Attrition Rate in Military General Surgery GME and Effect on Quality of Military Programs

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INTRODUCTION: The attrition rate in civilian general surgery Graduate Medical Education (GME) is estimated at 20%, while estimates of attrition in military general surgery (MGS) GME programs using the same methodology are nearly twice that. We sought to identify the true attrition rate in MGS GME, identify factors influencing attrition, and examine the relationship between attrition and quality of MGS GME.

METHODS: Deidentified data were collected on categorical general surgery residents matriculating from 2010 to 2013 from all 12 MGS residency programs. Information gathered included gender, medical degree, marital status, location of program, presence of a military-related interruption in training, and age at start of the categorical contract. For those who did not graduate, data on postgraduate year at time of attrition, reasons for attrition, and deficiencies in core competencies were solicited. To assess the effect of true attrition rate on graduate performance, we compared the published 5-year American Board of Surgery qualifying exam/certifying exam first time pass rates between military and civilian programs.

RESULTS: One hundred eighty-four categorical residents matriculated from 2010 to 2013. Fifty six (31.5 %) were women, 151 (62.1%) were MD's, 103 (56%) were married, 172 (93.5%) were less than 35 years old, and 33 (17.9%) had a military-related interruption in training. Nineteen individuals left residency prior to graduation (15 resigned, 2 resigned in lieu of termination, 2 terminated) for an overall attrition rate of 10.3%. The most common year for attrition was PGY-3 (31.6%) and most common reason for resignation was changing to a different subspecialty (73.3%). Men and women had equal attrition rates (10.3%), and there was no meaningful difference between MD's and DO's (9.9% vs 12.1%, $p = 0.71$) or region of training (10.6% East vs 9.1% West, $p = 0.73$). However, those who were not married, had a militarily mandated interruption in training and started their categorical training over the age of 35 had higher attrition rates (married 5.6%, not married 15%, $p = 0.04$, interruption 16% vs no interruption 9%, $p = 0.1$; Age $\geq$ 35 33.3% vs age $<$ 35 6.7%, $p < 0.01$). Comparison of American Board of Surgery (ABS) first time pass rates over a similar time period showed that military programs performed statistically discernibly better than civilian programs (82% $\pm$ 12 vs 75% $\pm$ 13, $p = 0.047$).

CONCLUSIONS: Previous used methodology over estimates the attrition rate in MGS GME. The lower rate in

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MGS programs results in a high level of graduate performance as measured by ABS pass rates. Interruption in training and especially marital status and age ≥ 35 appear to be potential predictors of attrition. Components of MGS GME training and selection processes might inform efforts to reduce attrition and improve performance in civilian surgical GME. (J Surg Ed 76: e49–e55. Published by Elsevier Inc. on behalf of Association of Program Directors in Surgery.)

KEY WORDS: attrition, general surgery, residency, military, GME

COMPETENCIES: Patient Care, Medical Knowledge, Professionalism, Interpersonal and Communication Skills, Practice-Based Learning and Improvement, Systems-Based Practice

INTRODUCTION

Likely due to a projected general surgeon shortage by 2050,[1] attrition rates and causes of attrition in general surgery residency programs have been of great interest in the last few years. Previously performed studies have shown that the attrition rate in general surgery compared to other subspecialties is significantly higher, with the rate in general surgery estimated around 20% and other subspecialties estimated as closer to 10%.[2] Attempts at uncovering the possible reasons for this disparity between medical and surgical subspecialties have revealed multiple contributing factors. Gender differences,[2,3] lack of formal professional development and mentorship,[4] concerns for family life,[3,4] and participation in military residency[2] programs have all been pointed to as major causes of attrition in general surgery. Based on previous estimates, it appears that participation in a military general surgery residency program may be one of the strongest predictors of attrition with a reported increase in the previously stated rate of 20% to an overall rate of 35%[2] for those enrolled in this type of program. This reported difference between civilian programs and military programs is of great interest to those in Military Graduate Medical Education (GME) as the inability to recruit and retain appropriate candidates in military training programs could be devastating to the medical readiness of our armed forces. The innovation of smaller and more mobile surgical teams to combat the changing operative landscape has led to an increase in demand for deployable general surgeons.[5] Unfortunately, the Army is projecting a shortage of this critical wartime specialty[5] that has not only affected their surgeons' deployment tempo, but has also affected general surgeons in the Navy and Air Force. Therefore, if the military is truly unable to retain the individuals selected for these residencies at that high of a rate, we must discover the reasons behind this increased attrition and correct them.

After closer examination of previously used methodology, some concerns were raised about the applicability of this approach to data collection in the military population. Military GME is a niche environment in which the needs of the Air Force, Army, Navy, and Marine Corps must also be considered when training future physicians of all subspecialties. Prior to 2014, it was common for Army and Navy trainees to have a break between their intern year and subsequent training years. During this break in training, military physicians serve as operational medical officers specializing in areas such as Flight medicine or Dive medicine, or care for military units as a General Medical Officer (GMO). In these billets, individuals function as general practitioners[6] for military units in the United States. They are stationed stateside or abroad in nonconflict areas. If the units that these individuals are attached to deploy, the individual will deploy with them in their role as a general practitioner. The time spent in an operational billet counts toward the time the individual incurred when signing their military contract for medical school payment. Frequently, these GMOs return to training after their time as operational physicians and become true categorical residents in a surgical or medical specialty of their choosing. All interns in the Army and Navy were, by definition, preliminary and a second formal application process was carried out to select categorical PGY 2's. The interns competed against medical officers returning from GMO tours for categorical positions in GME programs. In reviewing the methods of data collection used previously, it appears that there may have been some confusion with the use of the word "categorical." As mentioned previously, the Air Force was the only military branch with true categorical general surgery interns until 2014. This means that there were only 9 categorical interns in 2007, compared to the 31 categorical military interns[2] that were cited in the previous study. This discrepancy and lack of knowledge concerning the impact of operational tours on resident selection led us to believe that the previously quoted attrition rate may be inaccurate.

Using our insider knowledge of the Military GME process and our ability to collect accurate and complete data directly from military programs, we sought to identify the true attrition rate in Military General Surgery GME, identify factors influencing attrition, and examine the relationship between attrition rate and program quality. We hypothesized that the attrition rate was lower than the previously cited 35% and were concerned that given the external pressure to produce military general surgeons, a lower attrition rate might have been achieved by retaining underperforming trainees. Given that there is no easy way to holistically assess the quality of residency program graduates, we chose to examine 5-

year American Board of Surgery first time pass rates as a surrogate for residency program quality.

METHODS

Program directors from all 12 Military Health System General Surgery Residency programs were asked to contribute de-identified data from all categorical residents who began their categorical contracts between 2010 and 2013. This time frame was chosen to correspond with a major realignment in military general surgery residency programs dictated by the Base Realignment and Closure process resulting in consolidation of 4 prior existing programs in San Antonio Texas and the National Capital Region into 2 new programs. Data were collected by distributing a standardized Microsoft Excel file to each program director asking for information on the following parameters: resident age at the start of training, gender, type of medical degree (MD or DO), branch of military service, location of program (military base), marital status of resident at time of matriculation (single, married, divorced), date of intern year, date of categorical contract, and date of graduation. Age at the start of the categorical contract was divided into 4 categories (24-29, 30-34, 35-39, and finally 40 years or older) as exact ages were not known for each resident. Location of program for analysis was designated as East or West based on location in reference to the Mississippi River. This was chosen as the distribution of the 12 programs did not lend itself to meaningful analysis with respect to a more granular division (i.e., northeast, southwest, etc.). For those categorical residents that did not graduate, information was collected on the postgraduate year of attrition and the reason for attrition. Selectable options for reasons for attrition included resignation from residency, termination from residency, and resignation in lieu of termination. For those that resigned, information was collected on reason for resignation with options including changing to a different training program but remaining in General Surgery, changing to a different medical subspecialty, family concerns, and unknown. For those who were terminated or resigned in lieu of termination, information was collected on up to 3 Accreditation Council for Graduate Medical Education (ACGME) core competencies in which they were deficient. To further examine possible military specific causes of attrition, information on performance of an operational, or GMO, tour, and length of the tour in years was also collected. The first author (GR) and senior author (EMR) performed all analysis through review of the composite de-identified database and had no access to the information prior to compilation and were unable to re-identify any portion of the dataset.

To assess the impact of attrition on program quality as measured by graduate performance, the publicly available published 5-year American Board of Surgery Qualifying Exam/Certifying Exam first time pass rates from 2013 to 2017 were collected and analyzed to assess for any difference between military and civilian programs in this category.

Analysis of continuous variables was conducted with 1-way analysis of variance with post hoc assessment using Scheffe-Bonferroni. Categorical variables were compared using Chi squared. Univariate logistic regression was used to determine significant predictors of attrition. All analysis was performed using IBM SPSS Statistical Software (version 24). Statistical significance was set at alpha < 0.05. The project was granted exemption by the Walter Reed National Military Medical Center Institutional Review Board.

RESULTS

The residency programs that contributed this information consisted of 4 Air Force programs, 4 Army programs, 2 Navy programs, 1 joint Air Force and Army program, and 1 joint Army and Navy program. These programs are located across the United States in Maryland, Virginia, Georgia, Mississippi, Texas, Nevada, California, Washington, Ohio, and Hawaii.

The compiled database included information on all 164 individuals who became categorical General Surgery Residents in the Air Force, Army, and Navy from the years of 2010 to 2013. The demographics of the residents are displayed in Table 1. The mean length of GMO/operational tour served by the 33 residents selected for this duty was 33 ± 12 months (range 12-60 months).

In total, 19 individuals left residency prior to graduation; 15 of those individuals resigned, 2 resigned in lieu of termination, and 2 were terminated. This led to an overall attrition rate of 10.3%. The differences in attrition rates based on the demographics are provided in Table 2.

The most common year in residency for attrition was the PGY-3 year at 36.6%, followed closely by the PGY-1 year at 26.3%, and then the PGY-4 year at 21.1%. For those who resigned, the most common reason was a change to a different medical subspecialty at 66.7%, with family concerns and unknown reasons being equally cited at 6.7% each. Professionalism was shown to be the most common ACGME core competency deficiency with 75% of the residents who were terminated or resigned in lieu of termination falling into this category. Patient care was the second most common core competency deficiency cited with 50% of these residents falling into this category. The other core competency problems included issues with interpersonal and communication

TABLE 1. Demographics of Categorical Residents

Demographics	Number of Residents	% of Total
Branch of service:		
Air Force	51	27.7%
Army	64	45.7%
Navy	49	26.6%
Gender:		
Male	126	66.5%
Female	56	31.5%
Marital status:		
Single/divorced	61	44%
Married	103	56%
Age:		
24-29	126	66.5%
30-34	46	25%
35-39	9	4.9%
40+	3	1.6%
Type of degree:		
MD	151	62.1%
DO	33	17.9%
Program location:		
East	65	46.2%
West	99	53.6%
GMO/operational tour		
Performed	33	17.9%
Did not perform	151	62.1%

TABLE 2. Attrition Rates by Demographics

Demographics	Attrition Rate (%)	p Value
Branch of service:		
Air Force	15.7%	0.345
Army	6%	
Navy	10.2%	
Gender:		
Male	10.3%	0.995
Female	10.3%	
*Marital status:		
Single/divorced	15%	0.04
Married	5.6%	
*Age:		
Less than 35	6.7%	0.007
35 or older	33.3%	
Type of degree:		
MD	9.9%	0.706
DO	12.1%	
Program location:		
East	10.6%	0.733
West	9.1%	
GMO/operational tour		
Performed	16.2%	0.102
Did not perform	6.6%	
Served $<$ 3 yrs (n = 14)	21.4%	0.66
Served $\geq$ 3 yrs (n = 19)	15.6%	

*statistically significant predictor of attrition based on alpha of 0.05.

skills, deficiencies of medical knowledge, and concerns about practice-based learning and improvement abilities.

When branch of service, gender, marital status, age, degree type, program geographic location, and performance of an operational tour were analyzed with univariate logistic regression, only marital status and age were found to be significant predictors of attrition. Residents who were not married (odds ratio [OR] = 2.6, $p < 0.05$) or $\geq$ 35 years old (OR = 5.6, $p = 0.01$) at the time of a categorical contract were approximately 2 and 5 times less likely to graduate, respectively.

Comparison of the American Board of Surgery first time pass rates for the compiled Qualifying and Certifying exam for graduates between 2013 and 2017 showed that military programs performed statistically discernibly better than civilian programs (82% $\pm$ 12 first time Military board pass rate vs 75% $\pm$ 13 Civilian board pass rate, $p = 0.047$).

DISCUSSION

Though this study focused on a military population, we believe that it helps to elucidate some more knowledge regarding attrition in all general surgery residency programs in the United States. The composition of our population in regards to gender and type of degree is similar to civilian programs. In the military, 62.1% were MD's compared to 79.7% in the civilian[7] population. Our population consists of 31.5% females compared to the general population, where females make up 36.3%[8] of surgical residents. The effect of gender on attrition rate has been a point of contention among several studies, with multiple citing gender as a predictor,[2,9,10,12] while others found that gender had no effect.[3,11,13] Due to the similarities between our population and the civilian general surgery residency population, we are comfortable in adding to the mix of data arguing that gender, and type of medical degree has no effect on attrition.

As in previous studies,[3] the attrition rate in the military setting is mostly voluntary. Our data, however, differ in regards to the timing of and the most common reasons for attrition,[3,11-13] as well as the effect of program location[13] on attrition. The PGY-1 year has been frequently cited as the most common year of attrition in civilian programs followed closely by the PGY-2 year or research years.[3,11-13] Our study found that the most common year for attrition in the military is the PGY-3 year followed by the PGY-1 year. When we examined data from the Air Force alone, since they were the only branch that had categorical interns during the study period, attrition peaked at 60% following the intern year. This is consistent with reports from civilian populations. The Army did not have categorical interns until 2014, and the Navy still does not routinely offer categorical internships. This

requirement to compete for a PGY 2 position is likely protective against attrition after the intern year, as the individuals who do not want to continue in general surgery can simply choose not to re-apply. When examining our data as a whole, it appears to agree with the idea that time doing research, or any prolonged time away from surgical training, likely affects attrition. The PGY-3 year is either the mandated research year or the year immediately following the time allotted for research in most of our programs. Also, though it was not statistically discernable, those who completed an operational tour had a higher likelihood of not making it to graduation when compared to their counterparts that did not perform an operational tour (OR 2.6, 16.2 % vs 6.6%). A comparison of attrition rates between those spending less than 3 years out of training and those spending 3 years or more showed no statistically discernable difference despite a slightly higher rate in the shorter duration group. This could be more evidence that a break in training may lead to higher rates of attrition, but infers that longer time away does not necessarily add additional risk. Ultimately more data collection will be needed to meaningfully examine this relationship.

The most common ACGME core competency deficiency in those who were terminated was professionalism. To our knowledge there is no other study that directly linked ACGME core competencies to termination, but a previous study examined the link between core competency deficiencies and need for remediation.[3] This showed that those most at risk of remediation had a common deficiency in medical knowledge, followed by interpersonal and communication skills, with professionalism cited much less frequently.[3] Unfortunately, we did not collect any data on remediation, type or length, and cannot speak to the effects of remediation on the individuals who were terminated or resigned in lieu of termination.

To evaluate for geographic effect, we divided programs by location as strictly East or West. We were unable to meaningfully divide our programs in a more specific manner as we only had 12 programs in our dataset. We found no effect in terms of attrition based on this grouping. Geography has been shown to have an effect on attrition with programs in the South having lower rates of attrition as compared to programs in the Northeast, Midwest and West.[13] While we demonstrated no difference between programs sorted by geography, we cannot comment on presence or absence of the southern protective factor.

Data on the effect of marital status have been somewhat contradictory. Effect of strain on family life has been quoted as reasons to leave residency,[3,10,12] while having strong spousal support is cited as being protective from attrition.[12] Contrary to current literature that found no relationship between marital status and attrition,[2] our data show that those who are single or divorced at the beginning of their continuous contracts have a higher likelihood of quitting or being terminated than their married counterparts. This information appears to agree with the protective nature of strong spousal support during residency training. Unfortunately, we do not have data regarding the marital status of these individuals throughout their training and cannot comment on whether these relationships were sustained.

Age has also been a factor examined multiple times. Age greater than 29 years old at start of surgical residency was originally thought to be predictive of attrition,[9,12] but this was later refuted.[13] Our data points out that age greater than or equal to 35 at start of categorical contract is an independent predictor of attrition. It is possible that age in this context may be a measure of other variables. For instance, in the military, trainees have often had a military career prior to entering military medicine. Many of those same people are drawn to operational tours to serve the career field that they were previously a part of (i.e., previous pilots becoming Flight Surgeons, or previous Submariners becoming Dive Medical Officers). This combination of prior career and operational tour can easily result in an age of matriculation into residency over 35. This may also reflect other effects of lifestyle decisions and concerns that have been cited in other studies as reasons to quit or change specialty. We did not have enough subjects to meaningfully analyze age greater than 35 as a predictor of attrition while controlling for a tour as a GMO. Further data collection with more subjects in this age range would help answer this question.

When we compared military and civilian programs in terms of first time ABS qualifying exam pass rates, we were pleased to find that military programs do not seem to be retaining underperforming trainees to meet military needs for surgeons. Military programs have been shown previously to perform well on board exams,[14,15] but that analysis did not directly reflect this more recent time period. While first time ABS Qualifying Exam/Certifying Exam pass rates are only one of many measures of program quality, it is reassuring as at least 1 indication that high standards are being maintained.

Lastly, we considered the question of what is different about military surgery GME programs that results in lower attrition rates while maintaining high quality of graduates? The one process that is shared by all programs across all military services is a structured program of resident selection. A recent publication on the use of selection science in surgical GME highlighted several components of a successful selection system.[16] These included situational judgment tests, a self-reported personality profile, structured interviews, and technical skills testing. Use of these tools resulted in improved efficiency of the match process and predicted decreases in attrition rates.[16] While the military selection system does

not formally involve all of these processes, many of them occur organically. For example, it is very common for all of the medical students who plan to rank a program highly to perform a 2 to 4 week audition rotation at their top 2 to 3 programs as a senior medical student. During this rotation, program directors and faculty get a "work sample" of how the student performs in the specific inpatient and outpatient environment. Interpersonal interactions with faculty, staff, residents, patients, and other students are easily sampled and compared. Technical skills are directly observable in both the operating room and the simulation lab, and both formal and informal interviews can take place throughout the rotation. Thus, at the end of 1 of these rotations, military program directors have a rich pool of information to draw from that far exceeds what is typically available in an Electronic Residency Application Service application and a single day interview. Additionally, nearly all GME applicants are committed to their individual military branch for a period of 3 to 7 years regardless of completion of residency training. If the individual chooses to discontinue his or her residency plans, options to fulfill this service commitment may be limited as the ability to transfer to another training program or subspecialty is not guaranteed. In some instances, individuals will finish their military commitment by becoming a GMO. Though these individuals will likely deploy less frequently than if they became general surgeons in the military, this extended time as a GMO can come with a need to pursue residency training after the military commitment has passed. This uncertainty regarding ability to switch into a different subspecialty and possibility of having to wait until one's military commitment is over to finish residency can serve as a disincentive to dropout. While we have no way of knowing what effect either of these aspects has on retention and attrition, it is likely that both these factors play some role.

LIMITATIONS

The most significant limitations of our work are related to the time frame chosen for data collection and recollection bias of the program directors. Our first limitation, having only 3 years of data, is due to the Base Realignment and Closure which was discussed earlier in the paper. This consolidation of residency programs took place administratively in 2009. Thus, the 2010 intern class was the first to represent the current alignment of military programs. Therefore, we were concerned that any data collected prior to 2010 would not accurately reflect the current state of our programs. Since general surgery residency is 5 to 6 years in length, it would be impossible to have complete data on the classes after 2013, as they are still in training. The paper that originally stated the increase in attrition rate among military programs covers a 9 year period. Though our timeframe overlaps with theirs, it does not directly match. Given the logistical issues already mentioned, we are comfortable with using our information because we know that even though it only covers 3 years, it is a complete dataset.

The next limitation arises from our reliance on program directors for information concerning individual residents and their reasons for attrition. Though most data concerning demographics and ACGME core competency issues for those who were terminated are routinely recorded and readily available, other information, particularly reasons for resignation, may not be. We relied heavily on program directors, coordinators, and information gathered by specific programs on what individuals did once they left residency to supply data for individual's reasons for resignation. We encouraged programs to select the "unknown" option as a reason for resignation if they had no data on this topic, but we do not have complete certainty that the reasons recorded by programs are a true reflection of resident's motivations to leave. However, all Program Directors surveyed were either serving as faculty, Associate Program Director, or Program Director during the dates in question, so there is reasonable institutional memory to support the conclusions.

CONCLUSIONS

Previous researchers were likely unaware of the unique needs of the military that can lead to gaps and delays in progression through the postgraduate years of surgical training, skewing their data collection and leading to an incorrect estimate of attrition. Due to our insider knowledge of Military GME, we were able to decipher that the true attrition rate in Military General Surgery Residency programs is 10.3% as opposed to the previously quoted 35%. We were also able to uncover and further delve into reasons for this attrition rate. Finally, we were able to find that this lower attrition rate does not come at a cost of quality, as shown by the American Board of Surgery first time pass rates. It is our hope that this information may guide Military GME and Civilian GME alike in battling the projected general surgeon shortages.

REFERENCES

1. Ellison EC, Pawlik TM, Way DP, Satiani B, Williams TE. Ten-year reassessment of the shortage of general surgeons: increases in graduation numbers of

general surgery residents are insufficient to meet the future demand for general surgeons. *Surgery*. 2016;164:726–732. https://doi.org/10.1016/j.surg.2016.04.042. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/30096611.

2. Yeo HL, Abelson JS, Mao J, et al. Who makes it to the end?: a novel predictive model for identifying surgical residents at risk for attrition. *Ann Surg*. 2017;266:499–507. https://doi.org/10.1097/SLA.0000000000002364. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26676064.

3. Yaghoubian A, Galante J, Kaji A, et al. General surgery resident remediation and attrition: a multi-institutional study. *Arch Surg*. 2012;147:629–633. https://doi.org/10.1001/archsurg.2012.1676. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/22967173.

4. Wasserman MA. A strategy to reduce general surgery resident attrition: a resident's perspective. *JAMA Surg*. 2016;151:215–216. https://doi.org/10.1001/jamasurg.2015.4607. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/26650772.

5. Edwards MJ, White CE, Remick KN, Edwards KD, Gross KR. Army general surgery's crisis of conscience. *J Am Coll Surg*. 2016;226:1190–1194. https://doi.org/10.1016/j.jamcollsurg.2016.03.001. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/29524661.

6. *Medicine and the Military. Frequently Asked Questions*. https://www.medicineandthemilitary.com/military-physician-faq.

7. ACGME Residents and Fellows With a Doctor of Medicine Degree (MD) by Specialty; 2015 https://www.aamc.org/data/workforce/reports/456766/2-3-chart.html.

8. ACGME Residents and Fellows by Sex and Specialty; 2015 https://www.aamc.org/data/workforce/reports/456766/2-2-chart.html.

9. Naylor RA, Reisch JS, Valentine RJ. Factors related to attrition in surgery residency based on application data. *Arch Surg*. 2006;143:647–651. https://doi.org/10.1001/archsurg.143.7.647. discussion 651-642. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/16645106.

10. Dodson TF, Webb AL. Why do residents leave general surgery? The hidden problem in today's programs. *Curr Surg*. 2005;62:126–131. https://doi.org/10.1016/j.cursur.2004.07.009. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/15706164.

11. Yeo H, Bucholz E, Ann Sosa J, et al. A national study of attrition in general surgery training: which residents leave and where do they go? *Ann Surg*. 2010;252:529–534. https://doi.org/10.1097/SLA.0b013e3161f2769c. discussion 534-526. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/20739654.

12. 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;149:946–953. https://doi.org/10.1001/jamasurg.2014.935. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/25075473.

13. 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. https://doi.org/10.1016/j.jamcollsurg.2012.11.005. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/23266420.

14. Falcone JL, Charles AG. Military and academic programs outperform community programs on the American Board of Surgery Examinations. *J Surg Educ*. 2013;70:613–617. https://doi.org/10.1016/j.jsurg.2013.03.009. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/24016372.

15. Falcone JL. A 15-year residency program report card: Differences between the creme of the crop and the bottom of the barrel on the American Board of Surgery examinations. *Am J Surg*. 2019;217:335–345. https://doi.org/10.1016/j.amjsurg.2016.09.002. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/30244617.

16. Gardner AK, Dunkin BJ. Pursuing excellence: the power of selection science to provide meaningful data and enhance efficiency in selecting surgical trainees. *Ann Surg*. 2016. https://doi.org/10.1097/SLA.0000000000002606. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/29727333.

SUPPLEMENTARY INFORMATION

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