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National Survey of Burnout among US General Surgery Residents

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Abstract

Background—Burnout is a complex syndrome of emotional distress that can disproportionately affect individuals who work in healthcare professions.

Study Design—For a national survey of burnout in US general surgery residents, we asked all Accreditation Council for Graduate Medical Education-accredited general surgery program directors to email their general surgery residents an invitation to complete an anonymous, online survey. Burnout was assessed with the Maslach Burnout Inventory; total scores for Emotional Exhaustion (EE), Depersonalization (DP), and Personal Accomplishment (PA) subscales were calculated. Burnout was defined as having a score in the highest tertile for EE or DP or lowest tertile for PA. Chi-square tests and one-way analyses of variance were used to test associations between burnout tertiles for each subscale and various resident and training-program characteristics as appropriate.

Results—From April–December, 2014, 665 residents actively engaged in clinical training had data for analysis; 69% met the criterion for burnout on at least one subscale. Higher burnout on each subscale was reported by residents planning private practice compared with academic careers. A greater proportion of women than men reported burnout on EE and PA. Higher burnout on EE and DP was associated with greater work hours per week. Having a structured mentoring program was associated with lower burnout on each subscale.

Conclusions—The high rates of burnout among general surgery residents are concerning given the potential impact of burnout on the quality of patient care. Efforts to identify at-risk populations and to design targeted interventions to mitigate burnout in surgical trainees are warranted.

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Keywords

Burnout; General Surgery; Surgical Education

INTRODUCTION

In the 1970s, the construct of "burnout" was introduced specifically to characterize an individual's stress experience and its association with the work environment.(1) Burnout is defined by feelings of emotional fatigue, cynicism and poor self-efficacy secondary to occupational stress (1, 2) and has been linked to poor job satisfaction and increased medical errors.(3–5) Additionally, burnout is associated with increased alcohol and substance abuse and impaired interpersonal relationships.(6) Given the potential impact of burnout on the quality patient care, burnout may have medicolegal and financial implications for surgeons and the institutions at which they work.

Several studies of burnout among attending surgeons have been conducted.(7–12) A national study of 7905 practicing surgeons across all subspecialties found that 40% met criteria for burnout. Single-institution studies of surgical residents report even higher rates of burnout among surgical trainees. (13, 14) Furthermore, attrition among surgical trainees remains high, with rates of 14–23% quoted in the literature.(15) Evidence suggests that emotional exhaustion, a key component of burnout, is associated with voluntary job turnover.(16) The existing body of evidence on burnout in residents has focused on all-comers to medical residency and surgical subspecialty training programs, but few studies have focused specifically on general surgery residents, and these data are limited to single-institution studies. (14, 17, 18)

To characterize the burden of burnout in surgical training, we sought to characterize the level of burnout in U.S. general surgery residents. We present findings from a national survey to determine the prevalence of burnout among general surgical trainees and to identify sociodemographic and program characteristics associated with burnout.

METHODS

All U.S. general surgery residents currently enrolled in an Accreditation Council for Graduate Medical Education (ACGME)-accredited general surgery training program were eligible to participate in the study. We obtained the publicly available contact information for all 246 ACGME-accredited general surgery programs. In April 2014, we sent an e-mail to each program coordinator or program director, asking them to distribute our survey to their general surgery residents. The email included a cover letter inviting surgical residents at their training program to participate in the study with a hyperlink to the survey. A reminder email was sent two weeks after initial distribution to encourage participation. The Institutional Review Board at Washington University approved this cross-sectional study. Participation was voluntary, and the survey was completed anonymously.

A 57-item questionnaire was developed to obtain data regarding sociodemographic characteristics, educational and professional activities, training-program characteristics, career goals, and burnout.

Sociodemographic data included five items regarding residents' age, gender, relationship status, and family size. Individuals who were married or partnered answered three additional items on the professional activity of their spouses/partners.

Educational and professional activity data were obtained from 27 items regarding participants' clinical year, research activity and additional degrees obtained, interruptions in training and career goals. We asked participants whether they had considered dropping out of residency at any point during their training and if trainees would elect to complete a general surgery residency if given the option again. We also asked about respondents' respective training programs, including geographic region, type of program (e.g. academic, community, or mixed), presence of a structured mentorship program, and about average work hours.

We used the validated, 22-item Maslach Burnout Inventory – Human Services Survey (MBI-HSS) to measure burnout.(2) Response options used a 7-point Likert scale ranging from 0 to 6. The survey was designed to measure various aspects of burnout on three subscales: emotional exhaustion (EE), depersonalization (DP) and personal accomplishment (PA). Missing data for the MBI-HSS were imputed using the means of each observed item. Less than 1% of MBI-HSS items had missing data. Total scores on each of the three subscales were stratified into high, moderate or low tertiles. The cutoffs for each tertile of burnout were empirically determined based upon the previously validated, normative MBI-HSS data for healthcare workers (Low EE ≤18, Moderate EE 19–26, High EE ≥27; Low DP ≤5, Moderate DP 6–9, High DP ≥10; Low PA ≥34, Moderate PA 29–33, High PA ≤28).(2) A score in the highest tertile for EE and DP and in the lowest tertile for PA corresponds to a high level of burnout; we defined the outcome of "burnout" as reporting a high level of burnout on one or more subscales, i.e., in the highest tertile of EE or DP or the lowest tertile of PA.

Chi-square tests were used to determine associations between categorical variables. One-way analysis of variance (ANOVA) was used to measure between-groups differences for age and number of work hours by overall burnout (yes vs. no) and by burnout tertiles on each subscale. Multivariate logistic regression was used to identify factors independently associated with burnout; we report the adjusted odds ratios and 95% confidence intervals. Multinomial logistic regression was conducted to identify factors associated with meeting criteria for burnout on more than one subscale (i.e., 2 vs. 1, 3 vs. 1 and 3 vs. 2 subscales). A p value < 0.05 was considered statistically significant. Statistical analyses were performed using SPSS version 23.0 (IBM Corp., Armonk, NY, 2015).

RESULTS

A total of 753 general surgery trainees completed the survey between April and December of 2014; 665 of these residents were engaged in clinical training and were included in

analysis. 88 (11.7%) of these trainees were engaged in other academic or research training separate from clinical training and were excluded. The average age of the study sample of residents in clinical training was 30 years. Table 1 describes the sociodemographic characteristics and career plans of the sample. A total of 69% of residents had partners (e.g. committed relationship or married) and the remaining 31% were single or divorced. Sixty-four percent of residents reported that they were training at an academic center, with another 25% described their training program as mixed, with training in both academic and community settings. Seventy-eight percent of residents planned to pursue a fellowship after completion of residency. Fifty-two percent of participants planned to enter a career in academic medicine, 40% planned enter private practice, and 6% planned to pursue a career in military surgery, non-surgical clinical practice or a non-clinical career after all GME training.

Prevalence of Burnout

We defined “burnout” as scoring in the highest tertile of EE or DP or in the lowest tertile of PA. Based on the MBI-HSS normative data (2), 57% of respondents scored in the highest tertile of EE, 50% of respondents scored in the highest tertile of DP, and 16% of residents scored in the lowest tertile of PA (Figure 1A). In our sample, 69% of respondents met the aforementioned criterion for burnout, with 24% exhibiting burnout on one subscale, 34% on 2 subscales, and 10% on all 3 subscales (Figure 1B).

Forty-four percent of residents reported considering dropping out of residency. Furthermore, 44% of residents reported that they would not choose to enroll in a general surgery residency, if given the option again, and of these individuals, 40% said they would pursue a career outside of medicine, 23% said they would enroll in a non-surgical specialty, and 37% reported they would pursue a different surgical subspecialty.

Sociodemographic Characteristics Associated with Burnout

Burnout was more prevalent among women, with 73% of women meeting the criterion for burnout compared to 65% of men ($p = 0.02$, Table 1). Gender differences in burnout were observed for EE and DP subscales (Tables 2–3), with a greater percentage of women meeting the criterion for burnout. In our sample of residents, having children was associated with higher levels of PA compared with not having children ($p=0.02$, Table 4). No significant associations between rates of burnout and relationship status were observed in our sample.

Professional and Programmatic Characteristics Associated with Burnout

The average number of work hours reported was 80 hours per week with a range of 60–120 hours. Residents who met the criterion for burnout reported working longer hours than those who did not (81 vs. 79 hours, $p = 0.001$, Table 1). Individuals who scored in the highest tertile for EE and DP reported longer work hours when compared to individuals scoring in the lowest tertile (each $p < 0.05$, Tables 2–3). Residents who intended to enter private practice or an alternative career (military surgery, non-surgical clinical practice or a non-clinical career) were more likely to meet the criterion for burnout than those who planned a career in academic medicine after training (78% vs. 73% vs. 61%, respectively, $p < 0.001$,

Table 1). A greater proportion of residents planning a career in private practice scored in the highest tertile of EE and of DP and in the lowest tertile of PA than residents planning a career in academia (Tables 2–4). No significant association between year of clinical training and burnout was observed (Tables 1–4) in univariate tests.

Burnout did not differ significantly by geographic location or type of training program (e.g., academic, community, or mixed). However, a greater proportion of trainees in mixed training programs scored in the lowest tertile of PA compared with the other training programs (Table 2–4); thus mixed training programs in particular were associated with greater burnout for PA.

We also observed a significant positive association between structured mentoring programs and burnout. A lower proportion of residents who reported the availability of a structured mentoring program for personal or professional support met the criterion for burnout than residents without a structured mentoring program (63% vs.76%, $p < 0.001$, Table 1). Greater proportions of residents without a structured mentoring program scored in the highest tertile of EE and DP and in the lowest tertile of PA (each $p < 0.05$, Tables 2–4).

Multivariate Logistic Regression Analysis

Using multivariate logistic regression, we also evaluated the independent associations between the binary outcome of burnout in any dimension and all variables of interest, including age, gender, work hours, career plans, having children, relationship status, postgraduate clinical training year, program type, and presence of a structured mentoring program (Table 5). A total of 596 individuals with complete data for all variables were included in this regression model (Table 1). No significant differences in overall burnout rates or in each burnout subscale were observed between individuals included in the analysis and those excluded due to missing demographic data (data not shown). Older residents, women, residents who lacked availability of a structured mentoring program and who worked longer hours were more likely to meet the criterion for burnout; but chief residents and residents who planned academic careers were less likely to meet the criterion for burnout (Table 5). We also conducted a multinomial logistic regression to identify factors associated with meeting the criterion for burnout on more than one subscale (i.e., 2 vs. 1, 3 vs. 1, and 3 vs. 2 subscales). Individuals who reported longer work hours met criterion on 2 subscales compared with 1 subscale (OR 1.043, 95% CI 1.013–1.074). None of the variables were independently associated with burnout on all three scales when compared with being burned out on either 1 or 2 scales.

DISCUSSION

Given the impact of burnout on job performance, it is alarming that 69% of U.S. general surgery trainees in our sample met the criterion for burnout. Furthermore, 44% of residents in our sample considered dropping out of their training program, and a greater proportion of trainees who met the criterion for burnout considered dropping out of residency training compared with trainees who did not meet the criterion for burnout. Evidence suggests that emotional exhaustion is associated with job turnover (16), and 57% of the residents in our sample exhibited high levels of emotional exhaustion. In a climate where the general

surgeon-to-population ratio has continually declined, there are concerns about the loss of surgical trainees and the potential for insufficient numbers of general surgeons to meet population needs.(19, 20) Evidence also suggests that the well-being of medical trainees is worse than age-matched peers in non-medical professions, with higher levels of burnout, fatigue, depression, and lower quality of life.(21) Since residents play an integral role in the coordination and delivery of patient care, ensuring the well-being of surgery residents who dedicate a substantial amount of time to enhancing the quality of the lives of others should be a priority. The existing body of evidence regarding burnout during residency training is limited to surgical subspecialty and non-surgical residents, with only a few single institutional studies focused on general surgery trainees. Our study contributes to this body of evidence and represents the first national survey evaluating burnout in general surgery residents.

This evaluation demonstrated that women training in general surgery were at higher risk of burnout compared to men (Table 5), which is in contrast to much of the existing literature on burnout in residents training in other specialties. In a literature review of 15 studies reporting gender differences in burnout during medical training, none of the studies reviewed reported a higher risk of burnout in women.(18) Most of these studies were small, cross-sectional surveys and may have had insufficient power to detect a gender difference. However, a national study of head and neck surgery residents also identified an association between female gender and emotional exhaustion.(22) Surgical training may differentially affect women when compared with other medical training programs; for example previous investigators have found that female surgical residents are more likely than nonsurgical residents to perceive stereotyped bias against women.(23) Women may have additional stressors at home that challenge work-life balance when compared to men and may find it challenging to find mentorship in a historically male-dominated field.(24) Although a significantly greater proportion of residents without children reported burnout on the PA subscale (compared with residents with children), multivariate logistic regression analysis demonstrated no significant independent association between having children and meeting the criterion for burnout overall (i.e., on at least one of the subscales). Similar findings were demonstrated in a study of residents in multiple specialties at Wayne State University (25), where individuals without children had rates of burnout 1.5 times higher than those with children. Children may represent a marker for improved social support outside of the hospital training environment. Social support has been associated with lower levels of work-related stress.(26)

In our multivariate logistic regression model we observed a greater likelihood of burnout with increasing age in general surgery trainees (Table 5). Interestingly, however, there was a lower likelihood of experiencing burnout residents in PGY 5 compared with PGY 1 (despite PGY 5 residents being older than PGY 1 residents, Table 5), suggesting that the experience of burnout may decrease over time over the clinical years of residency, independent of age. The literature on age and burnout in residents is limited and shows conflicting results, (14, 27) but none of these studies analyzing age and burnout specifically focused on general surgery trainees.

We also noted that residents who planned to enter private practice reported higher levels of burnout (Table 1) and were about twice as likely to report burnout on any subscale compared with those planning a career in academic medicine (Table 5). Consistent with these findings, a study of burnout and career satisfaction in members of the American College of Surgeons found that private practice surgeons were more likely to experience burnout than surgeons practicing in academic settings.(8) There may be systematic differences in personality characteristics, lifestyle or coping strategies between residents who plan private practice and academic medicine careers. An earlier study demonstrated that private practice surgeons reported working fewer hours, had more weeks of vacation, and earned a higher income.(28) Another study found that exposing a group of medical students to private practice in surgery was associated with a change in their perceptions of the surgical field and even convinced some students to consider a career in surgery when they previously had not.(29) Residents who are interested in a private practice career may perceive that private practice affords greater flexibility in scheduling than academic surgery, and thus, these residents may be more severely impacted by their lack of control over work schedules and the stress resulting from rigorous surgical training.

Our results indicated that longer work hours were associated with higher levels of emotional exhaustion and depersonalization and work hours emerged as a factor independently associated with burnout on any subscale in the multivariate model (Table 5). Residents in our sample reported working an average of 80 hours per week, 23% of whom reported working longer hours, in violation of the ACGME-mandated 80-hour work week. Our findings are consistent with a national study of burnout in 684 otolaryngology residents, where work hours were associated with increased emotional exhaustion.(22) Interestingly, work-hour reform has not appeared to have a positive effect on burnout (13) or attrition in general surgery trainees.(30–32) While we recommend adherence to the ACGME work-hour guidelines and believe it likely plays an important role in the etiology of burnout, our observed high rates of burnout despite the majority of respondents adhering to work hour limitations suggest that attempts to address burnout should extend beyond work-hour restrictions.

Finally, a lower proportion of residents training at programs that provided a structured mentoring program reported burnout when compared with residents training at programs lacking a formal mechanism for personal and professional support, similar to findings of an exploratory study of multispecialty residents at two Michigan hospital systems.(33) In a qualitative study of attrition among surgical residents, administrative support emerged as an important theme for preventing attrition.(30) Residents who voluntarily left their surgical training program cited the lack of a mechanism to discuss personal and professional concerns without fear of reprisal as a contributing factor for departure. Effective mentorship programs that pair faculty with residents based upon personal and professional values may provide a powerful aid for coping and alleviation of burnout. Strong mentoring relationships and other supports can provide opportunities for surgical trainees to receive guidance for anticipating and navigating challenges and to express personal and professional concerns without fear of repercussions.

While burnout appears to be prevalent in surgical residency training, the experience of burnout and contributing factors are likely to be highly individualized. Maslach et al. conceptualized burnout as an experience that results from a mismatch between one's values and their work setting on at least one of six dimensions: 1) workload; 2) perceived control over work experiences; 3) rewards for work; 4) sense of community; 5) perceived fairness in the workplace; and 6) personal ethics and values. This conceptual framework is directly applicable to the residency training experience and suggests that a catch-all approach to mitigating burnout may be challenging. Mentoring relationships can aid in early identification of burnout and help trainees develop strategies to mitigate their individual experience of burnout. Our findings suggest that availability of a structured mentoring program offering personal and professional support for residents has the potential to tailor interventions to mitigate burnout. Evaluating mentoring programs is an important area of future research.

This study has several limitations. While our study represents the largest survey of burnout in U.S. general surgery residents, our findings are limited by selection bias, as there may be systematic differences between respondents and non-respondents. We lacked information about the characteristics of general surgery residents and the institutions where they trained, since we did not have information regarding how many or which training program directors distributed our email invitation to their residents. However, the demographic and programmatic characteristics of our sample align with those reported by the National Study of Expectations and Attitudes of Residents in Surgery (NEARS), a cross-sectional survey that was administered in concert with the American Board of Surgery In-Training Exam in 2008, which included 75% of categorical general surgery residents.(34) Although our two studies reported a similar rate of programs in academic settings (64% vs. 68%) and had a similar geographical distribution of programs, the NEARS study reported 32% of residents were women,(34) which was less than the 43% we report. This difference might reflect an increase in the number of female general surgery trainees over time. In another report, Davis et al found that between 2000 and 2006, the proportion of female US medical graduates entering general surgery residency increased from 32% to 40%.(35) Others reported that in 2006–2008, 42% of medical students applying to general surgery were women.(36) More recently, it was reported that in 2011 women comprised 45% of highly selective general surgery residency applicants.(37) The variations by gender between the NEARS population (which reflects applicant pool from 2001–2007) and our population (reflecting the applicant pool from 2006–2013) likely represents changes in the demographics of general surgery during that time period. We also found slightly lower rates of marriage (43% in our population vs. 51% in NEARS). Interestingly, this too may reflect demographic shifts in the general surgery population as subset analysis of the PGY-1 and PGY-2 residents in the NEARS populations (which overlap with our populations) found 43% of residents reported being married.(38) Taken together, we believe these data suggest that our sample, although limited in size does reflect a representative cross-section of US general surgery residents engaged in clinical training.

In the present study, we focused on residents actively involved in clinical training, and elected to exclude residents involved in other academic or research training at the time of survey. Research fellowships during surgical training represent an experience that is distinct

from clinical training and likely has unique drivers of burnout that warrant an independent, in-depth analysis. We feel that including these residents in the analysis of burnout during clinical training may have confounded our analysis of burnout during surgical residency, which is predominately a clinical training paradigm. We anticipate that future study will be required to understand the scope and burden of burnout in residents during non-clinical training years and how that relates to burnout during clinical training.

The timing of our study also may have influenced the results, and as with all studies relying on self-reported data, there may be response bias. While we collected data from April to December of 2014, a large proportion of responses were received in August and September. Studies of interns' mood and empathy suggest that rates of depression increase and empathy decreases throughout the academic year.(39, 40) Since many of our respondents completed the survey early in the academic year, we might expect that an even greater percentage of residents may experience burnout than our data demonstrated. Additionally, as the link to our anonymous survey was distributed by program coordinators or directors, we were unable to discern whether individuals might have completed the survey more than once; although unlikely, this could introduce another source of bias. We are also limited by the cross-sectional study design and cannot make causal inferences from these data.

Despite these limitations, our study provides an important profile of U.S. general surgery residents and indicates that burnout is pervasive among surgical trainees. Rates of burnout in this sample of general surgery residents were similar to reports in surgical subspecialty and non-surgical residents.(21, 25) Despite comparable rates of burnout, attrition rates in general surgery residency are higher than those in medicine residency.(14, 41) Our results highlight the need to further characterize the personal and professional implications of burnout in surgical trainees, to develop systematic strategies to identify early signs of burnout and to support residents' personal and professional development.

CONCLUSIONS

The high rates of burnout among general surgery residents are concerning given the potential impact of burnout on the quality of patient care. Efforts to identify at-risk populations and to design targeted interventions to mitigate burnout in surgical trainees are warranted.

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References

1. Maslach C, Schaufeli WB, Leiter MP. Job burnout. Ann Rev Psychol. 2001; 52:397–422. [PubMed: 11148311]

2. Maslach, C., Jackson, SE. Maslach burnout inventory : manual. 2. Palo Alto, Calif. (577 College Ave., Palo Alto 94306): Consulting Psychologists Press; 1986.
3. West CP, Huschka MM, Novotny PJ, et al. Association of perceived medical errors with resident distress and empathy: a prospective longitudinal study. JAMA. 2006; 296:1071–1078. [PubMed: 16954486]
4. Shanafelt TD, Bradley KA, Wipf JE, Back AL. Burnout and self-reported patient care in an internal medicine residency program. Ann Int Med. 2002; 136:358–367. [PubMed: 11874308]
5. Shanafelt TD, Balch CM, Bechamps G, et al. Burnout and medical errors among American surgeons. Ann Surg. 2010; 251:995–1000. [PubMed: 19934755]
6. Kahill S. Relationship of burnout among professional psychologists to professional expectations and social support. Psychological Reports. 1986; 59:1043–1051. [PubMed: 3823309]
7. Balch CM, Freischlag JA, Shanafelt TD. Stress and burnout among surgeons: understanding and managing the syndrome and avoiding the adverse consequences. Arch Surg. 2009; 144:371–376. [PubMed: 19380652]
8. Balch CM, Shanafelt TD, Sloan JA, et al. Distress and career satisfaction among 14 surgical specialties, comparing academic and private practice settings. Ann Surg. 2011; 254:558–568. [PubMed: 21946217]
9. Campbell DA Jr, Sonnad SS, Eckhauser FE, et al. Burnout among American surgeons. Surgery. 2001; 130:696–702. discussion -705. [PubMed: 11602901]
10. Shanafelt TD, Balch CM, Bechamps GJ, et al. Burnout and career satisfaction among American surgeons. Ann Surg. 2009; 250:463–471. [PubMed: 19730177]
11. Bertges Yost W, Eshelman A, Raoufi M, Abouljoud MS. A national study of burnout among American transplant surgeons. Transplant Proc. 2005; 37:1399–1401. [PubMed: 15848732]
12. Kuerer HM, Eberlein TJ, Pollock RE, et al. Career satisfaction, practice patterns and burnout among surgical oncologists: report on the quality of life of members of the Society of Surgical Oncology. Ann Surg Oncol. 2007; 14:3043–3053. [PubMed: 17828575]
13. Gelfand DV, Podnos YD, Carmichael JC, et al. Effect of the 80-hour workweek on resident burnout. Arch Surg. 2004; 139:933–938. discussion 938–940. [PubMed: 15381609]
14. Ishak WW, Lederer S, Mandili C, et al. Burnout during residency training: a literature review. J Graduate medical education. 2009 Dec; 1(2):236–42.
15. Dodson TF, Webb AL. Why do residents leave general surgery? The hidden problem in today's programs. Curr Surg. 2005; 62:128–131. [PubMed: 15708164]
16. Wright TA, Cropanzano R. Emotional exhaustion as a predictor of job performance and voluntary turnover. J Applied Psychol. 1998; 83:486–493. [PubMed: 9648526]
17. Prins JT, Gazendam-Donofrio SM, Tubben BJ, et al. Burnout in medical residents: a review. Med Education. 2007; 41:788–800.
18. Thomas NK. Resident burnout. JAMA. 2004; 292:2880–2889. [PubMed: 15598920]
19. Charles AG, Walker EG, Poley ST, et al. Increasing the number of trainees in general surgery residencies: is there capacity? Acad Med. 2011; 86:599–604. [PubMed: 21436659]
20. Fischer JE. The impending disappearance of the general surgeon. JAMA. 2007; 298:2191–2193. [PubMed: 18000204]
21. Dyrbye LN, West CP, Satele D, et al. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med. 2014; 89:443–451. [PubMed: 24448053]
22. Golub JS, Weiss PS, Ramesh AK, et al. Burnout in residents of otolaryngology-head and neck surgery: a national inquiry into the health of residency training. Acad Med. 2007; 82:596–601. [PubMed: 17525550]
23. Salles A, Mueller CM, Cohen GL. Exploring the relationship between stereotype perception and residents' well-being. J Am Coll Surg. 2016; 222:52–58. [PubMed: 26616033]
24. Gifford E, Galante J, Kaji AH, et al. Factors associated with general surgery residents' desire to leave residency programs: a multi-institutional study. JAMA Surg. 2014; 149:948–953. [PubMed: 25075473]

25. Martini S, Arfken CL, Churchill A, Balon R. Burnout comparison among residents in different medical specialties. Acad Psychiatry. 2004; 28:240–242. [PubMed: 15507560]
26. Viswesvaran C, Sanchez JI, Fisher J. The role of social support in the process of work stress: a meta-analysis. J Vocational Behavior. 1999; 54:314–334.
27. Brewer EW, Shapard L. Employee burnout: A meta-analysis of the relationship between age and years of experience. Human Resource Development Review. 2004; 3:102–123.
28. Schroen AT, Brownstein MR, Sheldon GF. Comparison of private versus academic practice for general surgeons: a guide for medical students and residents. J Am Coll Surg. 2003; 197:1000–1011. [PubMed: 14644289]
29. Carter MB, Larson GM, Polk HC Jr. A brief private group practice rotation changes junior medical students' perception of the surgical lifestyle. Am J Surg. 2005; 189:458–461. [PubMed: 15820461]
30. Bongiovanni T, Yeo H, Sosa JA, et al. Attrition from surgical residency training: perspectives from those who left. Am J Surg. 2015; 210:648–654. [PubMed: 26238074]
31. Leibrandt TJ, Pezzi CM, Fassler SA, et al. Has the 80-hour work week had an impact on voluntary attrition in general surgery residency programs? J Am Coll Surg. 2006; 202:340–344. [PubMed: 16427562]
32. Everett CB, Helmer SD, Osland JS, Smith RS. General surgery resident attrition and the 80-hour workweek. Am J Surg. 2007; 194:751–756. discussion 756–757. [PubMed: 18005766]
33. Eckleberry-Hunt J, Lick D, Boura J, et al. An exploratory study of resident burnout and wellness. Acad Med. 2009; 84:269–277. [PubMed: 19174684]
34. Wong RL, Sullivan MC, Yeo HL, et al. Race and surgical residency: results from a national survey of 4339 US general surgery residents. Ann Surg. 2013; 257:782–787. [PubMed: 23001076]
35. Davis EC, Risucci DA, Blair PG, Sachdeva AK. Women in surgery residency programs: evolving trends from a national perspective. J Am Coll Surg. 2011; 212:320–326. [PubMed: 21247778]
36. Jagsi R, Griffith KA, DeCastro RA, Ubel P. Sex, role models, and specialty choices among graduates of US medical schools in 2006–2008. J Am Coll Surg. 2014; 218:345–352. [PubMed: 24468225]
37. Stain SC, Hiatt JR, Ata A, et al. Characteristics of highly ranked applicants to general surgery residency programs. JAMA Surg. 2013; 148:413–417. [PubMed: 23677403]
38. Sullivan MC, Yeo H, Roman SA, et al. Surgical residency and attrition: defining the individual and programmatic factors predictive of trainee losses. J Am Coll Surg. 2013; 216:461–471. [PubMed: 23266420]
39. Bellini LM, Baime M, Shea JA. Variation of mood and empathy during internship. JAMA. 2002; 287:3143–3146. [PubMed: 12069680]
40. Rosen IM, Gimotty PA, Shea JA, Bellini LM. Evolution of sleep quantity, sleep deprivation, mood disturbances, empathy, and burnout among interns. Acad Med. 2006; 81:82–85. [PubMed: 16377826]
41. Sullivan MC, Yeo H, Roman SA, et al. Surgical residency and attrition: defining the individual and programmatic factors predictive of trainee losses. J Am Coll Surg. 2013; 216:461–771. [PubMed: 23266420]

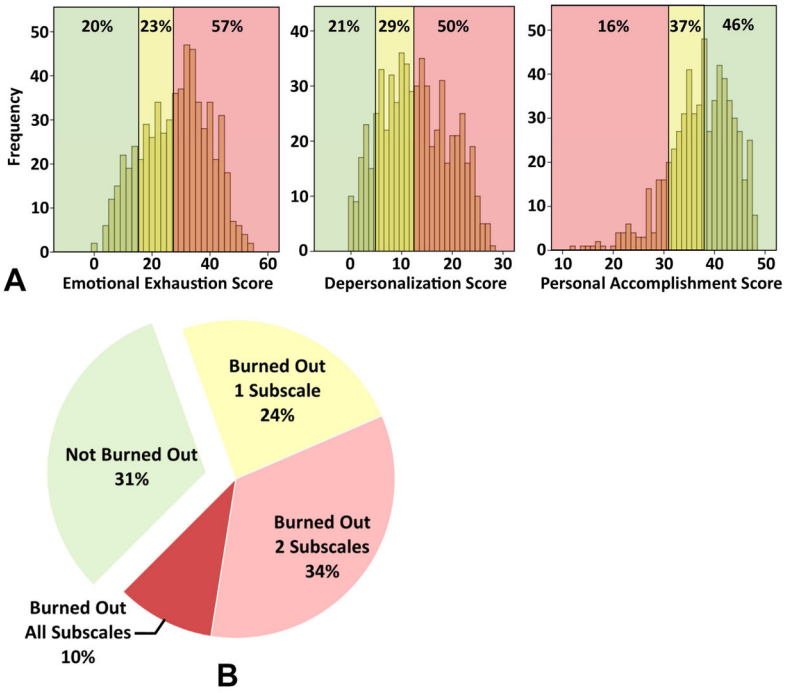

Figure 1.

Results of Maslach Burnout Inventory – Human Services Survey Subscale Scores. (A) Histograms demonstrating the frequency of scores for the Maslach Burnout Subscale of Emotional Exhaustion (EE), Depersonalization (DP) and Personal Accomplishment (PA). Note that burnout is associated with high EE and DP but low PA scores. Green, yellow and red shading reflect low, moderate and high burnout for EE, DP and PA subscales (2). (B) Percentage of residents who are burned out (scoring in the highest tertile of EE or DP or in the lowest tertile of PA) on 0, 1, 2 or 3 of the subscales. In total, 69% of residents met criteria for burnout on at least 1 subscale.

Table 1

Study Sample and Variables Associated with Burnout in Univariate Analyses

Variable	Total, n (%)	Burnout on any subscale? n (%)*		
		No	Yes	p Value
Gender				
Men	375 (56.4)	132 (35.2)	243 (64.8)	0.020†
Women	289 (43.5)	77 (26.2)	212 (73.4)	
Unknown‡	1 (<1.0)	--	--	
Relationship status				
Single/divorced	206 (31.0)	65 (31.6)	141 (68.4)	0.885
Committed relationship	169 (25.4)	51 (30.2)	118 (69.8)	
Married	287 (43.2)	93 (32.4)	194 (67.6)	
Unknown‡	3 (<1.0)			
Has children				
Yes	133 (20.0)	50 (37.6)	83 (62.4)	0.087
No	596 (76.1)	151 (29.8)	355 (70.2)	
Unknown‡	26 (3.9)	--	--	
Year of clinical training (PGY)				
1	181 (27.2)	62 (34.3)	119 (65.7)	0.086
2	161 (24.2)	41 (25.5)	120 (74.5)	
3	105 (15.8)	29 (27.6)	76 (72.4)	
4	90 (13.5)	32 (35.6)	58 (64.4)	
5	102 (15.2)	41 (40.2)	61 (59.8)	
Unknown‡	26 (3.9)	--	--	
Career plans				
Academic	354 (52.3)	139 (39.3)	215 (60.7)	<0.001†
Private practice	264 (39.7)	57 (21.6)	207 (78.4)	
Other	37 (5.6)	10 (27.0)	27 (73.0)	
Unknown‡	10 (1.5)	--	--	
Program type				
Academic	425 (63.9)	144 (33.9)	281 (66.1)	0.166
Community	70 (10.5)	19 (27.1)	51 (72.9)	
Mixed/other	169 (25.4)	45 (26.6)	124 (73.4)	
Unknown‡	1 (<1.0)	--	--	
Program location				
West	114 (17.1)	30 (26.3)	84 (73.7)	0.375
Midwest	198 (29.8)	59 (29.8)	139 (70.2)	
South	154 (23.2)	55 (35.7)	99 (64.3)	

Variable	Total, n (%)	Burnout on any subscale? n (%)*		
		No	Yes	p Value
Northeast	195 (29.3)	63 (2.8)	131 (67.2)	
Unknown**	4 (<1.0)	--	--	
Structured mentoring program?				
Yes	365 (54.9)	136 (37.3)	229 (62.7)	
No	296 (22.5)	72 (24.3)	224 (75.7)	<0.001†
Unknown‡	4 (<1.0)			
Age, y, mean (SD)	30.3 (3.3)	30.1 (3.3)	30.3 (3.2)	0.463
Work hours, mean (SD)	80.1 (8.0)	78.6 (7.1)	80.8 (8.3)	0.001†

*Percentages are of total respondents reporting burnout in each variable category (ie % of row totals).

†Significant.

‡Individuals with unknown status were excluded from univariate analysis.

PGY, postgraduate year.

Table 2

Variables Associated with Emotional Exhaustion in Univariate Analyses

Variable		MBI-HSS Emotional Exhaustion Subscale Tertiles, n (%)*			
	Total, n (%)	Low	Moderate	High	p Value
Gender					
Men	375 (56.4)	82 (21.9)	100 (26.7)	193 (51.5)	0.002†
Women	289 (43.5)	41 (14.2)	60 (20.8)	188 (65.1)	
Unknown‡	1 (<1.0)	--	--	--	
Relationship status					
Single/divorced	206 (31.0)	37 (18.0)	50 (24.3)	119 (57.8)	0.996
Committed relationship	169 (25.4)	33 (19.5)	41 (24.3)	95 (56.2)	
Married	287 (43.2)	53 (18.5)	69 (24.0)	165 (57.5)	
Unknown‡	3 (<1.0)	--	--	--	
Has children					
Yes	133 (20.0)	29 (21.8)	35 (26.3)	69 (51.9)	0.307
No	596 (76.1)	89 (17.6)	118 (23.3)	299 (59.1)	
Unknown‡	26 (3.9)	--	--	--	
Year of clinical training (PGY)					
1	181 (27.2)	40 (22.1)	42 (23.2)	99 (54.7)	0.467
2	161 (24.2)	22 (13.7)	37 (23.0)	102 (63.4)	
3	105 (15.8)	18 (17.1)	24 (22.9)	63 (60.0)	
4	90 (13.5)	19 (21.1)	25 (27.8)	46 (51.1)	
5	102 (15.2)	23 (22.5)	26 (25.5)	53 (52.0)	
Unknown‡	26 (3.9)	--	--	--	
Career plans					
Academic	354 (52.3)	90 (25.4)	89 (25.1)	175 (49.4)	<0.001†
Private practice	264 (39.7)	30 (11.4)	58 (22.0)	176 (66.7)	
Other	37 (5.6)	3 (8.1)	9 (24.3)	25 (67.6)	

Variable		MBI-HSS Emotional Exhaustion Subscale Tertiles, n (%)*			
	Total, n (%)	Low	Moderate	High	p Value
Unknown‡	10 (1.5)	--	--	--	
Program type					
Academic	425 (63.9)	89 (20.9)	103 (24.2)	233 (54.8)	0.087
Community	70 (10.5)	13 (18.6)	13 (18.6)	44 (62.9)	
Mixed/other	169 (25.4)	20 (11.8)	44 (26.0)	105 (62.1)	
Unknown‡	1 (<1.0)	--	--	--	
Program location					
West	114 (17.1)	24 (21.1)	23 (20.2)	67 (58.8)	0.627
Midwest	198 (29.8)	29 (14.6)	29 (24.7)	120 (60.6)	
South	154 (23.2)	31 (20.1)	41 (26.6)	82 (53.2)	
Northeast	195 (29.3)	38 (19.5)	47 (24.1)	110 (56.4)	
Unknown‡	4 (<1.0)	--	--	--	
Structured mentoring program?					
Yes	365 (54.9)	84 (23.0)	89 (24.4)	192 (52.6)	0.003†
No	296 (22.5)	39 (13.2)	70 (23.6)	187 (63.2)	
Unknown‡	4 (<1.0)	--	--	--	
Age, y, mean (SD)	30.3 (3.3)	30.4 (3.6)	29.9 (2.8)	30.4 (3.3)	0.227
Work hours, mean (SD)	80.1 (8.0)	77.8 (6.3)	79.4 (8.1)	81.1 (8.2)	<0.001†

*Percentages are of total respondents reporting burnout in each variable category (ie % of row totals).

†Significant.

‡Individuals with unknown status were excluded from univariate analysis.

PGY, postgraduate year.

Table 3

Variables Associated with Depersonalization in Univariate Analyses

Variable		MBI-HSS Depersonalization Subscale Tertiles, n (%)*			
	Total, n (%)	Low	Moderate	High	p Value
Gender					
Men	375 (56.4)	89 (23.7)	97 (25.9)	189 (50.4)	0.037†
Women	289 (43.5)	50 (17.3)	97 (33.6)	142 (49.1)	
Unknown‡	1 (<1.0)	--	--	--	
Relationship status					
Single/divorced	206 (31.0)	42 (20.4)	70 (34.0)	94(45.6)	0.323
Committed relationship	169 (25.4)	34 (20.1)	42 (24.9)	93 (55.0)	
Married	287 (43.2)	63 (22.0)	81 (28.2)	143 (49.8)	
Unknown‡	3 (<1.0)	--	--	--	
Has children					
Yes	133 (20.0)	37 (27.8)	39 (29.3)	57 (42.9)	0.054
No	596 (76.1)	95 (18.8)	149 (29.4)	262 (51.8)	
Unknown‡	26 (3.9)	--	--	--	
Year of clinical training (PGY)					
1	181 (27.2)	41 (22.7)	45 (24.9)	95 (52.5)	0.081
2	161 (24.2)	30 (18.6)	40 (24.8)	91 (56.5)	
3	105 (15.8)	19 (18.1)	33 (31.4)	53 (50.5)	
4	90 (13.5)	25 (27.8)	28 (31.1)	37 (41.1)	
5	102 (15.2)	21 (20.6)	40 (39.2)	41 (40.2)	
Unknown‡	26 (3.9)	--	--	--	
Career plans					
Academic	354 (52.3)	91 (25.7)	104 (29.4)	159 (44.9)	0.019†
Private practice	264 (39.7)	41 (15.5)	76 (28.8)	147 (55.7)	
Other	37 (5.6)	6 (16.2)	10 (27.0)	21 (56.8)	

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Variable		MBI-HSS Depersonalization Subscale Tertiles, n (%)*			
	Total, n (%)	Low	Moderate	High	p Value
Unknown‡	10 (1.5)	--	--	--	
Program type					
Academic	425 (63.9)	95 (22.4)	122 (28.7)	208 (48.9)	0.166
Community	70 (10.5)	18 (25.7)	23 (32.9)	29 (41.4)	
Mixed/other	169 (25.4)	26 (15.4)	48 (28.4)	95 (56.2)	
Unknown‡	1 (<1.0)	--	--	--	
Program location					
West	114 (17.1)	23 (20.2)	26 (22.8)	65 (57.0)	0.573
Midwest	198 (29.8)	39 (19.7)	59 (29.8)	100 (50.5)	
South	154 (23.2)	32 (20.8)	46 (29.9)	76 (49.4)	
Northeast	195 (29.3)	44 (22.6)	63 (32.3)	88 (45.1)	
Unknown‡	4 (<1.0)	--	--	--	
Structured mentoring program?					
Yes	365 (54.9)	93 (25.5)	113 (31.0)	159 (43.6)	<0.001†
No	296 (22.5)	46 (15.5)	78 (26.4)	172 (58.1)	
Unknown‡	4 (<1.0)	--	--	--	
Age, y, mean (SD)	30.3 (3.3)	30.6 (3.8)	30.3 (3.1)	30.1 (3.1)	0.218
Work hours, mean (SD)	80.1 (8.0)	78.8 (6.9)	79.3 (7.7)	81.1 (8.4)	0.005†

*Percentages are of total respondents reporting burnout in each variable category (ie % of row totals).

†Significant.

‡Individuals with unknown status were excluded from univariate analysis.

PGY, postgraduate year.

Table 4

Variables Associated with Personal Accomplishment in Univariate Analyses

Variable		**MBI-HSS Personal Accomplishment Subscale Tertiles, n (%)***			
	Total, n (%)	**Low**	**Moderate**	**High**	**p Value**
Gender					
Men	375 (56.4)	55 (14.7)	142 (37.9)	178 (47.5)	0.189
Women	289 (43.5)	53 (18.3)	118 (40.8)	118 (40.8)	
Unknown‡	1 (<1.0)	--	--	--	
Relationship status					
Single/divorced	206 (31.0)	38 (18.4)	82 (39.8)	86 (41.7)	0.155
Committed relationship	169 (25.4)	34 (20.1)	66 (39.1)	69 (40.8)	
Married	287 (43.2)	36 (12.5)	111 (38.7)	140 (48.8)	
Unknown‡	3 (<1.0)	--	--	--	
Has children					
Yes	133 (20.0)	14 (10.5)	46 (34.6)	73 (54.9)	0.022†
No	596 (76.1)	89 (17.6)	202 (39.9)	215 (42.5)	
Unknown‡	26 (3.9)	--	--	--	
Year of clinical training (PGY)					
1	181 (27.2)	31 (17.1)	70 (38.7)	80 (44.2)	0.342
2	161 (24.2)	30 (18.6)	65 (40.4)	66 (41.0)	
3	105 (15.8)	22 (21.0)	41 (39.0)	42 (40.0)	
4	90 (13.5)	9 (10.0)	35 (38.9)	46 (51.1)	
5	102 (15.2)	11 (10.8)	39 (38.2)	52 (51.0)	
Unknown‡	26 (3.9)	--	--	--	
Career plans					
Academic	354 (52.3)	46 (13.0)	124 (35.0)	184 (52.0)	0.003†
Private practice	264 (39.7)	56 (21.2)	110 (41.7)	98 (37.1)	
Other	37 (5.6)	6 (16.2)	17 (45.9)	14 (37.8)	

Variable		MBI-HSS Personal Accomplishment Subscale Tertiles, n (%)*			
	Total, n (%)	Low	Moderate	High	p Value
Unknown‡	10 (1.5)	--	--	--	
Program type					
Academic	425 (63.9)	58 (13.6)	152 (35.8)	215 (50.6)	<0.001†
Community	70 (10.5)	12 (17.1)	35 (50.0)	23 (32.9)	
Mixed/other	169 (25.4)	39 (23.1)	73 (43.2)	57 (33.7)	
Unknown‡	1 (<1.0)	--	--	--	
Program location					
West	114 (17.1)	24 (21.1)	38 (33.3)	52 (45.6)	0.612
Midwest	198 (29.8)	34 (17.2)	77 (38.9)	87 (43.9)	
South	154 (23.2)	19 (12.3)	63 (40.9)	72 (46.8)	
Northeast	195 (29.3)	32 (16.4)	78 (40.0)	85 (43.6)	
Unknown‡	4 (<1.0)	--	--	--	
Structured mentoring program?					
Yes	365 (54.9)	53 (14.5)	129 (35.3)	183 (50.1)	0.004†
No	296 (22.5)	56 (18.9)	130 (43.9)	110 (37.2)	
Unknown‡	4 (<1.0)	--	--	--	
Age, y, mean (SD)	30.3 (3.3)	30.3 (3.4)	30.1 (3.0)	30.4 (3.4)	0.686
Work hours, mean (SD)	80.1 (8.0)	80.8 (8.2)	80.7 (8.6)	79.1 (7.2)	0.082

*Percentages are of total respondents reporting burnout in each variable category (ie % of row totals).

†Significant.

‡Individuals with unknown status were excluded from univariate analysis.

PGY, postgraduate year.

Table 5

Multivariate Logistic Regression Model of Factors Associated with Burnout on at Least 1 Subscale

Variables	Burnout on any subscale, adjusted OR (95% CI)	p Value
Age	1.10 (1.02–1.18)	0.014 *
Gender		
Male †	1.00	
Female	1.73 (1.17–2.55)	0.005 *
Relationship status		
Single/divorced †	1.00	
Committed relationship	1.14 (0.69–1.88)	0.607
Married	1.17 (0.71–1.92)	0.484
Has children		
Yes †	1.00	
No	1.32 (0.77–2.25)	0.312
Year of clinical training (PGY)		
1 †	1.00	
2	1.46 (0.86–2.49)	0.164
3	1.05 (0.57–1.94)	0.877
4	0.69 (0.36–1.31)	0.259
5	0.43 (0.22–0.83)	0.012 *
Career plans		
Academic medicine †	1.00	
Private practice	2.20 (1.48–3.30)	<0.001 *
Other (military, nonsurgical)	1.91 (0.82–4.43)	0.131
Program type		
Academic †	1.00	
Community	0.96 (0.50–1.82)	0.906
Mixed	1.18 (0.75–1.86)	0.484
Structured mentoring program?		
Yes †	1.00	
No	1.78 (1.21–2.61)	0.003 *
Work hours	1.03 (1.01–1.06)	0.009 *

* Significant.

† Reference group.