The Impact of Medical Student Burnout on Surgery Clerkship Performance

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OBJECTIVE: Increasing reports on resident burnout have resulted in efforts to improve trainee well-being. Medical student burnout, however, is not well understood. We set out to evaluate burnout among third-year medical students and explore its impact on clerkship performance.

DESIGN: Analysis of prospectively-collected survey data from medical students on the third-year surgery clerkship was performed. Surveys included an institution-specific pre- and postclerkship survey, the 12-item Grit Scale, and the Maslach Burnout Inventory.

SETTING: University of Cincinnati College of Medicine.

PARTICIPANTS: Between 2016 and 2017, 166 students completed the surgery clerkship and were asked to complete the surveys. Sixty-two students (37.4%) completed all surveys and were included in this study.

RESULTS: Among the third-year medical student participants, there was no difference in burnout before vs after the clerkship (22.6% vs 17.7%, $p = 0.41$). Students with burnout had significantly lower grit scores (3.10 ± 0.66) compared to those without burnout (3.63 ± 0.50, $p = 0.01$). Linear regression analysis demonstrated that increasing grit was associated with decreasing emotional exhaustion ($p = 0.01$), decreasing depersonalization ($p = 0.04$), and increasing personal achievement ($p = 0.03$). Finally, 75% of students with resolution of burnout developed an interest in surgery, whereas all students who developed burnout after the clerkship had no interest in surgery ($p = 0.03$). Upon completion of the rotation, burnout was not associated with poorer quality of clerkship experience or decreased clerkship performance ($p > 0.05$ for each).

CONCLUSIONS: Although traditionally considered a difficult rotation, we found no increase in medical student burnout following the surgery clerkship. Higher grit scores were associated with decreased burnout, though burnout did not have a negative impact on student experience or performance. Clerkships should continue to set high expectations and maximize educational opportunities without significant apprehension that it may have a negative impact on students. (J Surg Ed 76:1241−1247.

KEY WORDS: burnout, grit, medical student, surgery clerkship, student performance

COMPETENCIES: Interpersonal and Communication Skills, Professionalism, Practice-Based Learning and Improvement

INTRODUCTION

In 2016, Elmore et al. captured the attention of the surgical education community, reporting that nearly 70% of surgical residents met criteria for burnout.[1] Since bringing this concerning reality to light, there have been increased efforts to promote resident well-being and to mitigate burnout during training.[2,3] At the same time, the concept of grit—one's perseverance and passion for long-term goals—has emerged as an individual-level characteristic that is easily assessed, and more important, is associated with improved well-being, and decreased risk of attrition among surgical residents.[4-6]

While identifying and addressing resident burnout is important, little is known about burnout among medical students and its prevalence prior to residency. Moreover, it is unclear how the surgery clerkship—which is

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demanding and may provoke feelings of anxiety and nervousness—influences medical student well-being. Finally, the protective effect of grit on burnout has not been explored among medical students as it has been for surgical residents.

As surgical educators, it is imperative to explore these concepts in order to create an effective learning environment and to best identify those medical students who may excel in a career in surgery. Therefore, our study objectives were 3-fold. First, we assessed the prevalence of burnout among medical students on the surgery clerkship; second, we aimed to identify individual characteristics associated with student burnout; and third, we evaluated the impact of burnout on student experience and performance.

MATERIALS AND METHODS

Surgery Clerkship Information

At the University of Cincinnati, all medical students are required to complete an 8-week surgery clerkship consisting of a 4-week general surgery experience and a 4-week subspecialty surgery experience. The clerkship grade consists of averaged quiz scores (10%), the National Board of Medical Examiners Surgery Shelf Examination score (25%), and clinical evaluations from residents and faculty (50%). The remaining 15% is comprised of required course activities, including specific patient encounters and online learning modules. Final numeric grades are then converted to a letter grade of "Honors" (90%+), "High Pass" (85%-89%), or "Pass" (61%-84%) at the end of the rotation.

Survey Details

Following approval by the University of Cincinnati Institutional Review Board, all third-year medical students on the surgery clerkship during the 2016 to 2017 academic year ($n = 166$) were invited to complete a set of clerkship surveys. Surveys were administered online using Survey Monkey (www.surveymonkey.com). Participation in the study was voluntary. Because pre- and postclerkship surveys required linkage, surveys were confidential though not anonymous. To limit student concerns about the impact of survey responses on clerkship grades, identified data were not shared with those involved in grading and analysis was deferred until after final grades were assigned.

The clerkship survey set included a 23-question preclerkship questionnaire eliciting student demographics, interest in surgery, and expectations about the upcoming rotation, and a 26-question postclerkship survey evaluating the quality of the clerkship experience. Questions were formatted as a combination of Yes/No, multiple choice, and 5-point Likert scale. Grit was assessed at the start of the clerkship using the 12-item Grit Scale.[7] This assessment tool measures an individual's grit, defined as one's perseverance and passion for long-term goals, on a scale ranging from 1 (low) to 5 (high).

To assess burnout, the Maslach Burnout Inventory Human Services Survey[8] was included in both the pre- and postclerkship surveys. The Maslach Burnout Inventory Human Services Survey asks a series of questions based on how often one feels certain emotions, with responses on a 7-point Likert scale ranging from 0 (never) to 6 (every day). This subsequently generates 3 subscale scores: emotional exhaustion (EE), depersonalization (DP), and personal achievement (PA). Total scores for each subscale are then converted to ordinal values of low, moderate, or high based on previously reported normative data.[8] The cutoffs for each subscale are as follows: EE—low (0-16), moderate (16-26), and high (27+); DP—low (0-6), moderate (7-12), and high (13+); and PA—low (0-31), moderate (32-38), and high (39+). While various criteria for burnout (yes/no) have been used, in this study we defined burnout as meeting 2 of the following 3 "burnout criteria": high EE, high DP, or low PA.

Statistical Analysis

Continuous data with normal distribution are reported as mean and standard deviation or are otherwise reported as median and interquartile range. Categorical data are reported as the percent responding "Yes," and for questions involving a 5-point Likert scale, responses were converted to "Yes" (strongly agree and agree) or "No" (strongly disagree, disagree, and neutral). Burnout before and after the clerkship was compared using paired analyses performed by McNemar's and Wilcoxon signed-rank test. Students with and without burnout were compared using Student's t test or Wilcoxon rank test for continuous data and Pearson's chi-square test (or Fisher's exact test for rare occurrence) for categorical data. Simple linear regression was also performed. Statistical significance was set at $p < 0.05$. All statistical analyses were performed using JMP Pro Version 14.0 (SAS Institute, Cary, North Carolina).

RESULTS

Prevalence of Burnout Among Medical Students Before and After the Surgery Clerkship

The preclerkship survey was completed by 80 students, of whom 21.3% ($n = 17$) met criteria for burnout, and

TABLE 1. Burnout Before and After the Surgery Clerkship

	Before *n* (%) median (IQR)	After *n* (%) median (IQR)	p
Burnout	14 (22.6%)	11 (17.7%)	0.41
Burnout subscale scores			
Emotional exhaustion (EE)	22 (14-17)	21 (16-29)	0.38
Depersonalization (DP)	7 (3-11)	8 (3-12)	0.49
Personal achievement (PA)	36 (32-39)	38 (32-40)	0.07

the postclerkship survey was completed by 78 students, of whom 20.5% ($n = 16$) met criteria for burnout. Among these students, 62 completed both the pre- and postclerkship surveys and were included in this study (complete survey response rate of 34.3%).

Of the students included in this analysis, 59.7% ($n = 37$) were male and the majority were Caucasian ($n = 43$, 69.4%) or Asian ($n = 14$, 22.6%). The mean grit score was 3.51 ± 0.58. At the start of the rotation, 22.6% experienced burnout ($n = 14$). With regard to burnout subscales, 33.9% ($n = 21$) had high EE, 16.1% ($n = 10$) had high DP, and 21.0% ($n = 13$) had low PA. Upon completion of the clerkship, the proportion of student that met criteria for burnout declined slightly to 17.7% ($n = 11$). Using paired analyses, there was no significant change in burnout or any of its subscales before compared with after the rotation (Table 1). Of note, 8 students had resolution of burnout (yes to no, 12.9%), 5 developed burnout (no to yes, 8.1%) and the remaining students had no change in their burnout status (yes to yes, $n = 6$, 9.7%; no to no, $n = 43$, 69.4%).

Comparison of Students With and Without Burnout

Students with burnout at the start of the rotation were similar to student without burnout in terms of demographics, interest in surgery, or USMLE Step 1 scores (Table 2). However, students with burnout had significantly lower grit scores (3.10 ± 0.66) compared to students without burnout (3.63 ± 0.50, p = 0.01) (Fig. 1). Moreover, Simple linear regression demonstrated a linear relationship between grit and burnout such that an increasing grit score was associated decreasing EE (p = 0.01), decreasing DP (p = 0.04), and increasing PA (p = 0.03) (Fig. 2).

TABLE 2. Comparison of Students With and Without Burnout on the Surgery Clerkship

	No Burnout ($n = 48$) *n* (%)	Burnout ($n = 14$) *n* (%)	p
Gender (male)	26 (54.2%)	11 (78.6%)	0.10
Race			0.54
Caucasian	24 (70.8%)	9 (64.3%)	
Asian	10 (20.8%)	4 (28.6%)	
Middle Eastern	3 (6.3%)	0	
Other	1 (2.1%)	1 (7.1%)	
Age (years)			0.78
<23	1 (2.1%)	0	
24-26	38 (79.2%)	11 (78.6%)	
27-29	6 (12.5%)	1 (7.1%)	
30+	3 (6.3%)	2 (12.3%)	
Married	11 (22.9%)	3 (21.4%)	0.91
Children	3 (6.3%)	0	0.34
Physician in family	16 (33.3%)	5 (35.7%)	0.87
Surgeon in family	4 (8.3%)	2 (12.3%)	0.51
First clinical rotation	13 (27.1%)	4 (28.6%)	0.91
Rotations prior to surgery, median (IQR)	2 (0-5)	1 (0-2)	0.24
Interest in surgery			0.90
Yes	5 (10.4%)	1 (7.1%)	
No	27 (56.3%)	7 (50.0%)	
Maybe	16 (33.3%)	6 (42.9%)	
USMLE Step 1, mean ± SD	243 ± 14	239 ± 16	0.39

USMLE, United States Medical Licensing Examination.

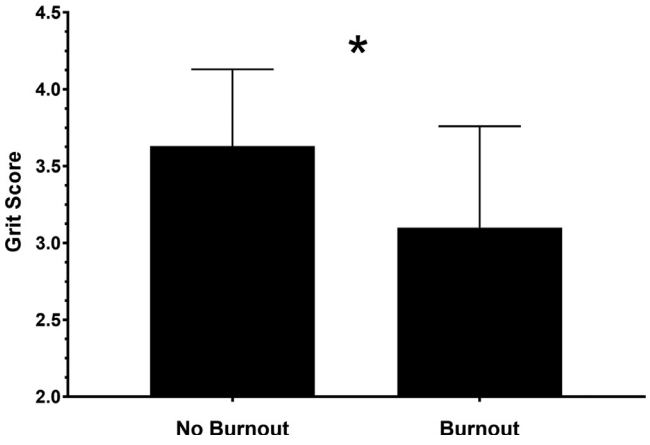

FIGURE 1. Student with burnout have lower grit scores (3.10 ± 0.66) compared to those without burnout (3.63 ± 0.50, p = 0.01). * p < 0.05.

Impact of Burnout on Surgery Clerkship Experience and Performance

Next, we explored how burnout impacted one's experience and performance on the general surgery clerkship. As a surrogate for quality of experience, we analyzed survey questions regarding students' clinical duties, educational activities, and clerkship impression, and no differences were found between the groups. Moreover, there were no differences between students with and without burnout with regard to clerkship performance, as measured by the final numeric grade (84.1 ± 4.4 vs 85.9 ± 4.7, p = 0.21) or final letter grade (p = 0.61) (Table 3).

Subset Analysis of Students With a Shift in Burnout Status

While burnout rates remained stable before and after the general surgery clerkship (22.6% pre vs 17.7% post), 21% of students (n = 13) had a shift in their burnout status during the rotation: 5 developed burnout and 8 had resolution of burnout. Subset analysis among this cohort was subsequently performed to explore potential factors related to a shift in burnout. There were no differences between the groups with respect to age, gender, race, first clinical rotation, or having a surgical mentor (p > 0.05 for each). However, among the 8 students with resolution of burnout, 6 (75.0%) reported both a new interest in pursuing a career in surgery and plans to complete a surgical acting internship. In contrast, of the

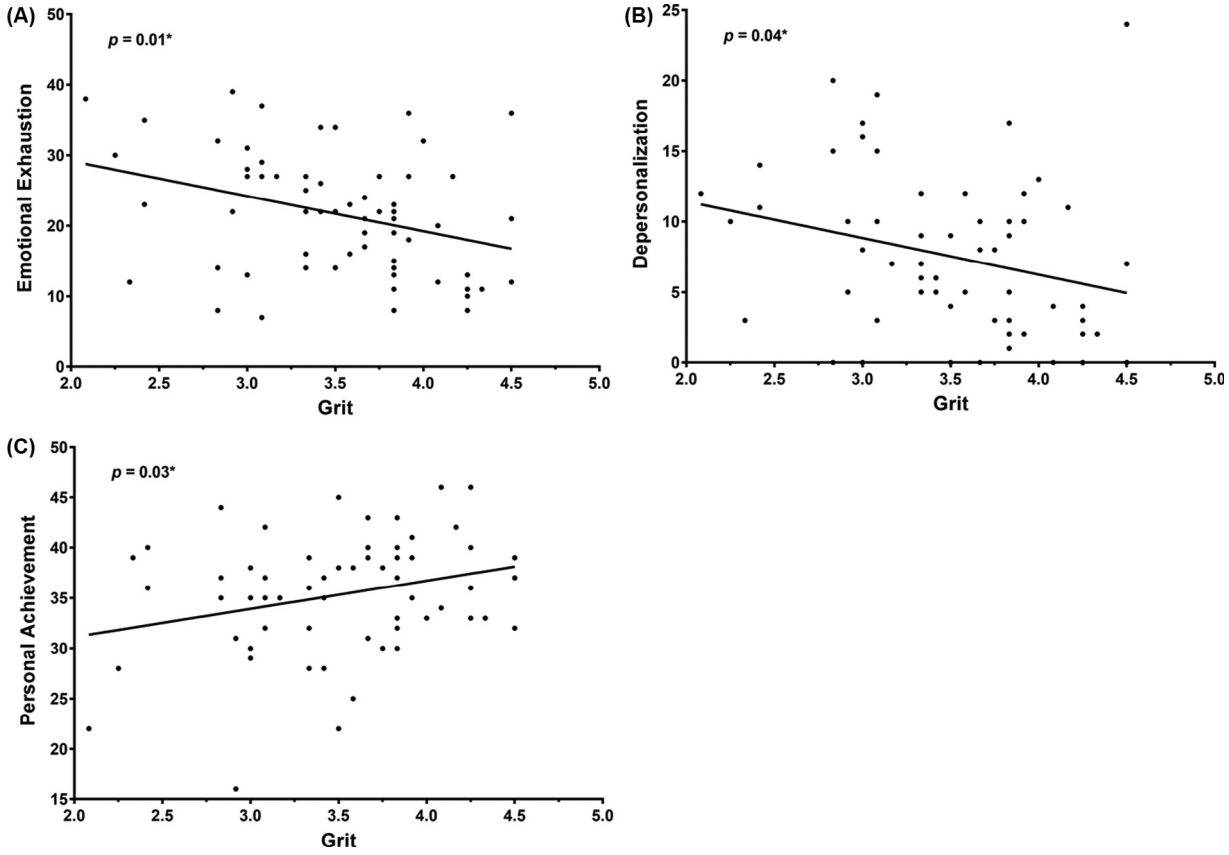

FIGURE 2. There is a linear relationship between grit and burnout subscale scores. Increasing grit score is associated with (**A**) decreasing emotional exhaustion (p = 0.01), (**B**) decreasing depersonalization (p = 0.04), and (**C**) increasing personal achievement (p = 0.03). * p < 0.05.

TABLE 3. Comparison of Student Performance for Students With and Without Burnout

	No Burnout ($n = 48$) n (%)/mean ± SD	Burnout ($n = 14$) n (%)/mean ± SD	p
Number of patients managed			0.82
1-2	24 (50.0%)	8 (57.1%)	
3-4	23 (47.9%)	6 (42.9%)	
>5	1 (2.1%)	0	
See independent consults	43 (89.6%)	11 (78.6%)	0.28
Receive formal teaching sessions	33 (68.8%)	13 (92.9%)	0.07
Give topic presentation	27 (56.3%)	11 (78.6%)	0.13
Receive directed education in OR	33 (68.8%)	10 (71.4%)	0.85
Overnight call was good experience	29 (58.3%)	9 (63.3%)	0.69
OR was good experience	40 (83.3%)	13 (92.9%)	0.37
Final clerkship impression			0.89
Better than expected	27 (56.3%)	9 (64.3%)	
Met expectations	18 (37.5%)	4 (28.6%)	
Worse than expected	3 (6.3%)	1 (7.1%)	
Grade components			
Quiz	76.3 ± 8.9	75.7 ± 7.5	0.81
Evaluations	87.5 ± 7.2	87.1 ± 7.1	0.27
Shelf	77.2 ± 7.2	76.0 ± 5.8	0.54
Final grade (numeric)	85.9 ± 4.7	84.1 ± 4.4	0.21
Final grade (letter)			0.61
Honors	12 (25.0%)	2 (14.3%)	
High pass	18 (37.5%)	5 (35.7%)	
Pass	18 (37.5%)	7 (50.0%)	

OR, operating room.

5 students who developed burnout, none indicated an interest in surgery ($p = 0.03$) or in performing a surgical acting internship ($p = 0.03$). Despite their diverging interests in pursuing a career in general surgery, there was no difference between the groups with respect to any of the clerkship grade components or final clerkship grade ($p > 0.05$ for each).

DISCUSSION

At our institution, one-fifth of third-year medical students participating in this study met criteria for burnout prior to beginning the surgery clerkship; however, the high demands of the surgery rotation were not associated with increased rates of burnout. Students with burnout had lower grit scores, and the relationship between grit and burnout was linear such that increasing burnout was associated with improved burnout subscale scores. Ultimately, student burnout did not appear to impact one's experience or performance on the surgery clerkship.

While a growing body of literature on resident burnout and well-being exists, there is a paucity of data on these topics among medical students. In a nationwide survey of medical trainees and providers, 56% of medical students met criteria for burnout (defined as high EE or high DP) and 58% reported depression, rates higher than that of age-matched nonmedical peers.[9] Moreover, burnout has been reported among international medical students, suggesting that this phenomenon is not simply cultural, but related to the demands of medical training, which includes difficult schedules, rigorous intellectual demands, and high-risk decision making.[10,11]

Although burnout did not increase after the surgery clerkship, it is noteworthy that approximately 20% of medical students participating in this study met criteria for burnout. Aside from grit, we did not identify any individual factors associated with burnout. This included race, gender, age, prior exposure to the medical field, timing of one's surgery rotation, or interest in pursuing a career in surgery. Despite efforts to make survey questions granular and capture multiple factors that may impact burnout, the questionnaire was not exhaustive. Therefore, further work is needed to identify which students are at highest risk for burnout during the third-year clerkships.

In this study, we used a less sensitive but more specific definition of burnout requiring 2 out of 3 burnout criteria (high EE, high DP, and/or low PA). We elected for this approach given recent criticism of the liberal definition of burnout.[12] Using a more sensitive metric of having any 1 of 3 burnout criteria (as used by Elmore et al.),[1] our burnout rate among medical students approaches 50%, similar to that observed by Dyrbye et al.[9] In addition, our median EE, DP, and PA subscale

scores are consistent with those reported among national medical students (22 vs 25, 7 vs 7, and 36 vs 36, respectively).[9] Interestingly, these rates of medical student burnout are not dissimilar to the 60% to 70% rates reported among both surgical and nonsurgical residents.[1,9] This suggests that while there are unique risk factors for burnout dependent on one's level of training, burnout among trainees is equally a problem for students and residents. Consequently, developing methods to identify burnout early may help decrease burnout rates prior to residency and cultivate an environment that prioritizes physician wellness.

Our subgroup analysis of students with improvements in burnout suggests that a developing interest in surgery may positively influence student well-being on the clerkship. This improvement resulted from decreased EE and DP, rather than increased PA (data not shown), which may indicate that how one perceives the challenging work on the clerkship is impacted by their interest and engagement with the rotation. There was no difference, however, in final grades among these students, questioning the relationship between well-being, interest in surgery, and clerkship performance. Given our small subgroup, however, further work is needed to understand the impact of student interest on performance, particularly with regard to intangible aspects that are not assessed by exams, as well as who ultimately goes into surgery.

Amidst the growing discussion on trainee well-being, grit has emerged as an individual-level characteristic that is easily assessed and is associated with improved psychological well-being and decreased burnout.[4,5] Grit has also been shown to correlate with a decreased risk of attrition among surgical residents.[5,6] Literature on grit among medical students, however, is sparse. High grit among pharmacy students has been associated with improved academic performance,[13] and more recently, our group has shown that high grit has a positive impact on student performance on the surgery clerkship.[14] To our knowledge, this is the first report to explore the relationship between grit and medical student burnout. While resident-level data on burnout can be extrapolated to students, directed studies among medical students are important as they experience unique stressors that begin in the preclinical years and increases upon entering the wards during the clinical years.[15] These include balancing clinical responsibilities with exam studying, anxiety regarding performance pressures, and apprehension over the approaching residency match process. Since evaluating a trainee's emotional and behavioral capacities can be difficult, reliable personality metrics, such as grit, may be useful in the medical school admissions and residency application process.[16-19]

While recognizing the presence of burnout among trainees and providers is important, understanding its impact is an imperative next step. Few studies have evaluated the ramifications of burnout on behavior. Jackson et al. found that high EE and DP among medical students were strongly associated with alcohol abuse/dependence.[20] Medical students with burnout reported issues with unprofessional conduct, as well as a loss of altruistic values.[21] To our knowledge, this is the first study to explore the impact of burnout on medical student performance during the surgery clerkship. We found that student burnout did not appear to have a negative impact on one's quality of experience or clerkship performance. In fact, though not statistically significant, a slightly greater proportion of students with burnout reported increased education in the operating room, formalized teaching, and opportunities to present surgical topics. These students were also more likely to report positive experiences on-call and perceive the rotation as better than expected. Though further work is needed to corroborate these findings, they should reassure clerkship directors that high expectations should be maintained, and educational activities should not be limited due to concern that it may have a negative impact on students.

Although our study included validated assessments and objective data, there are some methodological limitations. First, as with any survey-based study, responses rely on self-reporting and are therefore subject to recall bias. Second, data acquisition depends on adequate survey compliance; because of our lower response rate, the analyses may lack sufficient power to capture subtle differences that better explain student performance. Additionally, subjects were only included if they completed both pre- and postclerkship surveys and as such 18 preclerkship survey respondents were excluded for not performing the postclerkship survey. While we cannot address why these participants chose to not perform the postclerkship survey or whether burnout from the rotation played a role, we are assured that study attrition did not confound our results as the rate of burnout among this excluded cohort was only 19% ($n = 3$), lower than that of the entire sample. Lastly, this study represents a single institution's experience and may not be wholly generalizable to all medical school clerkships or students.

CONCLUSION

In this study we found that burnout among third-year medical students entering the surgery clerkship is not uncommon. However, the high demands of the surgery rotation were not associated with increased rates of burnout. Furthermore, students with burnout had lower grit scores, but no other individual characteristics influencing

the presence or absence of burnout were identified. Ultimately, student burnout did not impact one's experience or performance on the surgery clerkship. While awareness of burnout and well-being of students is important, clerkships should continue to maintain high expectations rather than limit educational rigor out of worry that it will negatively impact on students.

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