A Predictive Model for a Reputation-Based General Surgery Residency Match and a Novel Online Calculator

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OBJECTIVE: This study aimed to identify medical student characteristics that predict a successful categorical match into a general surgery residency and a match based upon Doximity program rankings.

DESIGN: This was a retrospective study that analyzed academic and personal predictors of a successful general surgery residency match.

SETTING: This study was set at the University of Alabama at Birmingham School of Medicine, a public medical school.

PARTICIPANTS: This study included 173 fourth-year medical students at a public medical school who matched into general surgery residency programs.

METHODS: Our cohort comprised students graduating from our institution between 2004 and 2015 that matched into preliminary or categorical general surgery positions. We collected academic variables and performed univariate analyses and logistic regression to examine the likelihood of specific match outcomes.

RESULTS: Of 173 students, 132 (76%) matched into a categorical position and 41 (24%) matched into a preliminary position. Of all variables, clinical ranking quartile was most effective in predicting a categorical match ($R^2 = 0.35$). Models for a match based upon Doximity ranking lacked the same predictive power.

CONCLUSIONS: This research identifies students that are at risk for not matching into a categorical position and predicts competitiveness for certain programs. It provides a novel calculator to give applicants easily interpretable match probabilities. (J Surg Ed ∎:∎∎∎-∎∎∎. © 2017 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

KEY WORDS: education, general surgery, residency, NRMP, match, calculator

COMPETENCIES: Interpersonal and Communication Skills, Professionalism, System-Based Practice

INTRODUCTION

The National Residency Match Program (NRMP) matches graduating medical students into residency positions. In 2015, there were 1224 categorical positions offered in general surgery,[1] and US seniors had an 85% successful match rate into these general surgery positions. The process has become increasingly competitive, uncertain, and expensive. Several previous studies have examined predictors of a successful categorical match in general surgery and the traits which are highly desired by program directors. Factors such as United States Medical Licensing Examination (USMLE) Step 1 and Step 2 Clinical Knowledge (CK) scores, Alpha Omega Alpha (AOA) membership, and the number of interviews attended have all been show to play an important role in a successful categorical match.[2-5]

However, only 1 study has analyzed how these predictors vary with a program's competitiveness or reputation.[6] And only 1 study has examined how applicant preferences might be aligned with the newly issued Doximity rankings.[7] As such, general surgery applicants have a limited ability to predict a successful categorical match and do not have an evidence-based method to assess their competitiveness across multiple programs.

In this study, we aimed to build statistical models to predict a student's likelihood of successfully matching into a

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categorical general surgery residency position and the likelihood of matching into a specific quartile of the Doximity general surgery ranking. We also aimed to create an online calculator that, using readily available academic data, could provide students easily interpretable probabilities regarding potential match outcomes.

MATERIAL AND METHODS

Study Cohort

Following institutional review board approval, we collected data from a cohort of students that graduated from the University of Alabama at Birmingham School of Medicine (UAB) from 2004 to 2015. We included students that matched through the NRMP main match or through the SOAP (Supplemental Offer and Acceptance Program) into a PGY1 (postgraduate year) position classified as preliminary general surgery, categorical general surgery, or surgery/academic. We excluded any student that matched into a PGY2 position in anesthesia, diagnostic radiology, emergency medicine, neurosurgery, nuclear medicine, ophthalmology, otolaryngology, physical medicine and rehabilitation, radiation oncology, or urology.

Variable Definitions

We defined a preliminary match as one in which the student secured a PGY1 position in preliminary general surgery, but did not secure a PGY2 position. We collected academic data for all students, including: USMLE Step 1 score, USMLE Step 2 CK score, USMLE Step 2 Clinical Skills score, preclinical rank quartile (a value from 1 to 4, with 1 being the top quartile), clinical rank quartile, AOA membership, overall numerical grade by clerkship (a grade out of 100 points), National Board of Medical Examiners (NBME) shelf examination scores by clerkship (a grade out of 100 points), and master's degree status. If the student matched into a categorical position, we collected the quartile rank of that program based upon its position in the 2015 Doximity general surgery program rankings, which rank residencies by reputation.[8]

Statistical Analyses

We performed descriptive statistical analysis to characterize student academic data. The significance of each measure was assessed through 2 independent sample t-tests, analysis of variance, or chi-squared tests. Binary logistic regression and ordinal logistic regression were performed to predict likelihoods of specific match outcomes. For logistic regressions, the upper and lower bounds of the CI represent a 95% CI around the predicted value. All statistical analyses were performed using SPSS, version 23. A 2-tailed $p < 0.05$ was chosen to represent statistical significance.

RESULTS

Cohort Description

The final cohort consisted of 173 medical students who matched into a residency position for general surgery. Of those, 132 (76%) matched to a categorical position, and 41 (24%) matched to a preliminary position. As described in the methods section, none of the 41 preliminary students secured a PGY2 position through the NRMP main match or through the SOAP. Based upon Doximity rankings of categorical programs, 69 (52%) matched to the first quartile, 22 (17%) matched to the second quartile, 32 (24%) matched to the third quartile, and 9 (7%) matched to the fourth quartile. A total of 3 categorical programs matched more than 5 students apiece over the study period: UAB (21 students, Doximity first quartile), Baptist Health System in Birmingham (11 students, Doximity third quartile), and University of Tennessee at Chattanooga (6 students, Doximity third quartile). Overall, the 132 categorical matches were spread across 59 unique residency programs. The 21 UAB matches thus comprised 30% of those Doximity first quartile matches. Furthermore, 70% of the Doximity top quartile matches were at non-UAB programs.

Table 1 shows the overall academic characteristics of the cohort. The mean USMLE Step 1 score was 218.0 (19.7), and the mean USMLE Step 2 CK score was 230.1 (21.1). The mean preclinical quartile ranking was 2.6 (1.0), indicating a ranking between the second and third quartiles, and the mean clinical quartile ranking was 2.5 (1.0).

Pearson correlation analysis showed that these academic variables were correlated with each other. Pearson correlations ranged from 0.69 between USMLE Step 1 and USMLE Step 2 CK to 0.14 between neurology clerkship grade and pediatrics shelf examination. A total of 27 correlations were greater than 0.50. USMLE Step 1 score was most strongly correlated with USMLE Step 2 CK (0.69), preclinical quartile (−0.60), and medicine clerkship NBME examination (0.59). Clinical quartile was most strongly correlated with obstetrician-gynecologist clerkship score (−0.69), medicine clerkship score (−0.66), and surgery clerkship score (−0.62), followed by USMLE Step 2 CK score (−0.55) and USMLE Step 1 score (−0.48).

Categorical vs Preliminary Match

Table 1 also compares the academic characteristics of students who matched in categorical positions to those who matched in preliminary positions. All variables except for neurology shelf examination had significantly different means between categorical and preliminary matches, with categorical students achieving better outcomes across all categories. The variables with the highest R^2 values were the clinical quartile (0.36), the medicine clerkship grade (0.27),