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AOA Critical Issues in Education

Reimagining the Path of an Unmatched Orthopaedic Residency Application

A Survey of Program Directors

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Investigation performed at the University of Tennessee College of Medicine, Chattanooga, Tennessee

Background: Few evidence-based suggestions are available to help applicants and mentors improve reapplication outcomes. We sought to provide program directors' (PDs) perspectives on actionable steps to improve reapplicants' chances for a match.

Methods: The PDs were asked to rank positions unmatched applicants can pursue, steps these applicants can take for the next application cycle, and reasons why reapplicants do not match.

Results: Responses from 66 of 123 PDs were received (53.6% response rate). Obtaining new recommendation letters and rotating with orthopaedics were the highest 20 ranked steps unmatched applicants can take. No curriculum vitae (CV) improvement, poor interview, and poor letters of recommendation were the most important reasons hindering applicants from matching when reapplying.

Conclusions: Steps reapplicants could prioritize include obtaining new recommendation letters, rotating in orthopaedics, and producing new research items. CV strengthening and improving interview skills address the 2 main reasons why unmatched applicants failed in subsequent attempts.

Level of Evidence: Level IV

Introduction

Orthopaedic surgery remains one of the most competitive residency specialties across medicine¹. Applicants to orthopaedics are accomplished students, with competitive metrics such as US Medical Licensing Examination scores, research activity, and leadership positions^{1,2}. Nonetheless, up

to 30% of US medical school applicants fail to match each year, which is one of the lowest match rates among residency specialties¹⁻³. In 2022, 1,470 applicants competed for 875 positions⁴. As the number of applicants increases each year, it is inevitable that a growing proportion of applicants will go unmatched.

Disclosure: The **Disclosure of Potential Conflicts of Interest** forms are provided with the online version of the article (<http://links.lww.com/JBJSOA/A545>).

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Orthopaedic residency literature has mostly focused on differences in applications from students who do and do not match^{3,5,6}. This information is considered to be of value to the applying students because they can “self-screen” before applying to orthopaedics. However, for applicants who go unmatched, little data exist to help guide their next steps. Some find themselves in another specialty while others reapply to orthopaedics^{7,8}. Those who remain committed to orthopaedic surgery as a career path have little guidance from the literature regarding the natural history of an unmatched applicant.

Kheir et al. surveyed 81 unmatched orthopaedic applicants to identify risk factors affecting reapplicants' outcomes in the match⁹. Results demonstrated a 58% match rate of orthopaedic reapplicants. The only significant factors affecting the subsequent match were sex and AOA status, whereby female sex and being AOA positively contributed to matching. Nonetheless, other important factors that have been identified to affect the matching outcome were not analyzed. The purpose of this study was to survey orthopaedic surgery program directors (PDs) to analyze variables that may influence an applicant's reapplication success into an orthopaedic residency. This is to provide meaningful material for applicants to understand the challenges they will face if they are unmatched and how to potentially enhance their chances for a future successful match.

Methods

Survey

A 10-question survey, including ranking-type questions, on PD preferences concerning unmatched applicants was created, and the Institutional Review Board granted approval for the study. An email containing a survey link was sent to PDs through the Collaborative Orthopaedic Education Research Program. In the fall of 2020, the survey was sent to 123 potential orthopaedic residency programs. Follow-up reminders were sent after 2 weeks, 1 month, and 2 months.

The survey was constituted of 3 sections: (1) positions unmatched applicants can pursue, (2) steps unmatched applicants can take, and (3) perceived reasons applicants do not match in their second attempt. The PDs were presented with different options for each of the aforementioned categories, and they were asked to rank these options in decreasing levels of importance.

Statistical Analysis

Statistical analyses were performed with IBM SPSS Statistics v27 (IBM). Tests were conducted 2-tailed, and a $p < 0.05$ defined statistical significance. Spearman correlation with bootstrap confidence intervals and Mann-Whitney U test were used for analyses. Effect size r less than 0.3 indicates a small effect, a medium effect is between 0.3 and 0.5, and a large effect is greater than 0.5.

Source of Funding

No financial support to disclose.

Results

Responses

Collectively, 66 of 123 PDs completed the survey on their perceptions of unmatched applicants for a response rate of 53.6%. Respondents represented both academic programs (62.1%; 41 of 66) and community programs (37.9%; 25 of 66). In response to interviewing previously unmatched applicants, only 2 programs (3.0%) answered with “never” and the most common answer was “sometimes” (57.6%; 38 of 66) (Fig. 1). In an answer to an open-ended question, 19.7% of PDs (13 of 66) mentioned that they would consider a reapplicant when recommended by a colleague. Most of the PDs (68.1%; 45 of 66) disclosed that they currently have previously unmatched applicants as residents in their programs. It was reported that 36.4% programs (24 of 66) had 1 previously unmatched applicant as a resident, 13.6% (9 of 66) with 2, 10.6% (7 of 66)

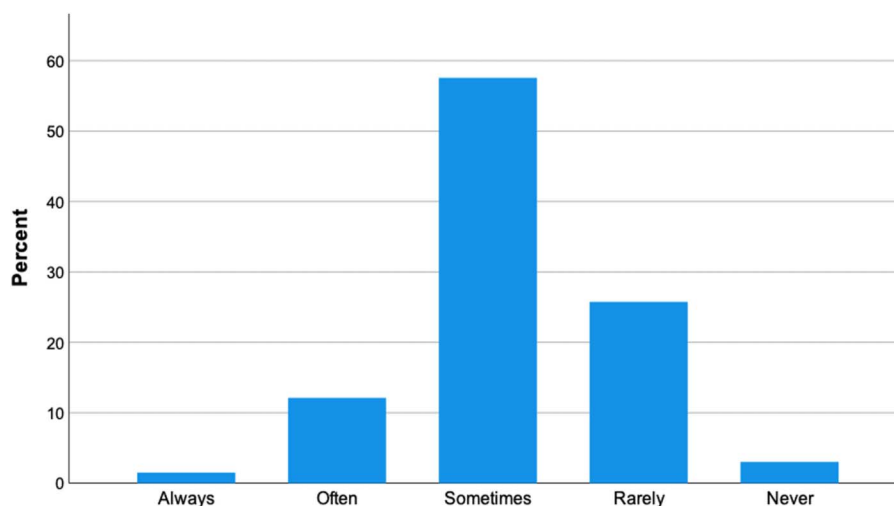


Fig. 1
Program directors' response to “do you offer interviews to previously unmatched applicants?”

TABLE I The Positions Unmatched Applicants Can Pursue as Ranked by Program Directors, From the Highest (Rank 1) to the Lowest (Rank 7)

Rank	Overall
1	Preliminary surgical internship at the same institution
2	Research fellowship at the same institution
3	Preliminary surgical internship at other institution
4	Research fellowship at other institution
5	Delay graduation
6	Switch specialty
7	Other

with 3, and 7.5% (5 of 66) with 4 or more. Academic and community programs had similar acceptance rates (70.7% vs. 64.0%) of and rates of interviewing (68.0% vs. 70.8%) unmatched applicants. There was a small positive correlation between the number of residency spots in the program and having unmatched applicants in that program ($r_s = 0.225$; 95% BCa CI, -0.008 to 0.451; $p = 0.071$).

Positions After Going Unmatched

PDs were asked to rank the different positions unmatched applicants can take. Preliminary surgical internship and a research year were the highest ranked positions by 50.0% and 36.3% of the respondents, respectively. Most of these respondents preferred that this position be taken in their own institution (73.0% of preliminary and 69.8% of research respondents). Table I lists the different positions unmatched applicants can pursue, from the highest ranked to the lowest. Other positions suggested by PDs include spending the year to obtain or begin working toward an advanced degree. These other positions were the lowest ranked options. Academic programs did not have a preference between preliminary

positions and research (42.5% vs. 40.0%), and community programs preferred preliminary surgical internships (55.5% vs. 25.9%).

Steps After Going Unmatched

PDs were asked to rank the different steps unmatched applicants can take before the next residency cycle. New letters of recommendation and rotating with the department were the 2 highest ranked steps, and passing Step 3 was ranked the lowest. Figure 2 details the number of PDs ranking each next step as the top 2 most important (i.e., ranks 1 and 2), and Table II summarizes the overall rank of each next step. Academic and community programs ranked the unmatched applicants' next steps similarly, except in passing Step 2 CK and Step 3, which academic programs consistently ranked higher ($p = 0.008$, $r = 0.330$ and $p = 0.037$, $r = 0.259$, respectively). Programs that preferred research years considered new research products as more valuable compared with programs that preferred preliminary years ($p = 0.077$, $r = 0.243$).

Reasons Applicants Do Not Match When Reattempting

The 3 most important reasons preventing unmatched applicants from matching were no curriculum vitae improvement, poor interview, and poor letters of recommendation (Table III). No curriculum vitae (CV) improvement was ranked as the most important reason by 27.3% of PDs (18 of 66). Introverted and extroverted personalities were the least important factors. PDs of academic and community programs ranked these reasons similarly, except those of community programs who tended to rank poor letters of recommendation higher ($p = 0.062$, $r = 0.237$). Programs that preferred research considered a lack of research output to be the main reason students did not match after reapplication ($p = 0.009$, $r = 0.370$). Programs that preferred preliminary surgical internships considered lack of "fit" a major reason for unmatching on reapplication ($p = 0.021$, $r = 0.323$).

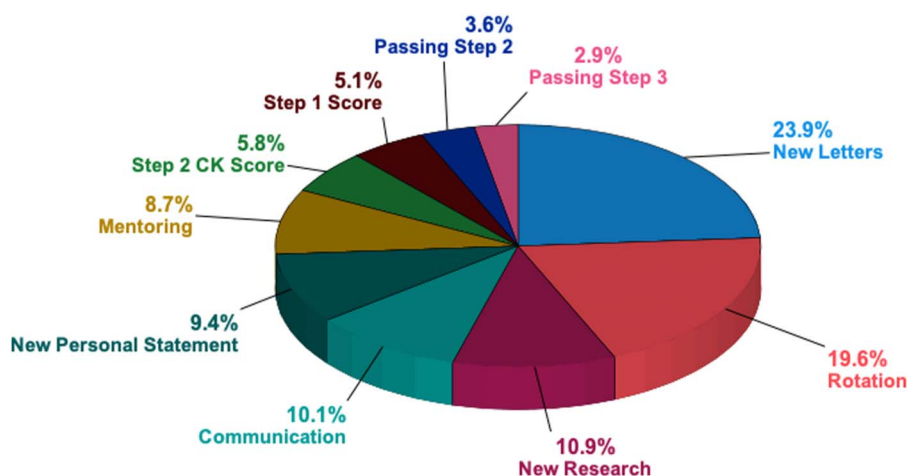


Fig. 2
The percentage of program directors ranking each step as rank 1 or 2.

TABLE II Steps That Applicants Can Pursue After Going Unmatched, as Ranked by Program Directors

Rank	Overall
1	New letters
2	Rotate in the department
3	New research
4	New personal statement
5	Get exceptional mentoring
6	Communicate with program
7	Have a good Step 1 score
8	Have a good Step 2 score
9	Pass Step 2 cs
10	Pass Step 3

Discussion

In the competitive specialty of orthopaedic surgery, with the number of applicants surpassing the number of available training positions, an increasing number of applicants find themselves unmatched when applying for residency^{3,4}. In this survey, PDs were asked to rank the different positions and steps unmatched applicants can pursue as well as the reasons contributing to reapplicants not matching. Most of the programs were willing to interview unmatched applicants. Nearly 70% of programs reported that they have matched previously unmatched applicants within the past 5 years. The most preferred routes for unmatched applicants were a preliminary surgical internship or a research year. The top 3 steps that applicants can take to improve their application are getting new letters of recommendation, rotating with the orthopaedic department, and having new research output. The 3 major reasons contributing to applicants going unmatched a second time were no improvement in an applicant's CV, poor interview performance, and poor letters of recommendation.

Over the past 10 years, there seems to have been a change in the perception of unmatched applicants. Amin et al, in their 2010 survey of 91 PDs, revealed that despite 65% of programs often or sometimes interviewing previously unmatched applicants, 75% rarely accepted these applicants¹⁰. In this survey from a decade later, a similar proportion of PDs mentioned that they often or sometimes interview previously unmatched applicants (69.7%) and a concordant number (68.1%) mentioned that they currently have a previously unmatched applicant as a resident. This shows greater agreement between the willingness to interview and rank unmatched applicants. One possible conclusion is that more programs are accepting unmatched applicants than previously. It is reasonable to conclude that PDs are more willing to accept an unmatched applicant if they have decided to interview them. This change could be the result of less stigma associated with unmatched applicants, improved program metrics to gauge reapplicant competitiveness, or fewer reservations concerning the ability of some unmatched applicants. Applicants have several potential

secondary options to consider after they go unmatched. The findings of this survey suggest that PDs view a preliminary surgical internship (50.0%) or a research year (36.3%) as the most beneficial options. This is comparable with the results from Amin et al, who determined that more PDs preferred a preliminary year over research (75% vs. 40%)¹⁰. Nonetheless, previous studies showed that a surgical internship and research year did not yield different match rates for previously unmatched applicants. In the study by Kheir et al, 52% of research year reapplicants and 64% of preliminary surgical internship reapplicants matched on subsequent reapplication ($p = 0.46$)⁹. Our results show that most of the PDs had a preference for either option to be done at their own institution. This is likely important for programs to get to know the applicants better and to discern factors that are important in residency that cannot be accurately assessed by an application, such as grit, hard work, fit, emotional intelligence, and communication skills. The importance of such relationships with institutions is highlighted in a 20-year assessment of unmatched orthopaedic residency applicants, which demonstrated that 87.5% of initially unmatched applicants who subsequently match do so at institutions that were in the same geographical region as their medical school, surgical internship, and/or research year, including 37.5% of applicants who matched at their home institution⁸.

Understanding program preferences might help applicants apply to their strengths. For example, nonacademic programs preferred a surgery clinical year over research. Programs that encourage a surgical internship seem to favorably view potential applicants doing rotations with orthopaedics, regardless of whether it is at their program or other programs. This can help applicants arrange for such rotations if their program and schedule permits. Regarding research, applicants should prioritize not just the activity of research but rather demonstrable academic productivity. Nonetheless, a clinical year vs. a research year is not the whole story. Not having any

TABLE III The Reasons Applicants Do Not Match When Reattempting, as Ranked by Program Directors From Most Important (Rank 1) to Least Important (Rank 11)

Rank	Overall
1	No curriculum vitae improvement
2	Poor interview
3	Poor letter
4	Low board score
5	Lack of research
6	Unrealistic expectations
7	Lack of "fit"
8	Poor advising
9	Unfamiliar applicant
10	Introvert
11	Extrovert

improvement with an applicant's CV was the highest ranked reason behind applicants going unmatched while reapplying, so applicants should try to enrich their work with experiences which strengthen their application as a whole. Another avenue for improvement is interview performance because a poor interview is another important contributor to reapplicants failing to match. The singular takeaway from this assessment is for unmatched applicants to take a realistic assessment of their strengths and weaknesses and do their best to convert weaknesses into strengths.

While applicants might be motivated to do everything they can think of, it is necessary to consider the value specific tasks add to their application. For example, preparing and taking Step 3 is a time-consuming process that PDs mentioned is the least likely to help unmatched applicants. Therefore, unless the applicant failed a step examination and needs to demonstrate his/her ability to pass board examinations, it is likely that the limited time before the next application cycle can be better directed toward other higher ranked areas. Although an excellent score on Step 3 may be admirable, it may not significantly improve an application. The converse of failing or poorly performing on Step 3 could degrade an application.

Although the aforementioned steps can be attempted to improve the probability of matching, applicants need to remain cognizant to metrics they cannot change, such as board scores and school rank, because they are still weighted highly by PDs. Therefore, having realistic expectations, applying to a favorable number of programs, and considering alternative options must be considered. To be of most help for applicants, results from this study are best combined with other data regarding the differences between matched and unmatched applicants as well as optimizing practices related to applying, interviewing, and ranking programs to match.

This study is not without limitations. Responses from the 66 PDs might not necessarily be representative of all PDs, and these opinions may change with time in light of changes to the application (e.g., Step 1 becoming pass/fail). Moreover, despite PDs having a leadership role in resident selection, ranking applicants typically involves multiple faculty members who might have different perceptions about the importance of different parts of the application. Nonetheless, it is generally assumed that PDs' opinions reflect those of the institution. Finally, although an attempt was made to rank the most pertinent aspects of unmatched applicants' applications in order of importance, there was no consensus on a single most important factor. It is unlikely that only 1 factor will contribute to an applicant's probability of matching. Rather, the results should

help students focus their efforts in areas that are more likely to pay off.

In conclusion, unmatched applicants may be considered for residency in most programs. Whether doing a preliminary surgical internship or a research year, obtaining new letters of recommendation, rotating with the orthopaedics department, and having new research products are things applicants can prioritize. It is also important for applicants and their mentors to note that no CV improvement and a poor interview are the 2 main reasons hindering unmatched applicants from a successful subsequent match. ■

Note: On behalf of the Collaborative Orthopaedic Educational Research Group (COERG): Andrew W. Wilson, MS; Charles Cody White, MD; Afshin Razi, MD; Amiethab Aiyer, MD; Andrew Sobel, MD; Anil B. Krishnamurthy, MD; Ashley Rogerson, MD; Benjamin Jackson, MD; Brent M. Cone, MD; Brian Scannell, MD; Brock T. Wentz, MD; Carl Paulino, MD; Carol Lin, MD; Charles J. Gatt, MD; Charles Pasque, MD; Craig Ebersson, MD; Daniel Wongworawat, MD; Dawn LaPorte, MD; Gabriella Ode, MD; George Dyer, MD; Gregory A. Vrabec, MD; Gregory Grabowski, MD; Gregory Vrabec, MD; Haleh Badkoobehi, MD; James Purtill, MD; Jayson Brooks, MD; Joel Klana, MD; John Andrawis, MD; Joseph M. Sowards, MD; Joseph Weistroffer, MD; Joshua Patt, MD; Joshua Wright-Chisem, MD; Justin J. Hicks, MD; Kathleen S. Beebe, MD; Kellie Leitch, MD; Kenneth Gundie, MD; Kimberly Templeton, MD; Lauren E. Geaney, MD; Lee Leddy, MD; Madhusudhan Yakkanti, MD; Mara Schenker, MD; Mary K. Mulcahey, MD; Matthew D. Beal, MD; Mauricio Kfuri, MD; Mel Harrington, MD; Michael D. Johnson, MD; Michael Hartman, MD; Monica Kogan, MD; Norman Turner, MD; Patrick Osborn, MD; Paul Dougherty, MD; Paul Tornetta, MD; Peter White, MD; Rajiv Rajani, MD; Randy Cohn, MD; Robert C. Decker, MD; Ryan D. Muchow, MD; Ryan Fitzgerald, MD; S. Elizabeth Ames, MD; Samir Mehta, MD; Scott E. Porter, MD; Selina Poon, MD; Shawn Gilbert, MD; Tessa Balach, MD; Thomas Scharschmidt, MD; William K. Payne, MD; William N. Levine, MD; and Youssef M. Khalafallah, MD.

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