



Contents lists available at ScienceDirect

Surgery

journal homepage: www.elsevier.com/locate/surg

Association between American Board of Surgery in-training examination score and attrition from general surgery residency[☆]

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ARTICLE INFO

Article history:

Accepted 27 March 2018

Available online xxx

ABSTRACT

Background: The American Board of Surgery In-Training Exam is administered annually to general surgery residents and could provide a way to predict attrition, potentially offering a point of intervention.

Methods: In 2007, a national survey of categorical general surgery interns was performed. Resident characteristics were linked to an American Board of Surgery database of American Board of Surgery In-Training Exam scores. Attrition was determined based on completion of training during eight years of follow-up. To identify residents at risk of attrition, American Board of Surgery In-Training Exam scores were analyzed based on average rank and change in American Board of Surgery In-Training Exam score. **Results:** Of 1,048 residents, 739 (70.5%) participated and 108 (14.6%) did not complete training. Average American Board of Surgery In-Training Exam rank was higher for participants who completed training than those who did not (51.8 vs. 42.7 percentile respectively, $P < .001$). Ranking below the 25th percentile was less common among those who dropped out (41.7% ranked below 25th percentile and dropped out versus 51.5% ranked below 25th percentile and completed, $P = .06$), but those whose rank dropped > 16.5 percentile points were more likely to leave training (attrition rate 13.0% with a drop versus 6.0% without a drop, $P = .003$). In adjusted analysis, a one percentile increase in American Board of Surgery In-Training Exam rank was associated with decreased odds of attrition (OR 0.98, $P < .01$).

Conclusion: Lower American Board of Surgery In-Training Exam scores are associated with attrition, but this difference is small, and some residents complete training with very low scores. A large drop in American Board of Surgery In-Training Exam scores from one year to the next appears to be associated with attrition. Program directors should focus their efforts on these at-risk residents.

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Introduction

Attrition from general surgery training is common, with 10 to 25% of residents voluntarily leaving residency.^{1–4} The costs of attrition include deleterious effects to programs' training morale, and resources, as well as long-term losses in the number and diversity

of general surgeons.⁵ Residents who leave general surgery training frequently cite concerns related to lifestyle, family responsibilities, financial stability, and health status, as well as unmet professional needs related to education and program support.^{6–10}

Several broad factors associated with attrition have been identified. At an individual level, features such as trainee gender, race/ethnicity, and marital status have been associated with attrition.^{11–17} Programmatic factors related to attrition also have been identified, such as work hours and program size and location.^{9,18,19} Despite these known risk factors, it remains challenging to anticipate which individual learners are most at risk for attrition.

The American Board of Surgery (ABS) In-Training Exam (AB-SITE) is a standardized multiple-choice test administered annually to nearly all general surgery residents. The exam is offered each January and is intended to be used as a formative assessment of residents' clinical knowledge.^{20,21} Scores on the ABSITE are

[☆] This work was supported by the Robert Wood Johnson Foundation. Drs. Symer, Abelson, and Gade received support from AHRQ [T32-HS000066-23]. Dr. Sosa serves on the Data Monitoring Committee of the Medullary Thyroid Cancer Consortium Registry supported by Novo Nordisk, GlaxoSmithKline, Astra Zeneca, and Eli Lilly. Dr. Yeo's spouse receives salary from Bioscrip, Inc. The authors have no other potential conflicts to disclose. A portion of these results will be presented at the Academic Surgical Congress in Jacksonville, FL, in February 2018.

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predictive of success on the ABS Qualifying Exam, but there are no national data on how ABSITE scores relate to attrition during graduate surgical training.^{22,23} The quantitative, standardized nature of the ABSITE along with its widespread distribution make it an attractive tool for potentially identifying residents who might be struggling in training.

To investigate the relationship between ABSITE scores and attrition, we followed a national cohort of general surgery interns entering residency in 2007. We hypothesized that low ABSITE scores would correlate with increased attrition. Exploratory analyses of ABSITE scores were also performed to better anticipate which residents would be at greatest risk of attrition.

Methods

Analysis of data collected as part of the National Study of Expectations and Attitudes of Residents in Surgery (NEARS) was performed. Categorical general surgery interns who began training in academic year 2007-2008 were asked to complete a survey at the start of their intern year to collect basic demographic information. Preliminary residents were not included. Variables included intern race/ethnicity, gender, marital status, medical school location, whether they had close family to turn to, and whether they had family members working in medicine. Only interns with complete survey information were included for analysis. This cohort was longitudinally followed during residency, and their rate of attrition was measured. Additional description of the methodology used in NEARS has been previously reported.²⁴ The study was approved by the Weill Cornell Medical College Institutional Review Board, #1509016546.

American Board of Surgery (ABS) records were used to determine the primary endpoint, which was attrition from general surgery residency training. Follow-up was completed in June 2016, allowing interns eight additional years to complete residency. Cumulative attrition at the end of this follow-up is reported. The ABS was not given access to resident survey responses in order to increase resident participation and maintain confidentiality. In order to assess the risk of selection bias, the ABS separately confirmed that in the first year of follow-up, residents who did not participate in the survey had a rate of attrition similar to that of those who participated.

For this analysis, the ABS provided resident ABSITE scores and corresponding ranks for each year that a resident had taken the test. These scores and ranks were then linked to individual survey results. The Board also provided basic program characteristics, such as location, size (based on number of chief residents graduating per year), and type (community, academic, or military). Residents with missing scores, those who dropped out of training before ever taking the ABSITE, and those with a missing or incorrect ABS linkage were excluded from analysis (Fig. 1).

ABSITE results can be reported in two ways: as a score and as a rank. Using a proprietary formula, the ABS creates a three-digit score from an individual's responses, accounting for year-to-year variation, such as test item difficulty and the overall ability of a cohort of test takers. This score is then reported to training programs as a percentile rank. Average score and rank were normally distributed, and therefore mean and standard deviations are reported. As many programs use a percentile rank cutoff value to identify residents in need of remediation, the proportion of participants whose rank during training dropped below the 25th percentile was evaluated.²⁵ The lowest rank that participants achieved at any point throughout their training also is reported. To determine if there was a cut-point, or threshold, value of average ABSITE rank or score below which attrition was more likely to occur, graphical and restricted cubic spline regression models were used. However, no such threshold value was identified.

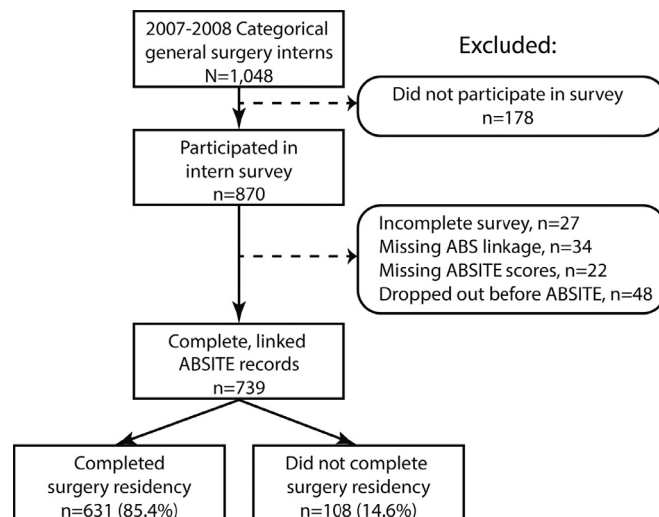


Fig. 1. CONSORT diagram. ABS = American Board of Surgery; ABSITE = ABS In-Training Exam.

Baseline resident characteristics and associated ABSITE scores and ranks were compared with Chi square or Kruskal-Wallis tests. A multivariable logistic regression was performed to determine whether ABSITE rank was independently associated with attrition. ABSITE rank was treated as a continuous predictor in the model, adjusting for participants' sex, race, ethnicity, marital status, attendance at a U.S. or Canadian medical school, having close family to turn to, having family members working in medicine, and training program characteristics, such as location, size and type. All *P* values are 2-sided, with significance defined as $P < .05$. Analyses were performed using SAS 9.3 (Cary, NC).

Additional exploratory analyses were performed among those interns with ≥ 2 ABSITE scores. In this subgroup, we examined the difference between the value from the last year for which data were available and the average value from earlier years. This was calculated by subtracting the average score from the earlier years from the last year's score. For residents who had completed training in the typical timeframe, this value is equivalent to their fifth year ABSITE score minus the average ABSITE score from years one through four. A negative value indicates an individual whose last score had dropped over time. The standard deviation in this change in score was large, indicating a large variation in score change across the study cohort. There was a linear relationship between the size of rank decrease and the proportion of residents dropping out, without a threshold effect. Therefore, a binary variable was created based on a drop in rank of > 16.5 percentile points. This cut point was chosen as a drop of 16.5 percentile points because it represents the 75th percentile of the range of decreases in rank.

In this subset of residents for whom more than one score was available, an additional multivariable logistic regression analysis was performed with drop in rank treated as a binary variable. Interaction between a drop in score and average rank was explored and found to be significant ($P = .03$), therefore an interaction term was added to this model.

Results

Of 1,048 eligible interns who started training in 2007, 870 (83.0%) participated in the intern survey. Residents who dropped out before the first ABSITE or who had incomplete or missing ABSITE information were excluded (Fig. 1). Of the 739 (70.5%) residents who were included for analysis, 106 (14.6%) dropped out of general surgery training.

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