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Education

DOES THE NATIONAL RESIDENT MATCH PROGRAM RANK LIST PREDICT SUCCESS IN EMERGENCY MEDICINE RESIDENCY PROGRAMS?

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Abstract—Background: Emergency medicine (EM) residency programs use nonstandardized criteria to create applicant rank lists. One implicit assumption is that predictive associations exist between an applicant's rank and their future performance as a resident. To date, these associations have not been sufficiently demonstrated. **Objectives:** We hypothesized that a strong positive correlation exists between the National Resident Match Program (NRMP) match-list applicant rank, the United States Medical Licensing Examination (USMLE) Step 1 and In-Training Examination (ITE) scores, and the graduating resident rank. **Methods:** A total of 286 residents from five EM programs over a 5-year period were studied. The applicant rank (AR) was derived from the applicant's relative rank list position on each programs' submitted NRMP rank list. The graduation rank (GR) was determined by a faculty consensus committee. GR was then correlated to AR using a Spearman's partial rank correlation. Additional correlations were sought with a ranking of the USMLE Step Score (UR) and the ITE Score (IR). **Results:** Combining data for all five programs, weak positive correlations existed between GR and AR, UR, and IR. The majority of correlations ranged between. When comparing GR and AR, there was a weak correlation of 0.13 ($p = 0.03$). **Conclusion:** Our study found only weak correlations between GR and AR, UR, and IR, suggesting that those variables may not be strong predictors of resident performance. This has important implications for EM programs

considering the resources devoted to applicant evaluation and ranking. © 2016 Elsevier Inc. All rights reserved.

Keywords—education; residency application; emergency medicine; ranking; predicting success; resident performance

INTRODUCTION

Emergency Medicine (EM) residency training programs seek to identify and recruit the most promising medical school graduates. With regard to resident selection, numerous criteria have been utilized in an attempt to identify predictors of future resident performance as defined primarily by clinical work, professionalism, and performance on standardized examinations. The implicit assumption in this ranking process is that a strong association exists between applicants deemed competitive by these criteria and their future performance as resident physicians.

A number of studies have examined this association; most of these have been small, single-centered studies done in specialties other than EM. We further examined this association by extending the study to include multiple residency training programs while focusing specifically on

EM residencies. We tested the hypothesis that there was a stronger correlation between medical school metrics and resident performance than previously reported by designing a multicenter study investigating the association between graduating resident rank, National Resident Match Program (NRMP) applicant match-list rank, United States Medical Licensing Examination (USMLE) Step I score, and In-Training Examination (ITE) score.

MATERIALS AND METHODS

Study Design

A multicenter prospective cohort study was carried out by five residency programs. The Institutional Review Boards of each site approved the study design and implementation.

Study Protocol

All programs provided four separate variables for residents in each of their respective graduating resident classes from 2008–2012.

- 1) *Graduate Rank (GR)*, as defined by a graduating rank list position in order of best to worst in that resident's graduating class. The GR was obtained via an appraisal of the resident's overall performance during training determined by a consensus panel of five attending physicians with experience and expertise at resident assessment who were core faculty across each of the years studied. During this evaluation, the faculty panel ranked residents on a scale of 1 (unsatisfactory) through 9 (superior) for each of the six Accreditation Council on Graduate Medical Education core competencies, prior to deciding on an overall rank of graduates.
- 2) *Applicant Rank (AR)* was obtained by listing the residents from highest to lowest based on their NRMP rank list position as applicants within their residency class.
- 3) *The USMLE Step I score rank (UR)* was obtained by ranking the residents within their class from highest to lowest USMLE Step I score.
- 4) *The ITE score rank (IR)* was obtained by ranking the residents within their graduating class from highest to lowest with regard to their final post-graduate year ITE score. All resident rank lists were de-identified and sent to the primary site for statistical analysis with the objective of measuring correlations between the variables of interest.

Data Analysis

The original sample size was calculated to be 193 based on 80% power to attain a correlation of $r = 0.20$ between

GR and AR under a 5% significance level and using a two-sided test. This sample size was increased by a factor of 10% for each additional covariate: site, class year, USMLE, and ITE score, yielding 283, which is a lower bound for the final sample size of 286. To make the data consistent across sites, raw scores were transformed into standardized ranks by site and class year. When a resident took an examination twice, we used the first score in our data set. Associations between these standardized ranked scores were analyzed using Spearman's partial rank correlations. A multilevel model was also used to account for class year nested within site and the different metrics reported. For the multilevel model, statistical significance was assessed at the 5% level with a multiple testing correction. Statistical analyses were carried out using SAS 9.4 (SAS Institute, Cary, NC) and R 3.1.1 (Vienna, Austria).

RESULTS

Each of the five sites contributed data on 44 to 75 residents for a total of 286 individual residents. The class size ranged from 7 to 16 for all sites and the five class years included ([Supplementary Table 1, Appendix](#), available online). The results from the multilevel model for program and resident year nested within program were null. Based on the final multilevel model the effect sizes for AR, UR, and IR ranged from 0.10–0.17 ([Table 1](#)). From the aggregated data across all five sites, AR, UR, and IR have weak positive correlations with GR, ranging from $r = 0.097$ to $r = 0.159$, with $p > 0.01$ ([Table 2](#)). The raw data is illustrated in the scatterplots to help visualize any trends in relation to the selected variables ([Figure 1](#)).

DISCUSSION

Our aggregate dataset provides a more robust assessment of the applicant ranking process than we were able to identify in the educational literature prior to 2015. Much of the research in this area has been done in specialties other than EM, limiting our ability to extrapolate lessons learned for EM residency leadership. Surgical residents at one program showed a weak positive

Table 1. Summary of Multilevel Model* of GR

Variable	Estimate	Standard Error	p-Value
AR	0.13	0.06	0.032
UR	0.10	0.07	0.120
IR	0.17	0.07	0.013

GR = graduate rank; AR = applicant rank; UR = United States Medical Licensing Examination (USMLE) Step 1 rank; IR = In-Training Examination rank.

* Standardized rank scores of GR, AR, UR, and IR.

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