Ranking of Resident Applicants on the Match List – Does it Correlate with Their Final Ranking on the Core Competencies?

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Abstract
Determining which medical students will be quality residents is an annual question that challenges residency faculty. Analyzing both objective factors (such as grades and standardized testing) and subjective factors (such as recommendations, essay quality and personality) are involved in determining how good a candidate a given student is. Prior to the Match, residencies rank each applicant on their list for submission to the National Residency Match Program (NRMP). The final rank list scores of medical students who applied to, and were accepted by, the Joan C Edward School of Medicine’s (JCESOM) Family Medicine residency program between the years of 2005 to 2011 were analyzed to determine if there was any correlation between the order in which the students who entered the program were ranked during the Match process, and the order in which these same students (now residents) were ranked on their final scores (just before graduation, three years later) on the Core Clinical Competencies. Furthermore, the United States Medical Licensing Exam (USMLE) Part 1 and Part 2 scores were also compared to their final scores on the Core Clinical Competencies to determine their significance. Using the Pearson Correlation Coefficient, it was determined that there was a statistically significant correlation (0.621; 95% confidence interval 0.39 to 0.78) between the order that the residents were listed on the rank list and their order on the final evaluation. No such correlation was found for USMLE Part 1 (-0.13; 95% confidence interval -0.42 to 0.19) or USMLE Part 2 (-0.26; 95% confidence interval -0.53 to 0.054). This result shows that the process used by the Family Medicine Residency at JCESOM to rank prospective residents does correlate with the final evaluations of these same residents three years later.

Introduction
Every summer, newly minted fourth-year medical students begin to upload their applications to the Electronic Residency Application Service (ERAS). Every fall, residency directors begin to sift through the applications they have received, looking for clues as to which applicants they should invite to interview. And every winter, with the interview process complete, these same residency directors submit their match list, hoping that the end result of the whole process will be a new class of residents suitable for their particular program. Which characteristics to value most is always a question.
Medical students take the United States Medical Licensing Exam (USMLE) Part 1 at the end of their second year of training, and USMLE Part 2 Clinical Knowledge (CK) during their fourth year. Thus, USMLE Part 1 scores, and usually Part 2 (CK) scores are available as part of their ERAS application. Other components of ERAS are the student’s grade transcript, the Dean’s letter, and various letters of recommendation.

In order for residency programs to determine the best residents for their programs, their evaluation process needs to have predictability and reliability. Across all specialties, the top 5 selection criteria are 1) grades in required clerkships, 2) USMLE Step 1 scores, 3) grades in senior electives in specialty, 4) number of honors grades and 5) USMLE Step 2 scores. In this same study however, the student’s institutional Medical Student Performance Evaluation (Dean’s letter) ranked very low in perceived usefulness. Several studies have analyzed which student metrics were most important. A look at independent surgery programs determined that USMLE scores and medical school region were stronger predictors of whether applicants were ranked or not. Interestingly, earlier date of application correlated with higher applicant quality as measured by USMLE score, medical school performance, quality of letters of recommendation and personal statements as well. Internal medicine program directors were more likely than surgery program directors to view membership in the Gold Humanism Honor Society favorably. However, in the field of family medicine, there has been limited consensus on what was important in selecting and ranking students for the Match.

Outside the formal application process social media has been used by residency directors to gather further information on candidates. 17% of surgical program directors accessed social media, compared to 16.3% of all types of program directors. As a result, 33% of the surgical programs, and 38.1% of all programs, ranked
applicants lower based upon data from social media websites.\textsuperscript{5,7,8}

In 2013, a meta-analysis analyzed studies done to determine if the various criteria that program directors use to select and rank their candidates had any relationship to how these candidates actually fare in their residencies.\textsuperscript{9} The authors performed a literature search of the following medical and educational databases up through September 4, 2012: Excerpt Medica Database (EMBASE); Education Resources Information Center (ERIC); MEDLINE and PubMed for publications in English that met their selection criteria of comparing a measurable selection strategy with a measurable outcome. The authors concluded that objective selection criteria such as USMLE Step 1 and Step 2 scores had a high correlation with objective outcome scores like USMLE Step 3 scores, which is not surprising. However, objective selection criteria also had a higher correlation with subjective outcome scores such as the In-Training Evaluation Report than such subjective selection criteria as consensus committee rank, medical school reputation, interviews, deans’ letters and reference letters.\textsuperscript{9}

Thus residency directors have a plethora of information available to guide them in ranking the medical students who apply to their residencies. However, we were not able to locate any studies limited to the specialty of Family Medicine that examined what criteria, if any, reliably predicted the performance of these candidates during their residency. Our purpose, therefore, was to determine if there is any correlation between both subjective data (how the residents were ranked at the match meeting) and objective data (their USMLE Part 1 and Part 2 CK scores) available on applicants and their subsequent performance in a Family Medicine residency program.

The selection process at the Joan C Edwards School of Medicine’s (JCESOM’s) Family Medicine program begins with the Residency Director and core residency faculty screening the applications, then offering on-site visits to those who seem most promising. Those candidates who come for an on-site visit are interviewed by several faculty members and residents. Evaluation forms are submitted by all interviewers involved in the process, and the scores averaged. This average score is used to establish a preliminary match list, which is discussed by all faculty and residents at a ‘Match Meeting’ in February. Changes in the order of the rank list often result from input gathered during this meeting. The revised list then serves as the basis for the final rank list that the Program Director submits to the National Resident Matching Program in March.

Residents are evaluated on the Core Clinical Competencies throughout their training. The six Core Clinical Competencies, as established by the Accreditation Council of Graduate Medical Education (ACGME), are Patient Care, Medical Fund of Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, and System-Based Practice. The faculty meet monthly, typically evaluating one-third of the residents (one class) at each meeting. At this meeting, various factors are considered, including monthly evaluations submitted by JCESOM faculty (both from the Department of Family Medicine and other Departments, e.g., Internal Medicine, Pediatrics, OB/GYN, depending on what rotations the resident has completed since his or her last evaluation). Evaluations submitted by Family Medicine faculty who have served as preceptors for the resident while he or she attended his or her continuity patients are also considered. These forms use the Core Clinical Competencies as the basis for the evaluation. Even though the formal Core Clinical Competencies are a relatively recent development (they were established by the ACGME in 1999), the attributes which they measure have historically been used to evaluate residents.\textsuperscript{10}

For most of these competencies, the evaluation form indicates what should be considered when making the ranking. For example, under Practice Based Learning and Improvement the directions state “Consider how well the resident 1) Accessed medical literature and applied evidence-based medicine, 2) Displayed motivation to learn and improve, 3) Taught students.” For each competency, there is a 5 point scale, in which 1=Unsatisfactory performance, 2=Below expected for level of training, 3=Typical for level of training, 4=Above level of training, and 5=Outstanding performance—top for level of training.

Thus, each resident is evaluated between three and four times a year, and appropriate feedback provided by his or her faculty advisor.

Methods

Data/Population—Data was obtained from the classes that matched in the years 2005-2011 and subsequently graduated in the years 2008-2014 inclusive at the Family Medicine residency of the Joan C. Edwards School of Medicine (JCESOM).

Main Outcome—Rank within a residency class, based upon an average of the final (just before graduation) six Core Clinical Competency Scores (Patient Care, Medical Fund of Knowledge, Practice-Based Learning and Improvement, Interpersonal and Communication Skills, Professionalism, and System-Based Practice).

Main Variables of Interest—1) The position rank of each candidate
on the Match List, compared to the other candidates who matched in that selection year. 2) USMLE Part 1 score. 3) USMLE Part 2 score.

Analysis—The Residency Director provided information on the original applicant order on the final Match List, as well as their final scores on the Clinical Competencies three years later before graduation. For each resident, the final scores on each of the six core competencies were averaged to determine a rank order within the class. For each class, the rank order on the original match list was compared to the rank order obtained by comparing the final scores on the Core Clinical Competencies, using Pearson’s correlation, according to the sample methodology. This test was chosen in consultation with the Biostatistics Section of Marshall University School of Medicine Appalachian Clinical and Translational Science Institute (ACTSI), as being the most appropriate test for comparison of two ordinal scales. The value of the correlation and the 95% confidence interval were calculated using Stata 14.0 (College Station, TX).

The Residency Coordinator also provided information on each resident’s scores on the USMLE Step 1 and Step 2 (CK). These data were also compared using the Pearson correlation with their final ratings on the Core Clinical Competencies, which are the primary criteria used to evaluate residents in programs accredited by the American Council for Graduate Medical Education (ACGME).

Results

Initial attempts to analyze the data by individual class yielded non-significant results, largely due to the limited number of data points in each class. However, when the data was aggregated for all classes, analysis using Pearson’s Correlation Coefficient yielded a correlation coefficient of 0.62 (95% confidence interval 0.39 to 0.78) between the order on the Match List and the final ranking on the Clinical Competencies, as shown in Figure 1. Thus, the process of combining both subjective criteria and objective data in order to select residents for the Family Medicine residency at the JCESOM shows a definite, moderate correlation with how well those residents are rated in their Core Clinical Competencies at graduation.

It should be noted that the number of residents in each class varied, for two main reasons. For most years, the initial class size was seven; in one year it was eight. In four years (2007-2010, inclusive) one or two residents were selected through the osteopathic match program, leaving only 5-6 allopathic residents. (Because only one to two osteopathic students were chosen each year, and they were ranked separately at an earlier meeting than the allopathic students, they were not included in this analysis.) Finally, not all of the students selected finished the program, usually because they transferred to another specialty after their first year. As a result of these factors, the number of residents in each class with data available for both their rank on the Match list and their rank on the Clinical Competencies at graduation three years later varied from a low of 4 to a high of 8.

No correlation was found between the USMLE scores (Part 1 or Part 2) and the final ranking on the Core Clinical Competencies. See Figures 2 and 3. For Part 1 scores the Pearson’s Correlation Coefficient was -0.127, with a 95% confidence interval of -0.418 to 0.188. For Part 2 scores the Pearson’s Correlation Coefficient was -0.262, with a 95% confidence interval of -0.530 to 0.054.

Discussion

This is the first study of its type that we are aware of that focuses exclusively on the specialty of
Family Medicine. The meta-analysis mentioned in the Introduction surveyed the literature through September of 2012. Of 1877 potentially relevant studies, 80 met the selection criteria. These were from a variety of institutions; however, the 5 studies from Thomas Jefferson Medical College (all of which were described as studying “an assortment” of specialties, which were not further specified) included between them a total of 13,535 participants. As the total number of participants in all 80 studies was 41,704, the participants from studies conducted at Thomas Jefferson Medical College represented almost a third of the total population. Specialties that were studied included Anesthesia (2), Assorted (17), Dermatology (1), ENT (3), ER (2), General Surgery (11), Internal Medicine (13), OB/GYN (5), Ophthalmology (1), Orthopedic Surgery (8), Pediatrics (5), Physical Medicine and Rehabilitation (1), Psychiatry (5), Radiology (5) and Unspecified (1). Fifty studies compared an objective selection strategy to an objective outcome; 70 compared objective selection criteria to subjective outcomes; 5 compared subjective selection criteria to objective outcomes; and 34 compared subjective selection criteria to subjective outcomes. Many studies made more than one of the above comparisons. As mentioned in the Introduction, this meta-analysis discovered that objective selection criteria were more highly predictive of not only objective outcome criteria, but also of subjective outcome criteria as well, most often In-Training Evaluation Reports (used for 62 of the 70 comparisons; the other 8 used Professionalism). These comparisons were found in 30 of the studies; only 5 of these studies were US based studies that examined classes evaluated entirely after 2009 (when the ACGME Clinical Competency standards were established).

In contradistinction to the results obtained in this meta-analysis, our study showed a better correlation with our combined objective and subjective selection process than with objective measures alone, when final rankings on the Core Clinical Competencies are considered as the outcome measure. There are at least three possible reasons for this discrepancy. First, regarding the meta-analysis, it is not certain what the criteria for the In-Training Evaluation Reports was; however, of the 30 studies that used this as a subjective outcome measure, only 5 of them involved evaluations made after the Core Clinical Competencies were published by the ACGME. Secondly, the population that applies to the Thomas Jefferson Medical College, which supplied the largest share of the data for the meta-analysis, may be intrinsically different than the population that applies to JCESOM. Thirdly, in the meta-analysis, there were no studies that looked specifically at Family Medicine programs exclusively (although they may have been included in the 17 studies, from 13 different institutions, that were described as studying assorted residencies).

There are at least two limitations to our study. First, although it drew data from a several year period, it was drawn from a single residency program (Family Medicine) at a single institution (JCESOM), and therefore the results may not be generalizable across other specialties or other institutions. Also, as mentioned above, the limited number of data points within each class made it impossible to determine if a correlation existed for any individual class, although a moderate correlation was demonstrated for the group as a whole. Nevertheless, it appears to be the first study that focused solely on the specialty of Family Medicine.
Conclusion

The process of combining both subjective criteria and objective data in order to select residents for the Family Medicine residency at the JCESOM shows a definite, moderate correlation with how well those residents are rated in their Core Clinical Competencies at graduation.

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