reported by 16.6% of residents — 18.6% of women and 15.1% of men. Patients and patients' families were identified as the sources of racial discrimination by 47.4% of residents, followed by attending surgeons (17.4%), nurses and staff (10.7%), and other residents (8.2%).

Discrimination on the basis of pregnancy or childcare status was reported by 7.2% of all residents — 13.1% of women and 3.2% of men. The most common sources of pregnancy and childcare discrimination were other surgeons: attendings (36.8%) and other residents (22.6%).

Verbal or emotional abuse was reported by 30.2% of all residents — 33.0% of women and 28.3% of men. The sources were predominantly other surgeons: attendings (52.4%) and other residents (20.2%). Physical abuse was rare (affecting 2.2%) and was reported in similar frequency by men and women.

Sexual harassment was reported by 10.3% of all residents — 19.9% of women and 3.9% of men. Among women reporting sexual harassment, the sources were most frequently patients or patients' families (31.2%) and attending surgeons (30.9%), followed by other residents (15.4%) and nurses or staff (11.7%). Among men reporting sexual harassment, the sources were most frequently nurses or staff (22.7%).

Nearly 50% of residents reported having had experience with at least one form of mistreatment, with 19.0% reporting exposure to mistreatment at least a few times per month and 30.9% reporting exposure a few times per year.

Table 2. Frequency of Mistreatment, Duty-Hour Violations, Burnout, and Suicidal Thoughts among U.S. Surgical Residents.*

Variable	Overall (N = 7409)	Men (N = 4438)	Women (N = 2935)
		number (percent)	
Gender discrimination	2366 (31.9)	442 (10.0)	1912 (65.1)
A few times per year	1453 (19.6)	325 (7.3)	1123 (38.3)
A few times per month or more frequently	913 (12.3)	117 (2.6)	789 (26.9)
Racial discrimination	1227 (16.6)	671 (15.1)	547 (18.6)
A few times per year	859 (11.6)	477 (10.7)	379 (12.9)
A few times per month or more frequently	368 (5.0)	194 (4.4)	168 (5.7)
Discrimination based on pregnancy or childcare status	532 (7.2)	144 (3.2)	383 (13.0)
A few times per year	361 (4.9)	84 (1.9)	275 (9.4)
A few times per month or more frequently	171 (2.3)	60 (1.4)	108 (3.7)
Any discrimination on the basis of gender, race, or pregnancy or childcare status†	2848 (38.4)	884 (19.9)	1950 (66.4)
A few times per year	1773 (23.9)	645 (14.5)	1122 (38.2)
A few times per month or more frequently	1075 (14.5)	239 (5.4)	828 (28.2)
Verbal or emotional abuse	2238 (30.2)	1257 (28.3)	968 (33.0)
A few times per year	1593 (21.5)	882 (19.9)	704 (24.0)
A few times per month or more frequently	645 (8.7)	375 (8.5)	264 (9.0)
Physical abuse	166 (2.2)	108 (2.4)	57 (1.9)
A few times per year	95 (1.3)	54 (1.2)	41 (1.4)
A few times per month or more frequently	71 (1.0)	54 (1.2)	16 (0.5)
Any abuse: verbal, emotional, or physical	2243 (30.3)	1259 (28.4)	971 (33.1)
A few times per year	1598 (21.6)	884 (19.9)	707 (24.1)
A few times per month or more frequently	645 (8.7)	375 (8.4)	264 (9.0)
Sexual harassment	761 (10.3)	172 (3.9)	583 (19.9)
A few times per year	574 (7.7)	109 (2.5)	460 (15.7)
A few times per month or more frequently	187 (2.5)	63 (1.4)	123 (4.2)
Any mistreatment exposure†	3694 (49.9)	1605 (36.1)	2073 (70.6)
A few times per year	2289 (30.9)	1120 (25.2)	1162 (39.6)
A few times per month or more frequently	1405 (19.0)	485 (10.9)	911 (31.0)
Duty-hour violations of the 80-hr rule in the previous 6 mo — no. of mo			
0	4518 (61.0)	2952 (66.5)	1548 (52.7)
1–2	1869 (25.2)	954 (21.5)	906 (30.9)
≥3	1022 (13.8)	532 (12.0)	481 (16.4)
Outcome measures			
Burnout‡	2849 (38.5)	1591 (35.9)	1245 (42.4)
Suicidal thoughts	333 (4.5)§	173 (3.9)	156 (5.3)

* Residents were asked to report their gender. Excluded were data from 36 residents who did not report gender.
† Shown is the highest reported cumulative frequency of discrimination based on gender, race, or pregnancy or childcare status.
‡ Burnout is defined as symptoms of emotional exhaustion or depersonalization occurring at least weekly.
§ Data were missing for 15 persons (9 men and 6 women).

Table 3. Sources of Discrimination, Harassment, and Abuse Reported in a Survey of U.S. Surgical Residents*

Source of Mistreatment	Gender Discrimination			Racial Discrimination			Verbal or Emotional Abuse		
	number (percent)								
	All	Men	Women	All	Men	Women	All	Men	Women
	2366	442	1912	1227	671	547	2238	1257	968
Patient or patient's family	1032 (43.6)	87 (19.7)	940 (49.2)	581 (47.4)	257 (38.3)	320 (58.5)	181 (8.1)	108 (8.6)	73 (7.5)
Attendings	468 (19.8)	126 (28.5)	337 (17.6)	213 (17.4)	151 (22.5)	61 (11.2)	1173 (52.4)	652 (51.9)	512 (52.9)
Administration	16 (0.7)	10 (2.3)	6 (0.3)	20 (1.6)	13 (1.9)	7 (1.3)	25 (1.1)	14 (1.1)	11 (1.1)
Co-residents	179 (7.6)	56 (12.7)	121 (6.3)	101 (8.2)	59 (8.8)	41 (7.5)	451 (20.2)	232 (18.5)	217 (22.4)
Nurses or staff	503 (21.3)	50 (11.3)	452 (23.6)	131 (10.7)	73 (10.9)	56 (10.2)	177 (7.9)	102 (8.1)	73 (7.5)
Source not identified	169 (7.1)	113 (25.6)	56 (2.9)	181 (14.8)	118 (17.6)	62 (11.3)	231 (10.3)	149 (11.9)	82 (8.5)
	Physical Abuse			Sexual Harassment			Pregnancy or Childcare Discrimination		
	number (percent)								
	All	Men	Women	All	Men	Women	All	Men	Women
	166	108	57	761	172	583	532	144	383
Patient or patient's family	20 (12.0)	11 (10.2)	9 (15.8)	205 (26.9)	21 (12.2)	182 (31.2)	29 (5.5)	7 (4.9)	22 (5.7)
Attendings	36 (21.7)	19 (17.6)	17 (29.8)	207 (27.2)	26 (15.1)	180 (30.9)	196 (36.8)	27 (18.8)	168 (43.9)
Administration	10 (6.0)	8 (7.4)	2 (3.5)	9 (1.2)	6 (3.5)	3 (0.5)	35 (6.6)	8 (5.6)	26 (6.8)
Co-residents	17 (10.2)	11 (10.2)	6 (10.5)	111 (14.6)	20 (11.6)	90 (15.4)	120 (22.6)	30 (20.8)	90 (23.5)
Nurses or staff	10 (6.0)	6 (5.6)	3 (5.3)	108 (14.2)	39 (22.7)	68 (11.7)	23 (4.3)	7 (4.9)	15 (3.9)
Source not identified	73 (44.0)	53 (49.1)	20 (35.1)	121 (15.9)	60 (34.9)	60 (10.3)	129 (24.2)	65 (45.1)	62 (16.2)

* Data reflect responses from 7409 residents in 262 surgical residency programs. Residents were asked to report their gender. The total for each category of mistreatment is the number of residents reporting exposure to that mistreatment. Data from residents who did not report their gender are included in the total number reporting but are not included in values shown according to gender. Percentages may not total 100 because of rounding.

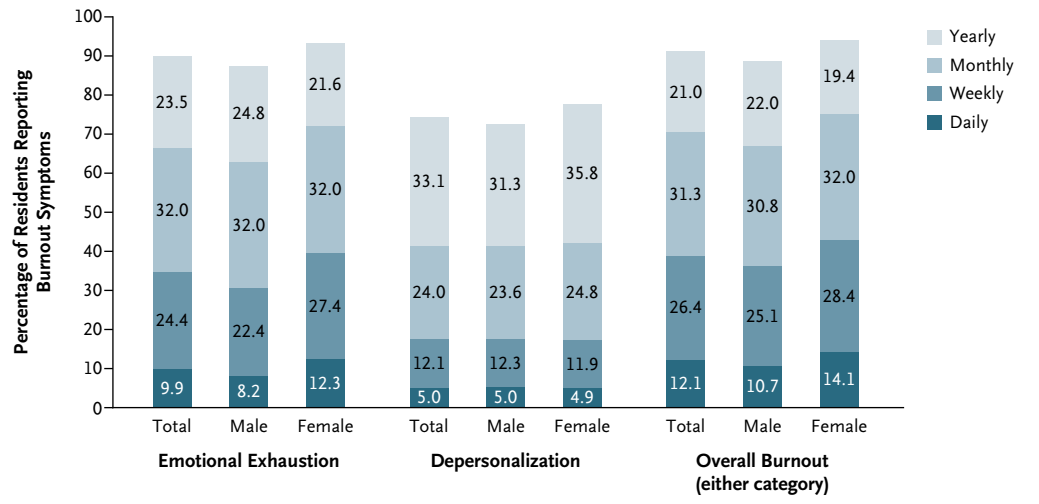

Figure 1. Frequency of Burnout Symptoms Reported by Surgical Residents, According to Self-Identified Gender.
Shown are the percentages of residents with symptoms of emotional exhaustion, depersonalization, and burnout (either emotional exhaustion or depersonalization).

Among women, 31.0% reported exposure a few times per month or more. For all mistreatment exposures, men more frequently failed to identify a source (e.g., among residents who reported gender discrimination, 25.6% of men did not identify the source, vs. 2.9% of women did not identify the source).

DUTY-HOUR VIOLATIONS

A total of 61.0% of residents (66.5% of men and 52.7% of women) reported no violations of the 80-hour rule. Violations of the 80-hour rule in 1 or 2 of the previous 6 months were reported by 25.2% of residents (21.5% of men and 30.9% of women), and violations in 3 or more of the previous 6 months were reported by 13.8% (12.0% of men and 16.4% of women).

PREVALENCE OF BURNOUT AND SUICIDAL THOUGHTS

Burnout symptoms occurring at least once a week were reported by 38.5% of residents, with 34.3% reporting symptoms of emotional exhaustion at least weekly and 17.1% reporting symptoms of depersonalization at least weekly. The unadjusted prevalence of burnout was higher among women than among men (42.4% vs. 35.9%) (Table 2). Female residents reported symptoms of emotional exhaustion more frequently, but depersonalization symptoms were reported with similar frequency by men and women (Fig. 1). Suicidal thoughts occurring during the past year were reported by 4.5% of residents and were reported more frequently by women than by men (5.3% vs. 3.9%) (Table 2).

FACTORS ASSOCIATED WITH BURNOUT

In adjusted models, residents in PGY 1 were more likely to report burnout than residents in PGY 4–5 (odds ratio, 1.21; 95% confidence interval [CI], 1.06 to 1.38). Increasing frequency of mistreatment exposures (composite of discrimination, harassment, and abuse) was associated with a stepwise increase in burnout, from a few times a year (odds ratio, with no exposure as reference, 2.02; 95% CI, 1.81 to 2.25) to a few times a month or more (odds ratio, 2.94; 95% CI, 2.58 to 3.36). Similarly, with increasing frequency of duty-hour violations, there was a stepwise increase in burnout, from violations in 1 or 2 of the previous 6 months (odds ratio, with no violations as reference, 1.82; 95% CI, 1.61 to 2.05) to violations in 3 or more months (odds ratio, 2.91; 95% CI, 2.52 to 3.35). Although women were more likely to report burnout in models that were not adjusted for mistreatment (odds ratio, 1.33; 95% CI, 1.20 to 1.48), this difference did not persist after adjustment for mistreatment (odds ratio, 0.90; 95% CI, 0.80 to 1.00) (Table 4). No significant interactions were noted between

Table 4. Characteristics Associated with Burnout and Suicidal Thoughts among U.S. Surgical Residents.*

Characteristic	Burnout†			Suicidal Thoughts		
	Percentage of Residents	Excluding Mistreatment Measures	Including Mistreatment Measures	Percentage of Residents	Excluding Mistreatment Measures	Including Mistreatment Measures
		odds ratio (95% CI)			*odds ratio (95% CI)*	
Overall	38.5			4.5		
Gender						
Male	35.9	Reference	Reference	3.9	Reference	Reference
Female	42.4	1.33 (1.20 to 1.48)	0.90 (0.80 to 1.00)	5.3	1.31 (1.03 to 1.67)	0.90 (0.69 to 1.18)
Clinical postgraduate year						
1	40.3	1.20 (1.06 to 1.36)	1.21 (1.06 to 1.38)	4.8	1.10 (0.81 to 1.49)	1.13 (0.83 to 1.55)
2–3	38.6	1.10 (0.97 to 1.24)	1.09 (0.96 to 1.24)	4.4	1.01 (0.77 to 1.32)	1.01 (0.76 to 1.33)
4–5	36.7	Reference	Reference	4.3	Reference	Reference
Relationship status						
Married or in a relationship	38.9	Reference	Reference	4.0	Reference	Reference
No relationship	37.2	0.86 (0.77 to 0.97)	0.83 (0.74 to 0.94)	5.6	1.33 (1.06 to 1.68)	1.31 (1.03 to 1.66)
Divorced or widowed	38.5	0.95 (0.65 to 1.39)	0.86 (0.58 to 1.28)	10.0	2.47 (1.36 to 4.51)	2.32 (1.29 to 4.18)
Program size						
Quartile 1: <26	35.2	Reference	Reference	4.4	Reference	Reference
Quartile 2: 26 to 37	39.7	1.17 (0.97 to 1.42)	1.14 (0.95 to 1.37)	4.7	1.18 (0.85 to 1.64)	1.15 (0.84 to 1.59)
Quartile 3: 38 to 51	39.7	1.11 (0.88 to 1.40)	1.04 (0.83 to 1.28)	4.7	1.18 (0.79 to 1.77)	1.12 (0.74 to 1.69)
Quartile 4: >51	39.6	1.09 (0.87 to 1.36)	1.00 (0.80 to 1.24)	4.2	1.11 (0.72 to 1.71)	1.05 (0.68 to 1.61)
Program type						
Academic	39.6	Reference	Reference	4.4	Reference	Reference
Community	36.9	0.92 (0.75 to 1.14)	0.96 (0.79 to 1.17)	4.8	1.18 (0.84 to 1.66)	1.22 (0.86 to 1.73)
Military	36.2	0.84 (0.60 to 1.16)	1.06 (0.78 to 1.46)	3.2	0.80 (0.33 to 1.93)	0.99 (0.42 to 2.33)
Program location						
Northeast	38.4	Reference	Reference	4.4	Reference	Reference
Southeast	37.1	0.96 (0.78 to 1.17)	1.07 (0.88 to 1.30)	4.3	0.98 (0.72 to 1.35)	1.08 (0.78 to 1.48)
Midwest	36.6	0.92 (0.78 to 1.10)	1.02 (0.86 to 1.21)	4.9	1.18 (0.88 to 1.58)	1.31 (0.98 to 1.75)
Southwest	36.5	0.91 (0.74 to 1.13)	1.04 (0.86 to 1.25)	3.8	0.88 (0.58 to 1.34)	0.98 (0.64 to 1.48)
West	44.9	1.32 (1.08 to 1.61)	1.40 (1.15 to 1.71)	5.0	1.16 (0.78 to 1.72)	1.20 (0.81 to 1.78)

80-hour-rule violations — no. of mo						
0	29.4	—	Reference	3.2	—	Reference
1–2	47.3	—	1.82 (1.61 to 2.05)	5.3	—	1.41 (1.07 to 1.87)
≥3	62.1	—	2.91 (2.52 to 3.35)	8.7	—	2.12 (1.56 to 2.88)
Mistreatment‡						
Never	27.3	—	Reference	2.5	—	Reference
A few times per year	45.3	—	2.02 (1.81 to 2.25)	5.3	—	2.08 (1.57 to 2.76)
A few times per month or more frequently	56.8	—	2.94 (2.58 to 3.36)	8.4	—	3.07 (2.25 to 4.19)

* Residents were asked to report their gender. Of 7409 residents, those with missing data on gender (36 residents) or program type (23) were excluded from burnout models, leaving a total of 7350 residents in the analysis. An additional 15 residents who did not respond to questions about suicidal thoughts were excluded from suicidal thoughts models, leaving a total of 7335 residents in the analysis of that outcome.
† Burnout is defined as symptoms of either emotional exhaustion or depersonalization occurring at least weekly.
‡ Shown is the highest recorded frequency of any form of discrimination, abuse, or sexual harassment. Response options were as follows: never, a few times per year, a few times per month, a few times per week, and every day.

gender and either duty-hour violations or the aggregate mistreatment variable (Table S4). Sensitivity analyses showed that each individual mistreatment measure was associated with burnout. Alternative definitions of burnout yielded similar associations with mistreatment. (Additional details on the association of burnout with mistreatment are provided in Tables S5 through S7.)

FACTORS ASSOCIATED WITH SUICIDALITY

In adjusted models, residents were more likely to report suicidal thoughts if they were not in a relationship (odds ratio, 1.31; 95% CI, 1.03 to 1.66) or were divorced or widowed (odds ratio, 2.32; 95% CI, 1.29 to 4.18) than if they were married or in a relationship. Increasing frequency of exposure to mistreatment exposures was also associated with a stepwise increase in suicidal thoughts, from exposures a few times a year (odds ratio, with no exposure as reference, 2.08; 95% CI, 1.57 to 2.76) to a few times a month or more (odds ratio, 3.07; 95% CI, 2.25 to 4.19). Increasingly frequent duty-hour violations were also associated with a stepwise increase in suicidal thoughts, from 1 to 2 months of violations (odds ratio, with no violations as reference, 1.41; 95% CI, 1.07 to 1.87) to 3 or more months of violations (odds ratio, 2.12; 95% CI, 1.56 to 2.88). Suicidal thoughts were more likely to occur in female residents than in male residents in models that did not adjust for mistreatment (odds ratio, 1.31; 95% CI, 1.03 to 1.67), but this difference did not persist after adjustment for mistreatment (odds ratio, 0.90; 95% CI, 0.69 to 1.18).

PROGRAM-LEVEL VARIATION IN MISTREATMENT

The percentage of residents within each program who reported each type of mistreatment varied widely among programs. For gender discrimination among women, the program-level median was 66.7% (interquartile range, 50 to 76.8; range, 0 to 100); for racial discrimination, 16.0% (interquartile range, 9.2 to 22.2; range, 0 to 46.2); for pregnancy or childcare discrimination among women, 11.5% (interquartile range, 0 to 20.0; range, 0 to 100); for verbal or physical abuse, 30.0% (interquartile range, 20.8 to 38.3; range, 0 to 66.7); and for sexual harassment of women, 16.7% (interquartile range, 9.1 to 28.6; range, 0 to 100) (Figs. S1 and S2). There was minimal agreement between all pairwise comparisons of mistreatment types at the program level; programs

that had a higher prevalence of one type of mistreatment did not necessarily have a higher prevalence of another (Table S8).

DISCUSSION

By surveying trainees in all ACGME-accredited U.S. general surgical residency programs and obtaining a near-complete response rate, we were able to comprehensively assess the overall prevalence of mistreatment, burnout, and suicidality. Mistreatment was associated with burnout and suicidal thoughts. Models not adjusted for mistreatment suggested that women had more frequent symptoms of burnout and more frequent suicidal thoughts than men. However, after adjustment for the higher prevalence of mistreatment among women, the differences in burnout and suicidality between men and women did not persist. Finally, there was considerable program-level variation in the reported incidence of mistreatment and duty-hour violations. These results offer a comprehensive national assessment of mistreatment and resident wellness that may be used to guide improvement efforts.

More than 50% of all general surgery residents reported some form of mistreatment. All mistreatment types were reported more frequently by women than by men. The prevalence of discrimination, harassment, and abuse reported by general surgery residents was similar to or lower than prevalences previously reported in the literature. However, in other studies, the data came from surveys with low response rates, distribution methods that precluded calculation of the response rate (e.g., Twitter and open-access websites), cohorts representing limited numbers of institutions, and variable exposure definitions.[11-14,28,29] The high response rate in the current study is advantageous for estimating the prevalence of mistreatment.

The sources of mistreatment, which differ by the specific mistreatment type, may provide important information to consider when designing interventions. For example, although employee training may reduce mistreatment originating from fellow physicians and staff, it is unlikely to lessen mistreatment by patients and their families. As such, residents may benefit from training that focuses on how to respond appropriately, whether the resident is the direct recipient of mistreatment or a witness to the mistreatment of a colleague.[9,30-34]

In this study, 38.5% of residents had burnout symptoms at least weekly, which is considerably lower than the percentage of residents with burnout reported in recent studies of general surgery trainees.[14,15] These differences are most likely driven by heterogeneity in burnout definitions[25] and nonresponse bias (i.e., in an incomplete sample, participants who respond to the survey are more likely to be burned out than people who do not respond), since previous studies had relatively low or unmeasurable response rates or included a limited number of institutions (or both).

The percentage of residents in this study who had suicidal thoughts (4.5%) is lower than that reported in a recent sample of practicing surgeons (6.3%)[2] but higher than that reported in the general population (2.0 to 3.3%).[35,36] Because the current study surveyed a large population with a high response rate, it is able to provide a more accurate estimate of prevalence. This finding is of particular importance because suicide is the second leading cause of death among trainees.[37]

Studies examining the associations between workplace mistreatment and the well-being of resident physicians are lacking. In this study, mistreatment, more than any other individual resident or program characteristic, was associated with burnout symptoms and suicidal thoughts. We also found that junior residents and those frequently exceeding duty-hour limits may be particularly susceptible to these poor wellness outcomes.

The higher raw rate of burnout reported among women in our study was not observed after adjusting for mistreatment. Although previous studies showed that female surgeons scored lower on measures of wellness,[15,16] our results suggest that the higher prevalence of mistreatment in women may explain these findings. Higher prevalences of discrimination, harassment, and abuse in women have been described previously.[11,13]

Although the overall prevalence of mistreatment may be troubling, the substantial number of programs with very low rates of mistreatment suggest that improvements in the training environment may be feasible, as is being investigated in the Surgical Education Culture Optimization

Through Targeted Interventions Based on National Comparative Data — The SECOND Trial (ClinicalTrials.gov number, NCT03739723). Given the association of mistreatment with burnout and suicidal thoughts, reducing mistreatment may be an effective method for improving the well-being of residents. However, the lack of concordance among the program-level prevalence of different mistreatment types (e.g., programs with a high incidence of gender discrimination do not necessarily also have a high incidence of sexual harassment) suggests the need for solutions tailored to the specific mistreatment type and local context.

Our study had several potential limitations. The concurrent administration of the survey with the ABSITE may influence the results; both examination-related distress and post-examination relief could affect reporting. Second, because individual performance on the ABSITE is tracked, residents may have had concerns about nonconfidentiality, despite assurances that survey data would be deidentified; the resultant social desirability bias would be expected to underestimate mistreatment. Third, given that the survey asked about exposures since the beginning of residency, recall bias may exist. Fourth, we intentionally did not define "discrimination," "abuse," or "harassment" in this exploratory study. Evidence indicates that when specific mistreatment behaviors are queried, reporting increases substantially[9]; thus, our results may underestimate the prevalence of mistreatment. However, asking about mistreatment without rigid definitions allows evaluation of exposures perceived by the residents. Because perception is an important metric of workplace safety, it is frequently used to assess workplace mistreatment.[38] Fifth, limitations in survey length left many potentially relevant variables (e.g., sexual orientation or clinical autonomy) unexplored. Sixth, correlation among mistreatment variables necessitated creation of a composite variable that summarized frequency of exposure to multiple types of discrimination. However, separate analyses of the individual exposures yielded similar results. Finally, we are not able to determine whether the observed associations of mistreatment with burnout and suicidality were causal.

Mistreatment is a frequent experience for general surgery residents in the United States and is associated with burnout and suicidal thoughts. The higher prevalence of burnout and suicidal thoughts among women may be explained largely by their more frequent exposure to mistreatment. Wide variation among programs suggests that opportunities for improvement exist. Our results provide initial insights on how we may build safer, more equitable, and more effective educational environments for trainees.

The results and conclusions of this article are the authors' own and do not represent the views of organizations providing support or otherwise involved.

Presented in part at the 2019 American College of Surgeons Clinical Congress, San Francisco, October 27–31, 2019, and in part at the 14th Annual Academic Surgical Congress, Houston, February 5–7, 2019.

Supported by the American College of Surgeons, the Accreditation Council for Graduate Medical Education, and the American Board of Surgery. Drs. Ellis and Hewitt were supported by a postdoctoral research fellowship from the Agency for Healthcare Research and Quality (5T32HS000078), and Dr. Yang's research was supported by the National Heart, Lung, and Blood Institute of the National Institutes of Health (K08HL145139).

Disclosure forms provided by the authors are available with the full text of this article at NEJM.org.

We thank the following persons who have contributed to the administration and execution of this research: Jeanette W. Chung, Ph.D., Allison R. Dahlke, M.P.H., Kathryn E. Englehardt, M.D., Remi Love, B.S., Ryan P. Merkow, M.D., Andrew Jones, Ph.D., Jason Kopp, Ph.D., and Christopher M. Quinn, M.S.

REFERENCES

1. West CP, Shanafelt TD, Kolars JC. Quality of life, burnout, educational debt, and medical knowledge among internal medicine residents. JAMA 2011;306:952-60.
2. Shanafelt TD, Balch CM, Dyrbye L, et al. Special report: suicidal ideation among American surgeons. Arch Surg 2011;146:54-62.
3. Shanafelt TD, Noseworthy JH. Executive leadership and physician well-being: nine organizational strategies to promote engagement and reduce burnout. Mayo Clin Proc 2017;92:129-46.
4. Shanafelt T, Goh J, Sinsky C. The business case for investing in physician well-being. JAMA Intern Med 2017;177:1826-32.
5. Dyrbye LN, Burke SE, Hardeman RR, et al. Association of clinical specialty with symptoms of burnout and career choice regret among US resident physicians. JAMA 2018;320:1114-30.
6. Frank E, Brogan D, Schiffman M. Prevalence and correlates of harassment among US women physicians. Arch Intern Med 1998;158:352-8.
7. Bates CK, Jagsi R, Gordon LK, et al. It is time for zero tolerance for sexual harassment in academic medicine. Acad Med 2018;93:163-5.
8. Dzau VJ, Johnson PA. Ending sexual harassment in academic medicine. N Engl J Med 2018;379:1589-91.
9. Benya FF, Widnall SE, Johnson PA, eds. Sexual harassment of women: climate, culture, and consequences in academic sciences, engineering, and medicine. Washington, DC: National Academies Press, 2018.
10. Nunez-Smith M, Pilgrim N, Wynia M, et al. Race/ethnicity and workplace dis-

crimination: results of a national survey of physicians. J Gen Intern Med 2009;24:1198-204.
11. Fnais N, Soobiah C, Chen MH, et al. Harassment and discrimination in medical training: a systematic review and meta-analysis. Acad Med 2014;89:817-27.
12. Sandler BJ, Tackett JJ, Longo WE, Yoo PS. Pregnancy and parenthood among surgery residents: results of the first nationwide survey of general surgery residency program directors. J Am Coll Surg 2016;222:1090-6.
13. Saalwachter AR, Freischlag JA, Sawyer RG, Sanfey HA. The training needs and priorities of male and female surgeons and their trainees. J Am Coll Surg 2005;201:199-205.
14. Lebares CC, Guvva EV, Ascher NL, O'Sullivan PS, Harris HW, Epel ES. Burnout and stress among US surgery residents: psychological distress and resilience. J Am Coll Surg 2018;226:80-90.
15. Elmore LC, Jeffe DB, Jin L, Awad MM, Turnbull IR. National survey of burnout among US general surgery residents. J Am Coll Surg 2016;223:440-51.
16. Dahlke AR, Johnson JK, Greenberg CC, et al. Gender differences in utilization of duty-hour regulations, aspects of burnout, and psychological well-being among general surgery residents in the United States. Ann Surg 2018;268:204-11.
17. American Board of Surgery. ABS in-training examination (http://www.absurgery.org/default.jsp?certabsite).
18. Bilimoria KY, Chung JW, Hedges LV, et al. National cluster-randomized trial of duty-hour flexibility in surgical training. N Engl J Med 2016;374:713-27.
19. Bilimoria KY, Hoyt DB, Lewis F. Making the case for investigating flexibility in duty hour limits for surgical residents. JAMA Surg 2015;150:503-4.
20. Bilimoria KY, Chung JW, Hedges LV, et al. Development of the Flexibility in Duty Hour Requirements for Surgical Trainees (FIRST) Trial protocol: a national cluster-randomized trial of resident duty hour policies. JAMA Surg 2016;151:273-81.
21. Desai SV, Asch DA, Bellini LM, et al. Education outcomes in a duty-hour flexibility trial in internal medicine. N Engl J Med 2018;378:1494-508.
22. Jackson SE, Maslach C, Leiter M. Maslach burnout inventory manual. 4th ed. Menlo Park, CA: Mind Garden, 2016.
23. McManus IC, Winder BC, Gordon D. The causal links between stress and burnout in a longitudinal study of UK doctors. Lancet 2002;359:2089-90.
24. Riley MR, Mohr DC, Waddimba AC. The reliability and validity of three-item screening measures for burnout: evidence from group-employed health care practitioners in upstate New York. Stress Health 2018;34:187-93.
25. Rotenstein LS, Torre M, Ramos MA, et al. Prevalence of burnout among physicians: a systematic review. JAMA 2018;320:1131-50.
26. Meehan PJ, Lamb JA, Saltzman LE, O'Carroll PW. Attempted suicide among young adults: progress toward a meaningful estimate of prevalence. Am J Psychiatry 1992;149:41-4.
27. Dyrbye LN, Thomas MR, Massie FS, et al. Burnout and suicidal ideation among U.S. medical students. Ann Intern Med 2008;149:334-41.
28. Crebbin W, Campbell G, Hillis DA, Watters DA. Prevalence of bullying, discrimination and sexual harassment in surgery in Australasia. ANZ J Surg 2015;85:905-9.
29. Freedman-Weiss MR, Chiu AS, Heller DR, et al. Understanding the barriers to reporting sexual harassment in surgical training. Ann Surg 2019 April 2 (Epub ahead of print).
30. Fairchild AL, Holyfield LJ, Byington CL. National Academies of Sciences, Engineering, and Medicine report on sexual harassment: making the case for fundamental institutional change. JAMA 2018;320:873-4.
31. Grinberg C. 'These things sometimes happen': speaking up about harassment. Health Aff (Millwood) 2018;37:1005-8.
32. Rabinowitz LG. Recognizing blind spots — a remedy for gender bias in medicine? N Engl J Med 2018;378:2253-5.
33. Viglianti EM, Oliverio AL, Meeks LM. Sexual harassment and abuse: when the patient is the perpetrator. Lancet 2018;392:368-70.
34. Coe IR, Wiley R, Bekker LG. Organisational best practices towards gender equality in science and medicine. Lancet 2019;393:587-93.
35. Kessler RC, Berglund P, Borges G, Nock M, Wang PS. Trends in suicide ideation, plans, gestures, and attempts in the United States, 1990-1992 to 2001-2003. JAMA 2005;293:2487-95.
36. Borges G, Nock MK, Haro Abad JM, et al. Twelve-month prevalence of and risk factors for suicide attempts in the World Health Organization World Mental Health Surveys. J Clin Psychiatry 2010;71:1617-28.
37. Yaghmour NA, Brigham TP, Richter T, et al. Causes of death of residents in ACGME-accredited programs 2000 through 2014: implications for the learning environment. Acad Med 2017;92:976-83.
38. Burkard AW, Boticki MA, Madson MB. Workplace discrimination, prejudice, and diversity measurement: a review of instrumentation. J Career Assess 2002;10:343-61.